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AUTOMATION TECHNOLOGY
19 AUGUST 1980 (FOUO 14/80) 1 OF 4

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JPRS L/9261

19 August 1980

USSR Report

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

(FOUO 14/80)

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USSR REPORT

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

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HARDWARE

UDC 681.327.67

MAGNETIC MEMORY ELEMENT FOR AN INTEGRAL SEMIPERMANENT STORAGE UNIT

Kiev ZAPOMINAYUSHCHIYE USTROYSTVA I KRIOELEKTRONNYYE KOMPONENTY EVM [Storage Units and Cryoelectronic Computer Components] in Russian 1979 pp 5-10

STEPANOV, V. A. and OSTAPENKO, Yu. V.

[From REFERATIVNYY ZHURNAL. AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, April 1980 Abstract No 4 B562]

[Text] The design, operation and findings of an experimental investigation of a magnetic memory element designed for the development of integral matrices and, on their basis, of a semipermanent storage unit are presented. Figures 2; references 4.

[361-1386]

ABSTRACTS FROM THE COLLECTION MINI- AND MICROCOMPUTER HARDWARE'

Kiev TEKHNICHESKIYE SREDSTVA MINI- I MIKROEVM in Russian 1979 pp 90-91

UDC 681.3.06.51

REAL-TIME OPERATING SYSTEM FOR MICROCOMPUTERS

[Abstract of article by Makhiboroda, A.V.]

[Text] The structure of a real-time operating system oriented to a specific class of jobs and modular hardware and programming support is presented. The proposed operating system (OS) realizes a simple tabular method of assignment control permitting organization of interface functions in the MEK-488 standard and control of execution of instrumental functions. It is promising for application in microprocessor devices built into scientific instruments. 2 figures, references: 5.

UDC 681.398

ON ONE METHOD OF COMPUTERIZED DATA COMPRESSION

[Abstract of article by Makovenko, Ye. T., Yakovlev, Yu. S. and Babyak, B.P.]

[Text] Analytical expressions are derived which make it possible to determine the minimally possible amount of memory (in bits) and the coefficient of data compression based on the frequency of encounter of alphabetical letters in a message array. An original method is proposed for data compression which may be applied in practice in the elaboration of specialized and control computers. The possible reduction of data redundancy is illustrated. 2 tables, references: 4.

UDC 62-50.001.5

CHARACTERISTICS OF SEVERAL EXPERIMENT CLASSES CONSIDERED AS OBJECTS OF AUTOMATION

[Abstract of article by Yegipko, V.M., Gorbunov, S.K. and Gorin, F.N.]

[Text] The totality of quantitative and qualitative indicators describing fundamental properties and features of experimental research as an object of automation is considered. Based on observation of over 400 experiments, ranges of variation in quantitative indicators are specified which correspond to five classes of experiments. Examples of value of quantitative indicators are cited for each class. 1 figure, 5 tables, references: 3.

UDC 681.142.4

ON DESIGNING AN AUTOMATED SCIENTIFIC EXPERIMENTATION SYSTEM BASED ON COUPLING DEVICES WITH STANDARD MONOPHONIC TAPE RECORDERS

[Abstract of article by Reutov, V.B., Sevast'yanov, A.K.]

[Text] The possibility of designing an experiental data collection and recording system based on coupling devices with a regular monophonic tape recorder and one central computer is considered in the study. Technical specifications of the device are illustrated. 1 figure, references: 3.

UDC 681.3: 518.5

ONE ALGORITHM FOR SOLVING FINITE DIFFERENCE EQUATIONS AND ITS APPLICATION IN DIGITAL GRIDS

[Abstract of article by Bashkov, Ye. A., Ladyzhenskiy, Yu. V. and Yuraga, A.L.]

[Text] An algorithm is proposed for organizing the computer process to solve finite difference equations in digital grids making possible a reduction in equipment expenditure without substantial increase in problem-solving time by reducing the number of junction processors. 1 figures, 3 tables, references: 4.

UDC 382.14

DETERMINING THE DIGITAL CONVERSION ERROR OF INTEGRAL CHARACTERISTICS OF A RANDOM PROCESS

[Abstract of article by Malinovskiy, B.N., Makov, D.K. and Potapova, G.N.]

[Text] Expressions are derived for total error and the coefficient of effect for the derivation of integral characteristics of a random process using level quantization, function generation of the quantized process, and time quantization operations. A nonstationary normal random process is used as a model of the input signal. It is shown that operations of quantization should be considered jointly when deriving integral characteristics. references: 3.

[359-8617]

8617
CSO: 1863

'ISKRA' SERIES DESK TOP CALCULATORS

Moscow ELEKTRONNYYE KLAVISHNYYE VYCHISLITEL'NYYE MASHINY RYADA "ISKRA" in Russian 1980 signed to press 16 Nov 79 pp 2-8, 11-17, 168

[Annotation, table of contents, introduction and excerpts from chapter 1 of handbook by B. A. Baklan, A. I. Bukhshtab, M. Ye. Levit, V. A. Murzin, L. M. Khokhlov and V. K. Shved; Izdatel'stvo "Statistika," 20,000 copies, 168 pages]

[Text] The basic technical characteristics and features of the element base of the "Iskra" series EKVM [desk top calculators] are considered in this book. The principles of construction of standard units are described. The structure and principles of logic construction are presented. Algorithms are given for operation of the most popular and advanced models in the series.

This book is intended for the specialists who operate and maintain the calculators in computing centers. It will be useful to engineers and technicians who use the calculators in their work.

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Introduction

The widespread introduction and efficient use of computing technology is an immediate national economic task, the successful performance of which depends directly on the skills of the specialists immediately engaged in operation and maintenance of specific models of machines.

Developed at the Leningrad State Union Industrial Design Bureau (GSKTB) for Calculators, the "Iskra" calculator series built with integrated circuits largely meets the needs of the country's national economy for modern calculators.

The "Iskra" series of calculators have MOS IC's for their element base. The technical-economic characteristics of these circuits most fully meet the requirements of the calculators for fast operation, degree of integration and cost.

The reliability of calculators using MOS IC's was enhanced by a sharp reduction in the number of elements in the machines (8-12-fold) and by the reduction in the number of solders (2-3-fold) and leads (about 2-fold).

The reduction in the number of parts and assembly connections made it possible to raise the technological effectiveness of calculators, improve their size-weight indexes, lower costs and sharply increase output of the machines in the country.

Engineering the "Iskra" series of calculators, based on standardized basic circuits and industrial design solutions, made it possible to obtain a great number of operational-technical advantages, including:

standardized nomenclature of calculator models for a wide range of computational operations;

unity of input languages and external software for the models;

and the possibility of setting up a centralized network for calculator repair in the USSR TsSU [Central Statistical Administration] system.

This book will provide essential theoretical and practical aid to specialists in the study and use of the "Iskra" series of calculators.

Chapter 1. Basic Characteristics of the "Iskra" Series of Calculators

1.1. Nomenclature of Models in the "Iskra" Series

The "Iskra" calculator series includes the following models:

the "Iskra-1103" and "Iskra-210"--for the simplest calculations;

the "Iskra-111," "Iskra-112," "Iskra-114" and "Iskra-1121"--for commercial calculations;

and the "Iskra-121," "Iskra-122," "Iskra-122-1," "Iskra-123" and "Iskra-124" for scientific calculations.

As noted above, MOS IC's with small, medium and large scale of integration (series K172, K144, K501, K145 and others) are used as the element base in the "Iskra" series of calculators. The functional capabilities and characteristics of the element base are covered in chapter 2.

The technical and operational parameters of the calculators essentially depend upon the type and quantity of memory registers used.

Three types of registers are used in the memory units of the "Iskra" series of calculators. With the first type, the user can press special keys to store and recall initial data, constants and calculation results.

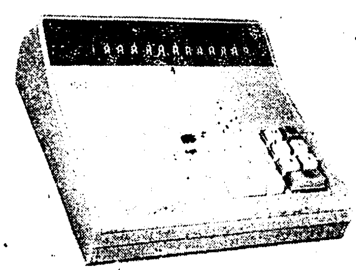
The second type of memory register can store input numbers or calculation results with a "plus" or "minus" sign in the corresponding memory register automatically or the user can press special keys for this. Memory contents can be recalled by pressing a special key.

The third type is a stack register not accessible to the user for storage and recall by using memory recall keys.

The stack registers form a special calculator memory that works on the last in first out principle. Stack registers make it possible to automate evaluation of algebraic expressions with regard to the conventional priority for execution of operations [4].

The basic characteristics of the "Iskra" series of machines are given in table 1.1.

The simplest model is the "Iskra-1103" (fig. 1.1) for simple economic planning and mathematical calculations. The machine performs addition, subtraction, multiplication and division on 12-digit numbers, as well as operations with a constant.



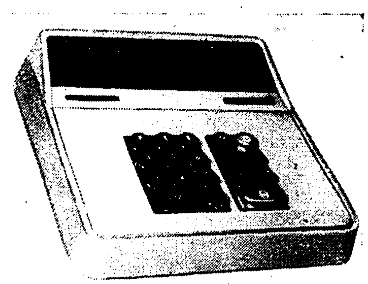


Fig. 1.1. "Iskra-1103" calculator Fig. 1.2. "Iskra-210" calculator

The "Iskra-210" (fig. 1.2) has similar capabilities, but it is smaller, weighs less and consumes less power than the "1103" because it has large-scale integrated circuits.

Table 1.1

	Calculators for solving the simplest problems		Calculators for solving commercial problems			
	"Iskra-1103"	"Iskra-210"	"Iskra-111"	"Iskra-112"	"Iskra-114"	"Iskra-1121"
1.	+, -, X, ÷, operations with a constant	+, -, X, ÷, operations with a constant	+, -, X, ÷, %, /%, ÷|, multiplication by constant, storage in a register	+, -, X, ÷, ÷|, %, /%, operations with constants, storage in three registers	+, -, X, ÷, %, /%, operations with constants, discounts, extra charges, storage in four registers	+, -, X, ÷, %, /%, operations with a constant, discounts, extra charges, storage in four registers
2.	K172 K144 K127 K161	K145 K165 K172 K186 K161	K172 K144 K127	K172 K144 K127	K501 K172 K144 K127 K161	K501 K172 K144 K186 K127
3.	0	0	1	3	4	4
4.	0.03 0.35	0.03 0.3	0.05 0.35	0.03 0.35	+, - 0.03 X, . 0.3	+, - 0.03 X, . 0.3
5.	luminescent tubes	luminescent tubes	gas-discharge tubes	gas-discharge tubes	luminescent tubes	printer on narrow paper tape roll
6.	12	12	12	12	15	15
7.	variable-fixed	variable-fixed	variable-fixed	variable-fixed	variable-fixed	variable-fixed
8.	none	none	none	none	none	none
9.	260 x 280 x 110	200 x 112 x 40	305 x 365 x 120	305 x 365 x 120	305 x 365 x 120	305 x 365 x 120
10.	3.5	2	7	8	7	12
11.	15	8	15	25	25	50

Key: 1. executable operations; 2. element base; 3. memory registers 4. average operation execution time, s; 5. output type; 6. digit length; 7. decimal point; 8. program size; 9. dimensions, mm; 10. weight, kg; 11. power consumption, W.

Calculators for solving scientific problems

"Iskra-121"	"Iskra-122"	"Iskra-122-1"	"Iskra-123"	"Iskra-124"
+, -, X, ÷, ÷|, ↑, √, storage in one memory register	+, -, X, ÷, ÷|, /-/, /X/, ↑, √, storage in two registers, evaluation of formulas with ()	+, -, X, ÷, ÷|, ↑, √, storage in two registers evaluation of formulas with ()	+, -, X, ÷, ÷|, ↑, √, storage in one memory register	+, -, X, ÷, ÷|, ↑, √, /-/, normal and inverse trig. functions, rad-deg, deg-rad, operations with (), storage, operation by program with length of 180 steps
K172 K144 K127	K172 K144 K127	K501 K127 K144 K172 K161	K172 K144 K127	K501 K127 K144 K172 K161
2 + 2 stacks	5 + 3 stacks	5 + 3 stacks	5 + 3 stacks	10 + 3 stacks
+, - 0.02 X, ÷ 0.15 √ 0.25	+, - 0.02 X, ÷ 0.15 √ 0.25	+, - 0.02 X, ÷ 0.15 √ 0.25	+, - 0.02 X, ÷ 0.2 √ 0.4	+, - 0.02 X, ÷ 0.1 √ 0.3 function 1.0
gas-discharge tubes	gas-discharge tubes	luminescent tubes	gas-discharge tubes	luminescent tubes
16	16	16	16	16
natural	natural	natural	natural	natural
none	none	none	71 instr.	180 instr.
407 x 385 x 127	407 x 385 x 127	305 x 365 x 120	407 x 385 x 127	407 x 385 x 127
15	15	7	15	15
30	30	20	40	40

The more complex "Iskra-111" is to be used for economic planning and statistical accounting calculations. It performs addition, subtraction, multiplication and division on 12-digit numbers, inverse division, accumulation in one memory register, computation of percentages and percentage ratios, as well as operations with constants. It also has keys to change the sign, to store numbers and to recall them from the memory register. Calculations can be performed with or without rounding of the results.

The "Iskra-112" (fig. 1.3) has circuitry similar to the "111" and is a more complex model for performing a wide range of statistical accounting and economic planning calculations. It performs all the operations mentioned for the "111" and also has manual or automatic accumulation in three memory registers.

Compared to the "112," the "Iskra-114" performs a wider range of operations. It has four memory registers; simple and automatic accumulation of operands and results can be performed in each of them. Operations for discounts and markups, as well as the capability of counting the number of operations performed permit extensive use of this model for automation of economic planning and statistical accounting calculations.

The "Iskra-1121" performs the same operations as the "114," but has a printer for output. Printing the initial data and results permits monitoring the course of the calculations and provides a record of the results.

Medium-scale integrated circuits are used in the "Iskra-114" and "Iskra-1121" models. Thus, despite the greater complexity of these models, they can be installed in the standard case used also for the "Iskra-111" and "Iskra-112" models.

The Iskra-122" (fig. 1.4) performs calculations on 16-digit numbers with a natural decimal point. It performs the following operations: addition, subtraction, multiplication, division, inverse division, exponentiation to an integral power, extraction of square root, accumulation, operations with parentheses, and extraction of the integer part of a number. The "Iskra-122" has five memory registers: two accumulating and three stack registers.

The "Iskra-122-1" is similar to the "122," but is smaller in size and weight since it has MOS IC's with MSI.

The "Iskra-121" is a simplified modification of the "122." It has two memory registers, including one accumulator and two stacks.

The "Iskra-123" is a programmable calculator. It has two modes of operation which provide manual calculation, program input, programmed calculation, and scanning of the program with the possibility of correcting it

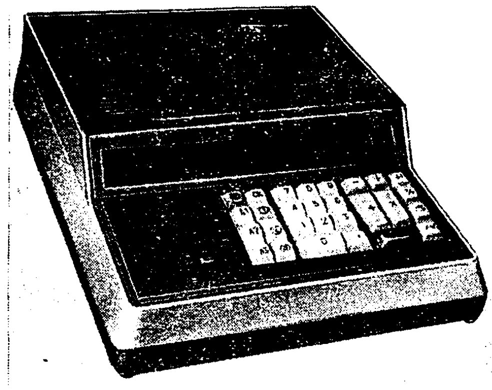


Fig. 1.3. "Iskra-112" calculator

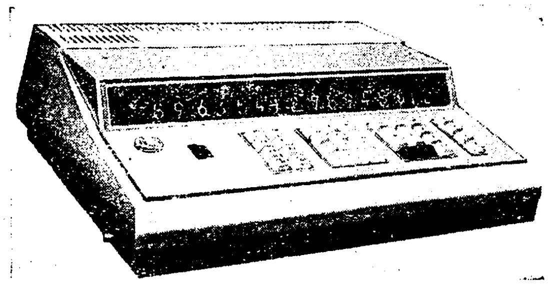


Fig. 1.4. "Iskra-122" calculator

when there are input errors. The broad functional capabilities of the "Iskra-123," which are similar to those of the "122," and the programmable control with conditional branching and program length up to 71 instructions enable the user to raise labor productivity.

The "Iskra-124" is the top of the line in terms of functional capabilities. In comparison to the "123," it includes calculation of elementary functions in its array of automatic operations.

Maximum program length is 180 instructions which may contain conditional and unconditional branches. A program may be input from the keyboard or from the magnetic card reader/writer.

The machine has 10 memory registers for storage of constants and intermediate results, as well as for automatic accumulation during calculations.

1.3. Calculator Engineering Design Philosophy

To match the unity of the input language for the calculator series, a unified structure and principles of engineering design and algorithmic circuit standardization were worked out.

The models in the series have the following assemblies and units: logic unit--to perform operations on input numbers and to control the other assemblies and units in the calculator; keyboard unit--for input of numbers and operations; display unit--to display results and initial data; power supply--to generate supply voltage for all the assemblies and units in the calculator.

The engineering solutions for the assemblies and units in all models are identical and basically make use of the same sets of products intended for broad applications.

The keyboard unit is built on the basis of a "gerkon-magnet" pair, structurally made as standardized key units (fig. 1.5) or modules (fig. 1.6).

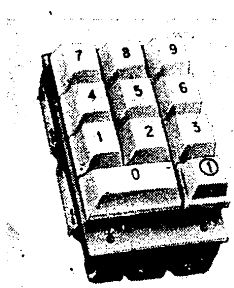


Fig. 1.5. Keyboard unit

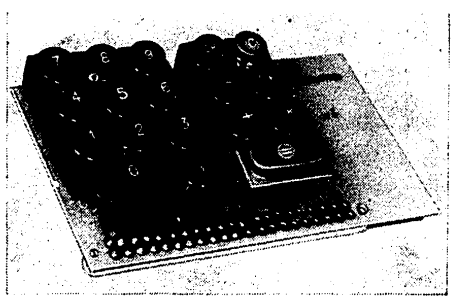


Fig. 1.6. Modular keyboard unit

The display unit in all models of the series (except the "Iskra-1103," "Iskra-114," "Iskra-122-1," "Iskra-124" and the "Iskra-210") has the same basic electrical circuits and is made with gas-discharge IN-14 indicator tubes with a control circuit made with series produced transistors and diodes (fig. 1.7).

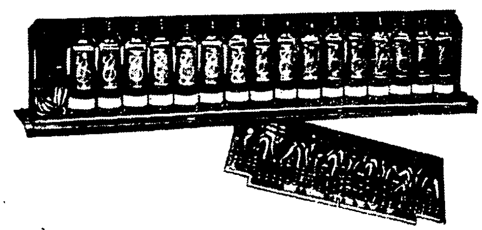


Fig. 1.7. Display unit with IN-14 tubes

The "Iskra-1103," "Iskra-114," "Iskra-122-1" and "Iskra-124" models have luminescent IV-6 indicator tubes (fig. 1.8), while the "Iskra-210" model uses the IV-3A type.

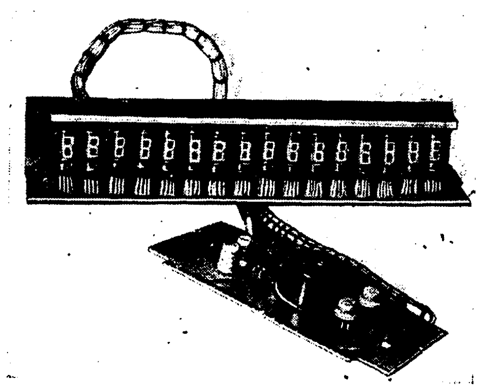


Fig. 1.8. Display unit with IV-6 tubes

Sequential access memory with a magnetostrictive delay line (MLZ) was used in the early "Iskra-111" and "Iskra-122" models. However, as production was assimilated and the cost reduced, the K-144 series of multidigit MOS integrated shift registers replaced the MLZ in the models of the calculator series built with IC's, which considerably enhanced the technological effectiveness of the machines being produced.

The power supply was developed on the basis of a key stabilizer with a converter and built with series produced discrete elements (fig. 1.9).

Design unification of the models in the series was achieved by development of three basic calculator designs which vary considerably in size and weight:

the basic design for calculators handling the simplest calculations like the "Iskra-1103" (fig. 1.10);

the basic design for calculators handling commercial calculations (the "Iskra-111" type and modifications of it, fig. 1.11);

the basic design for calculators handling scientific calculations (the "Iskra-122" type and modifications of it, fig. 1.12).

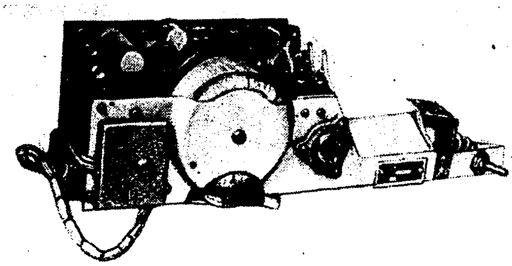


Fig. 1.9. Power supply for the "Iskra-122" calculator

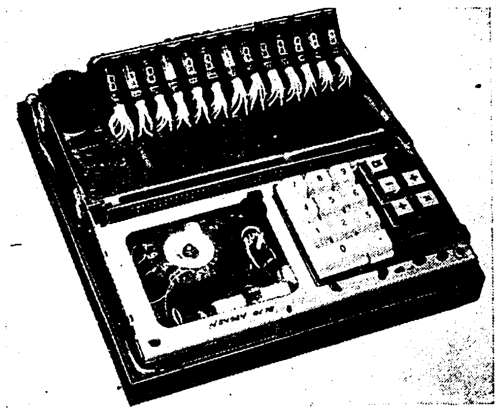


Fig. 1.10. Basic Design of the "Iskra-1103" calculator

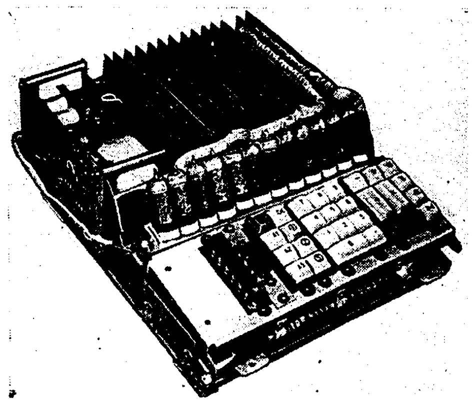


Fig. 1.11. Basic design of a calculator for commercial calculations

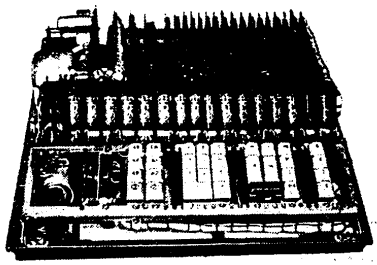


Fig. 1.12. Basic design of a calculator for scientific calculations

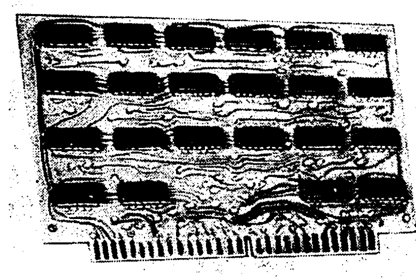


Fig. 1.13. Logic unit (type size 155 x 90 mm)

The basic characteristics of the three basic designs are given in table 1.5.

Table 1.5

Parameters	"Iskra-1103"	"Iskra-111"	"Iskra-122"
Digit length	12	12	16
Number of logic boards, pieces	3	14	20
Type size of board, mm	240 x 140	155 x 90	155 x 90
Permissible number of microcircuits, pieces	120	200	340
Number of parts, pieces	259	657	1879

In the basic designs ("Iskra-111" and "Iskra-122"), unified principles of the composition of the machines are used and the following basic parts and assemblies are standardized: type size of logic boards (fig. 1.13); connectors; keyboards; logic unit design (fig. 1.14); power supply design; and display unit design.

The basic design of the "Iskra-1103" is based on the common design elements (connectors, tubes, keyboards, etc.) of the "Iskra-111" and "Iskra-122," but differs substantially from them in principle of composition.

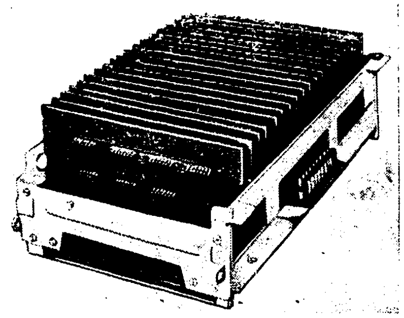


Fig. 1.14. Logic unit for the "Iskra-122" calculator

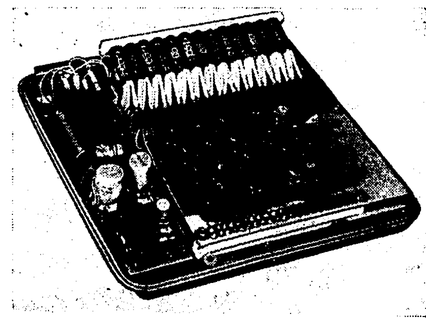


Fig. 1.15. Design of the "Iskra-210" calculator

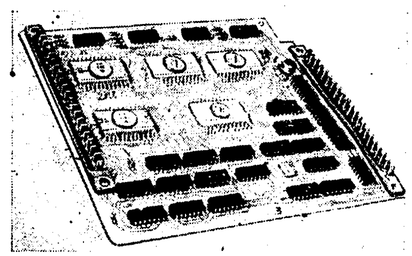


Fig. 1.16. Logic unit for the "Iskra-210" calculator

The "Iskra-210" with large-scale integrated circuits (fig. 1.15) has a completely different design. This new design is based on a single board version of a calculator logic unit (fig. 1.16).

The basic designs enable replacement of an electrical circuit without changing machine design.

[247-8545]

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SOFTWARE

LIST OF SOVIET ARTICLES DEALING WITH COMPUTER PROGRAMS

Moscow ALGORITMY I PROGRAMMY in Russian No 5, 1980 pp 2-110

[Following is a listing of the Soviet entries from ALGORITMY I PROGRAMMY (ALGORITHMS AND PROGRAMS), a bibliographical publication of GPNTB SSSR. This listing is from Vol 5, 1980].

[Excerpts]

1534. Bayakov, A. Yu. Gontarenko, S.V., Kuznetsov, S.D. Clusters of central processor operating systems. Report given at 4th conference of young specialists and scientists, April 78. Moscow, 1979, 13 pp. ("Preprint/AN SSSR. In-t toch. mekhaniki i VT, No 17).

1537. Zinov'yev, V.D., Klochkov. Monitoring and control of data processing in a computer center. "Vopr. radioelektron. Ser. EVT", 1979, iss. 5, pp 9-20. Principles and methods of monitoring and control of data processing at VTs, organization of package processing of assignments, planning, distribution and accounting of machine time. Algorithms and VTs report forms are given. Experience gained in using monitoring standards established for operating services for preventive maintenance and repair work is cited.

1538. Ivanov, V.N., Nechayev, V.M., Tsvetkov, V.V. Recording a hologram in permanent optoelectronic memory. Repot given at 4th conference of young specialists and scientists, Apr 78. Moscow, 1979, 17 pp ("Preprint/AN SSSR. In-t toch. mekhaniki i VT, No 18), bibliography 5 designations.

1541. Maklashin, O.A., Molchanova, G. Yu. Some questions on planning a CODASIL data base management system. Moscow, 1979, 30 pp ("Preprint/AN SSSR IPM", No 3). bibliography 4 designations.

1544. Popovskaya, K.I. Analysis of message management program of general telecommunications method of access. "Vopr. radioelektron. Ser. EVT", 1979, iss. 6, pp 81-84. Questions of evaluation of required operating memory and productivity of remote processing systems using general telecommunications methods of access.

1545. Pottosin, I.V., Realization language for systems programming, Novosibirsk, 1979, 24 pp. ("Preprint/SO AN SSSR VTs", No 179). bibliography 26 designations.

1580. Bleyvas, I.M., Nartov, P.A., Trakay, V.G. Magnetic system calculation program based on methods of secondary sources. "Elektron. tekhnika. Ser. 1. elektron. SVCh", 1979, iss. 5, pp 90-91. bibliography 4 designations. ALGOL-program calculation in cylindrical system of coordinates R, θ, Z axisymmetrical magnetic systems possessing symmetry with respect to OR axis. Program consists of chief program PROGRAM and 12 peripheral subroutines. Sytem of linear algebraic equations of high order, to which reduces solution of integral equations, is solved with aid of standard program SYSTEM. Solution time 25 minutes.

1584. Gusel'nikov, N.A. Varactor diode response analysis program. "Elektron. tekhnika. Ser. 1. elektron. SVCh", 1979, iss. 8, p. 121, bibliography 3 designations. Calculation program in ALGOL and FORTRAN of varactor response with Schottky barrier with arbitrary distribution of impurities throughout semiconductor structure. Counting time of one version depends on complexity of impurity distribution in diode and comprises 0.5 to 2 minutes.

1585. Gusel'nikov, N.A., Pogorelova, E.V. Calculation program of nonlinear characteristics of LPD based on equivalent model with arbitrary dopant distribution. "Elektron. tekhnika. Ser. 1. elektron. SVCh", 1979, iss. 1, pp 105-106, bibliography 3 designations. Calculation program of nonlinear response of LPD based on equivalent model with arbitrary distribution of impurities, enters complex of MLS programs of LPD response analysis under static and small-signal conditions as independent program and calculates both small-signal and nonlinear response of LPD (total resistance, efficiency, output power) for any distribution of impurities. Program is written in ALGOL-GDR and FORTRAN. Counting time of parameters of equivalent model of LPD is 0.5 to 1.5 min; counting time of dynamic response of LPD in large signals—fractions of a second.

1587. Kazachkova, T.I., Lazerson, A.G., Suchkov, S.G. Numerical analysis of propagation of surface acoustic waves in piezoelectric crystals. "Elektron. tekhnika. Ser. 1. elektron. SVCh", 1979, iss. 6, pp 7-12. bibliography 8 deisgnations. Method of calculation of velocities and structure of surface acoustic waves (PAV) propagating in piezoelectric crystal of arbitary symmetry is realized in ALGOL. Numerical analysis is done for Rayleigh waves in crystal of lithium niobate and Gulyayev-Blyushteyn waves in crystal of zinc oxide.

1591. Korobkin, V.A., Pyatak, N.I., Grutsyak, V.I. Nonreciprocal excitation of waveguide dielectric resonance of transversely magnetized ferrite specimen in rectangular waveguide. "Elektron. tekhnika. Ser. 1. elektron. SVCh", 1979, iss. 1, pp 17-23. bibliography 6 designations. Calculation and research done for 30 SCh 3 brand ferrite. For design of numerical algorithm, sequential solution of transcendental equation was carried out in ALGOL language.

1594. Man'kin, I.A., Usherovich, B.L., Shul'man, L.I. Nonlinear calculation of LBV in circuits of coupled resonators. "Elektron. tekhnika. Ser. 1. elektron. SVCh", 1979, iss. 8, pp 56-58, bibliography 8 titles. Algorithm for computer calculation of nonlinear response of LBV in circuits of c ..pled non-identical resonators is realized in ALGOL. Method is based on solution of nonlinear self-consistent equations allowing for the discrete nature of electron interaction in resonator clearances.

1599. Optimization of nominals and tolerances of primary parameters of GIMS/ Yu. Ye. Monakhov, D. S. Bazov, Ye. A. Shul'gin et al. "Vopr. radioelektron. Ser. Tekhnologiya pr-va i oborud.", 1979, iss. 2, pp 35-41. bibliography 6 titles. Method of determining optimum, nominal values of primary parameters of hybrid ICs and their tolerances based on formation of a self-determined hypercube, determining tolerance region in efficiency region of hybrid IC, is realized in ALGOL.

1601. Plyusnina, E.N. Calculation of deflection of atom beam by magnetic prism of atomic beam tube. "Elektron. tekhnika. Ser. 1. elektron. SVCh", 1979, iss. 9, pp 39-45. bibliography 4 titles. A method is described and results are cited for calculation in ALGOL program of deflecting action of magnetic prism on beam of atoms having two opposing signs of magnetic moments. Counting time for one indicator position with computation error of about 5% is 1-2 minutes according to beam width. The magnetic prism is a heterogeneous magnetic field with continuous gradient perpendiulcar to the beam axis. Beam pattern and the velocity distribution of the beam atoms are considered.

1602. Poresh, S.B. Program for calculation of high frequency small-signal response of a Gann diodes. "Elektron. tekhnika. Ser. 1. elektron. SVCh", 1979, iss. 8, p. 122. bibliography 6 titles. The NOISAM program for calculation of small-signal impedance and measurement of thermal noise of GaAs Gann diodes with n^+-n-n^+ type structure having static distribution of the electrical field and charge is written in FORTRAN and ALGOL.
Calculation time of one version depends on the desired parameters of the diode and comes to 30-50 minutes.

1603. Program of rapid two-dimensional calculation LBVO/ I. A. Man'kin, B. L. Usherovich, Yu. F. Kontorin, V. G. Shkhol'nikov. "Elektron. tekhnika. Ser. 1. elektron. SVCh", 1979, iss. 2, p. 109-110. bibliography 2 titles.
An ALGOL program is described for calculation of LBVO with magnetic focusing (MPFS an homogeneous field). Counting time of one spacing (spacing of three-point Euler diagram) for 432 KCh (18 layers about radius, 24 particles per layer) is four seconds.

1604. Sarayev, V.V. Program for calculation of quasiaxisymmetric systems with rare-earth magnets and armature. "Elektron. tekhnika. Ser. 1. elektron. SVCh", 1979, iss. 1, p. 116-119. bibliography 1 title. An ALGOL program is described for calculation of the field topography of three-dimensional systems with rare-earth magnets and magnetically soft winding. The algorithm takes into account the possiblity of armature saturation. Elements of the system are approximated by cylindrical annular sectors. Calculation time of one version, according to complexity of the system, amounts to 0.5 to 8 hours.

1605. Suchkov, S.G., Kazachkova, T.I. Program for calculation of the characteristics of surface acoustic waves in piezoelectric crystals. "Elektron. tekhnika. Ser. 1. elektron. SVCh", 1979, iss. 1, p. 114-115. bibliography 2 titles. An ALGOL program for calculation of the characteristics of surface acoustic waves computes the velocity, partial amplitudes and components of wave vectors of the waves propagating along the surface of piezoelectric crystals of arbitrary syngony. The program envisages calculation of relative change in velocity when the crystal surface is metallized. Calculation time of wave characteristics for one direction of propagation is about 40 seconds.

1623. Bryabrin, V.M., Senin, G.V. Analysis of natural language in a constrained context. "Vopr. kibernetiki/AN SSSR. Nauch. sovet po kompleks. probl. 'Kibernetika', 1980, iss. 61. Probl. iskusstv. intellekta, p. 111-117. bibliography 3 titles. A dialog information/logic system DILOS in LISP language and a special linguistic processor which is part of the system addressed to the user and for translation of input natural language sentences into the corresponding psi-expressions are described.

1639. Zaytsev, Zh. N., Sabitov, V.N. Practical methods of organization of a program of dynamic structure in PL/1 language for the F translator. "Vopr. radioelektron. Ser. EVT", 1979, iss. 6, pp. 58-62. bibliography 4 titles. The example is considered in PL/1 language which calls forth the charging module from the library through a mediator program in Assembler language, their combined editing and execution.

1664. Zheludkova, G.V., Mal'kova-Khaimova, N. Ya. A complex of 'Optima' programs permitting automated formulation of optimization programs on computer. "Elektron. tekhnika. Ser. 1. elektron. SVCh", 1979, iss. 9, pp. 108-109, bibliography 3 titles. The 'Optima' program complex makes it possible, with minimum knowledge of programming languages, to formulate the optimization problem in terms familiar to the user. The complex realized on the basis of the multiple langauge programming system introduces problem-oriented language (POYa) 'Optima' to the library of languages of the multiple language programming system; it translates optimization problems stated in POYa into FORTRAN, MADLEN; it directs the obtained program package to carry out a solution or enter peripheral memory for further use. Instructions are given on the use of the 'Optima' program complex as well as a description of syntax, semantics and metapragmatic fucntions which realize the translator from the language of the 'Optimization' subsystem.

1665. Karnachuk, V.I. Some means of terminal debugging of programs. Novosibirsk, 1979, 24 p. ("Preprint/AN SSSR. In-t teoret. i prikl. matematiki; No 19). bibliography 4 titles. A modified TELE complex for debugging the MS Dubna programs and FORTRAN statements for exchange with a terminal are described.

1669. Mikhaylova, S.N., Morozov, V.S. Programing for plotting a histogram and integral distribution curve (HISTO 2). "Elektron. tekhnika. Ser. 1. elektron.

SVCh", 1979, iss. 5, p. 97. bibliography 2 titles. The FORTRAN program for printout on ATsPU of a histogram and integral curve of distribution according to precomputed frequency array. Formation time of one graph is about 1.5 seconds.

1676. Gusnin, S. Yu., Nazarova, A. N., Omel'yanov, G.A. Elaboration of a library of minimization programs for engineering calculations. Report given at 4th conf. of young scientists and specialists, Apr. 78. Moscow, 1979. 28 p. ("Preprint/AN SSSR. In-t toch. mekhaniki i VT, No 16). bibliography 16 titles. The library of FORTRAN programs is designed as multiple level structure where the subroutines of each level realize a specific stage of calculations: reduction of a multidimensional problem to one-dimensional; retrieval of the minimum point of the goal function along the selected direction.

1701. Bershadskiy, A.M., Subsystem for solving arrangement problems. "Vopr. radioelektron. Ser. EVT", 1979, iss. 6, pp. 53-57. bibliography 8 titles. Solution of arrangement problems: standardization, coating and cutting: a single all-purpose FORTRAN progam containing 700 statements. Solution time about 4 hours for 10,000 circuit contacts.

1702. Bershadskiy, A.M., Fionova, L.V., Shigina, N.A. Compostion and structure of a functional program package of the arrangement subsystem. "Vopr. radioelektron. Ser. EVT", 1979, iss. 6, pp. 48-52. bibliography 5 titles. The FORTRAN program package for arrangement of one or various sized elements on printed circuit boards, components of hybrid ICs, cells (TEZ) in a panel (cassette) and so forth are described. Functional program statements about 2200.

1726. Martynov, S.M., Taranyuk, Yu. A. Complex of programs for calculation of correlation characteristics of analog and clipped signals and processes. "Elektron. tekhnika. Ser. 1. elektron. SVCh", 1979, iss. 8, pp. 123-125, bibliography 4 titles. The complex of FORTRAN programs contains calculation program for autocorrelation functions of analog signals; clipped (pulsed) signals (signals of the kind sign[x(t)]); functions of mutual correlation of analog signals; spectral density of output of analog and clipped signals; derivative of the autocorrelation function and mutual correlation function. Counting time depends on signal length, quantity r and variation, from two (in solving one problem) to 10 minutes (when solving a complex of problems).

1763. Vashkevich, N.P., Krasnov, G.I., Kuchin, A.V. Organization of data processing in an optical disc monitoring memory system. "Vopr. radioelektron. Ser. EVT", 1979, iss. 8, pp. 38-46. bibliography 5 titles. A program is described for simulating a volume on the order of five hundred FORTRAN statements which contains the subroutines: interval sensors between errors with specific distributive patterns, compression circuit simulator, subcalculation of buffer volumes, down time and computer operation time, etc.

1795. Vladimirskiy, N.V. Program package in BASIC language for use of the Wang-2200 computer in the manfuacture of PCBs. Moscow, 1979, 19 p. ("Preprint/AN SSSRFiz. in-t; No. 193). bibliography 2 titles. The process of manufacturing PCBs serviced by a program packages uses special Hungarian device ADMAP-2. Blown-up model of the PCB is the input for the program package, encoded in the numerical data unit; output PL in ADMAP-2 codes.

1806. Yegiazaryan, V.V. On optimum distribution of control memory for horizontal microprograms. "Vopr. radioelektron. Ser. EVT", 1979, iss. 9, pp. 30-35, bibliography 7 titles. Algorithms are cited for optimum density of distribution of memory page cells and optimum placement of microprogram distribution. Algorithms are oriented toward application in all-purpose syntactically oriented system of translation of symbolic microprograms.

1809. Litvintseva, L.V., Pospelov, D.A. Time in robots and dialog systems. "Vopr. kibernetiki/AN SSSR. Nauch. sovet po komplesk. probl. 'Kibernetika', 1980, iss. 61. probl. iskusstv. intellekta, p. 61-70, bibliography 20 titles. Principles of design of time logic convenient for use in systems of artificial intelligence. Special TIMER processor appearing in human/computer communication system based on natural language DILOS is described. Connection between time logic and means of expression of time relationships in natural languages is examined.

1850. Overchenko, V.F. Use of the process concept in realization of minicomputer operating systems. "Vopr. radioelektron. Ser. EVT", 1979, iss. 9, pp. 76-81. bibliography 3 titles. Principles of organization of minicomputer operating systems tested on M-6000 using process concept as element of global structure of OS.

1855. Expansion of basic possibilities of DISPAK disc operating system of the BESM-6 computer to create mathematical support of automated system of complex computer planning/A. N. Zakharova, S. A. Zyatsev, Ye. I. Karmazina et al. "Elektron. tekhnika. Ser. 1. elektron. SVCh", 1979, iss. 9, pp. 106-108, bibliography 5 titles. Extracodes of DISPAK disc operating system (DOS) of the BESM-6 computer, which are basic for organization of communications betweeen the BESM-6 and minicomputers of the Elektronika-100I, Elektronika-100/16I, M-400 type via computer multiplexer and 7th autonomous direction of BESM-6 are described. Extracodes are written in BEMSH autocde, were tested in operation and are included in the standard version of DISPAK disc operating system.

1865. Mayorov, S.A., Rudenko, A.A. Method of calculation of charge dynamics in two-dimensional MOS structure with pulsed voltage to the gate. Elektron. tekhnika. Ser. 3. Mikroelektron. 1979, iss. 3(81), pp. 20-25, bibliography 4 titles. A method of solving boundary problem of fundamental system of equations in semiconductor describing distribuition of potential and charge carriers in a two-dimensional MOS structure. Results are cited for BESM-6 computer calculations of pulsed volt-ampere response curves of the MOS structure using a three-dimensional grid 30 x 20 nodes. Counting time 15 minutes.

1869. Antonov, V.S., Tamarkin, M.B. Multicomputer complex based on old YeS computer models. "Vopr. radioelektron. Ser. EVT", 1979, iss. 7, pp. 21-25. bibliography 1 title.

1870. Buglayeva, L.D., Krylov, G.M., Lubovinina, L.M. Accounting for use of files and monitoring access to data. "Vopr. radioelektron. Ser. EVT", 1979, iss. 5, pp. 54-64. Programs for accounting of resources in collective-use of peripheral memory files in YeS computer center are described.

1875. Zheldakov, I.V., Rakhmankulov, I. Sh., Yankovskiy, V.V. On the effect of reliability of central YeS computer devices on solution time of applications packages. "Vopr. radioelektron. Ser. EVT", 1979, iss. 6, pp. 76-80. A method of evaluating job solution time in package multiprogram mode using procedures to recover complex errors of YeS central devices.

1876. Kazak, A.S., Klyuyev, V. Ye., Maksimov, N.S. Some aspects of exploitation of YeS OS operating systems. "Vopr. radioelektron. Ser. EVT", 1979, iss. 5, pp. 21-30. bibliography 4 titles. Basic problems of planning, generation, storage and servicing operating systems.

1877. Kazakov, A.K., Trofimov, T.B. Unified System operating system recovery facilities. "Vopr. radioelektron. Ser. EVT", 1979, iss. 3, pp. 41-48. Functions of YeS operating system recovery programs after computer errors and after I/O errors are characterized. Work with systems error journal used to gather information about errors is considered.

1880. Klyuyev, V.Ye., Maksimov, N.S. Packaged processing mode in the Unified System computer operating system. "Vopr. radioelektron. Ser. EVT", 1979, iss. 5, pp. 31-36. bibliography 2 titles. Preparation of initial data, use of classes and priorities to optimize computer load, monitoring assignment completion time, use of operational memory, means of quantization of time and scanning/scrolling.

1881. Kuznetsov, N.I. I/O support for magnetic tape memories in the Unified System operating system. "Vopr. radioelektron. Ser. EVT", 1979, iss. 3, pp. 26-33.

1882. Kul'bak, A.I., Molyavko, I.I., Gel'fand, B.N. Evaluation of full computer operation time of unified system computers. "Vopr. radioelektron. Ser. EVT", 1979, iss. 3, pp. 34-40. Methods of evaluating hardware according to reliability indicators in computer configurations, theoretical formulas, sources of derivation of initial data. Illustrative examples given.

1883. Lebed', M. Ya. Virtual memory support in the Unified System operating system. "Vopr. radioelektron. Ser. EVT", 1979, iss. 5, pp. 37-44. bibliography 5 titles.

1884. Lebed', M. Ya. Organization of page location in the Unified System (YeS) operating system. "Vopr. radioelektron. Ser. EVT", 1979, iss. 5, pp. 45-53. bibliography 5 titles.

1886. Malyshev, V.M., Questions of program compatibility written in Assembler and PL/1 languages in the YeS operating system. "Vopr. radio-elektron. Ser. EVT", 1979, iss. 3, pp. 15-25. bibliography 5 titles. Methods of interfacing subroutines in Assembler and PL/1 languages. Interfacing of re-enterable subroutines suited for work in multiproblem medium and recursive subroutines are proposed. Illustrative examples cited.

1887. On methods of choosing a computer hardware configuration for Unified Series computers/I. I. Yermak, R. O. Megrabyan, S. M. Porotskiy et al. "Vopr. radioelektron. Ser. EVT", 1979, iss. 5, pp. 91-101. bibliography 6 titles.

1890. Raykov, L.D. YeS EVM (Unified System of Computers) operating systems. "Vopr. radioelektron. Ser. EVT", 1979, iss. 7, pp. 11-20.

1896. Gazaryan, G.A. On the problem of survey locating a linear channel"Vopr. radioelektron. Ser. EVT", 1979, iss. 9, pp. 57-62. Solution time for a 80 contact channel is about two minutes.

1897. Gndoyan, A.K. On one algorithm for coating external connections of PCBs. "Vopr. radioelektron. Ser. EVT", 1979, iss. 9, pp. 52-56. bibliography 4 titles. A program was written for the YeS-1030 computer to find the minimally external stable set in a non-oriented graph in terms of a integral linear programming by the method of branches and boundaries where branching evaluation would be twice the value of the goal function to the linear part of the problem. The program contains 400 instructions; where n = 70 for a random graph, computation time is seven seconds.

1911. Bodryagin, V.I. Algorithmic foundations of planning designs of electromagnets on digital computers. "Vopr. radioelektron. Ser. EVT", 1979, iss. 6, pp. 115-126. bibliography 2 titles. A program is proposed for the YeS computers and M-222 for calculation of d.c. electromagnets having minimal overall dimensions for a desired tractive force.

1954. Dyuburg, O.I., Kessel'man, I.M., Shishkin, V.P. Control of request input in an information exchange system. Aviats. avtomatizir. kompleksy upr. i modelirovaniya: Mezhvuz. sb. nauch. tr./Kiev in-t inzh. grazhd. aviatsii, 1979, iss. 3, pp. 65-70. Organizational principles of construction of a information system based on the Elektronika-100 computer which has page organization of memory with speed on the order of 300,000 add-type operations per second. Possibilities of two versions of request input control are quantitatively evaluated.

1969. Control computer, annular sequential main KAMAK and peripheral stations of 'Del'fin' installation automation subsystems/A. P. Allin, Yu. V. Senatskiy, G. V. Sklizkov et al., Moscow, 1979, 27 pp. ("Preprint/AN SSSR. Fiz. in-t; No. 156). bibliography 9 titles. The RSX-11M operating system, a disc-type, multiprogram real-time operating system for all PDP-11 series computers, is described; the computers have an operational memory ranging from 8K to 2048K 16-digit words, providing the user with facilities to elaborate and debug programs. A program in MACRO-11 language is cited.

[363-8617]

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CSO: 1863

'METHODS OF SYMBOLIC MULTIPROCESSING' TO BE PUBLISHED BY 'NAUKOVA DUMKA'

Kiev KIBERNETIKA in Russian No 2, 1980 p 35

[Announcement of publication in 1980 of the book "Metody simvol'noy mul'tiobrabotki" by V. M. Glushkov, G. Ye. Tseytlin, and Ye. L. Yushchenko, 15 sheets, 2 rubles, 50 kopecks]

[Excerpt] Results obtained with methods of symbolic multiprocessing are generalized in the monograph. A methodology and technology of structurized parallel programming are presented, the basis of which is apparatus of systems of algorithmic algebras oriented toward multiprocessing. Considerable attention is given to parallel grammatical and automatic models of language processors. The problem of parallel syntactic analysis is examined and, in particular, methods based on strategies of bilateral and multilayer multiprocessing. The problem of parallel multiphase translation of the conveyer type is examined within the framework of the designing of the software of multiprocessor computer systems.

The monograph is intended for specialists working on the creation of contemporary and future high-capacity computers and can be useful to instructors, graduate students and undergraduates of cybernetics faculties.

[365-2174]

2174
CSO: 1863

ABSTRACTS FROM THE JOURNAL 'KIBERNETIKA'

Kiev KIBERNETIKA in Russian No 2, 1980 pp 149-152

UDC 51:65.012.122

AN ANALYTICAL STUDY OF ONE CLASS OF DYNAMIC MODELS. I.

[Abstract of article by Glushkov, V. M., Ivanov, V. V., and Yashchenko, Yu. P.]

[Text] The authors present formulations of some nonlinear, including optimizational, problems flowing from the two-product dynamic macroeconomic model of V. M. Glushkov. Questions of the existence, uniqueness, stability and asymptotic behavior of solutions of these problems are studied.

UDC 519.21

SOME MARKOV MODELS OF SYSTEMS WITH PARTIAL AFTEREFFECT

[Abstract of article by Zakharin, A. M.]

[Text] Models of the Markov type are constructed which are oriented toward solution of problems in the investigation of complex multicomponent stochastic systems with aftereffect. Results of the studies are presented.

UDC 681.14:517.11

SOME ALGEBRAIC ASPECTS OF THRESHOLD LOGIC

[Abstract of article by Ayzenberg, N. N., Bovdi, A. A., Gergo, E. P., and Geche, F. E.]

[Text] An algebraic approach to the study of Boolean threshold functions is proposed. It is based on application of the apparatus of the theory of group rings and certain properties of tolerance matrices.

UDC 51:62-50:007

ASYMPTOTIC ESTIMATION OF THE DIAGNOSTIC WORD LENGTH FOR A FINITE AUTOMATON

[Abstract of article by Rystsov, I. K.]

[Text] An asymptotic estimation is obtained for the logarithm of the function L(n), where L(n) is equal to the maximum among the lengths of the shortest diagnostic words for Mealy automata having n states.

UDC 51:681.3.06

REALIZATION OF ATTRIBUTE SEMANTICS

[Abstract of article by Pen'yam, Ya. E.]

[Text] The author examines a method of programming the attributes and the rules for their computation in the UTOPIST language, that is, the method of automatic realization of attribute semantics.

UDC 51:681.3.06

POSPL--A PROGRAM PACKET THAT PROCESSES LIST STRUCTURES

[Abstract of article by Berestovaya, S. N., Krilyuk, N. I., and Pashkovets, N. D.]

[Text] The paper describes the functional composition, program structure and possibilities of the POSPL packet, which is a supplement of the PL-1 language in the direction of list structure processing. The packet is realized in the YeS [Unified System] OS [operating system].

UDC 51:681.3.06

THE PROBLEM OF PROGRAM PARALLELING FOR MULTIPROCESSOR COMPUTER SYSTEMS

[Abstract of article by Mityayeva, S. A.]

[Text] The author describes methods of paralleling cyclic sections of sequential programs written in a high-level language and intended to be realized by multiprocessor computer systems.

UDC 681.142.2

MIXED COMPUTATIONS AND PROGRAM OPTIMIZATION

[Abstract of article by Kas'yanov]

[Text] Mixed computations and program optimization are compared with respect to their application to individualize program transformation in terms of a single programming language that retains the sense and improves the quality of the program on the fixed subset of its initial data.

UDC 51:681.3.06

TRANSFORMATIONS SUPPLEMENTING PROGRAM DEFINITIONS

[Abstract of article by Trakhtenbrot, M. B.]

[Text] A definition of correctness is proposed for program transformation. Transformations and program designs are examined which permit the quality and reliability of programs to be improved by supplementing their definitions.

UDC 51:681.3.06

PROBLEMS OF MACROGENERATION FOR REALIZATION OF PROBLEM-ORIENTED MEANS OF DATA PROCESSING

[Abstract of article by Babenko, L. P., Volkova, N. A., Mel'nik, L. A., and Sinyagovskaya, V. V.]

[Text] The authors describe a specialized macrosystem which is oriented toward macroprocessing of COBOL language files and supported by the "OKA" system for control of data bases.

UDC 681.3.016.2

DATA PROCESSING PROCEDURE IN AN ASU

[Abstract of article by Andon, F. I., and Polyachenko, B. Ye.]

[Text] An integrated problem-solving procedure in an ASU is examined, one which provides for a minimum number of exchanges between the computer system memory levels. A structure is proposed for the system of planning and controlling problem solving in an ASU, and the problems of planning and controlling computation processes in an ASU are formulated.

UDC 681.3.06:51

DISUPPP--DIALOG SYSTEM FOR THE CONTROL OF SPECIALIZED PACKAGES OF APPLIED PROGRAMS

[Abstract of article by Krishtopa, I. V., Nepomnyashchiy, B. D., Perevozchikova, O. L., and Yushchenko, Ye. L.]

[Text] Questions in the construction of systems for control of problem solution by specialized packages of applied programs are studied. A method of formalizing the semantics of PO-languages is described. The language of dialog and the architecture of the DISUPPP are examined.

UDC 51:681.3.06

PROCEDURE OF MODULAR PRODUCTION OF PROGRAM UNITS

[Abstract of article by Lavrishcheva, Ye. M.]

[Text] A procedure is proposed for creation of program units from initial modules preset in a standardized form. The types of the relations between the modules and the forms of representation of the structure of the created unit are determined.

UDC 51:681.3.06

MODULAR PROGRAM GENERATION SYSTEM

[Abstract of article by Orlov, B. N., and Ponomarev, A. S.]

[Text] An approach is proposed that assures automatic creation of an area for common variables of FORTRAN modules based on table-defined module links.

UDC 681.3

REALIZATION OF OPERATING SYSTEM ABSTRACTION LEVELS

[Abstract of article by Deglyarev, Ye. K., and Kalinichenko, S. P.]

[Text] The interaction of levels in a dominant hierarchy of operating system abstraction levels is analyzed. It is shown that an operating system can be regarded as a language processor making the transition from the language of tasks control into the machine language.

UDC 51:62-50:007

MONITORING OF AUTOMATA SYNTHESIZED ON THE BASIS OF STANDARD AND HOMOGENEOUS CIRCUITS

[Abstract of article by Brovarnik, V. V.]

[Text] A structure-analytical method is proposed for test monitoring of automata synthesized on the basis of standard and homogeneous circuits. Automata with simple input circuits and those with priority during different realizations of the correction function are examined.

UDC 51:681.3.01

INHOMOGENEOUS GRAPH SORTING AND WORK DISTRIBUTION FOR TWO PROCESSORS

[Abstract of article by Ayrapetyan, L. P.]

[Text] A schedule for fulfilling a set of dependent operations by two identical processors is constructed on the basis of the methods of inhomogeneous sorting.

UDC 62-50.007:65

METHOD OF REALIZING DYNAMICALLY ARISING ASSOCIATIONS IN HIERARCHIC AND NETWORK DATA BASES

[Abstract of article by Filipova, M. Kh.]

[Text] The paper deals with methods of dynamic (on-line) realization of relations and efficient retrieval of information stored in modern data base control systems. A device is proposed which permits on-line organization of inverted retrieval in data bases.

UDC 681.3.06:51

METHOD OF CONSTRUCTING SOFTWARE CROSS-SYSTEMS FOR MINI- AND MICRO-DIGITAL COMPUTERS

[Abstract of article by Muchnik, M. M.]

[Text] The paper deals with the realization of two macrogenerators used to produce software for specialized digital computers. The architecture of the macrogenerators is examined, languages of macrodefinitions are characterized and the methods of production of assemblers and compilers from high-level languages are described.

UDC 51:681.3.01:007

TECHNIQUE FOR OPTIMIZATION OF PROCESSOR ELEMENT ALGORITHMS WITH AN ASYNCHRONOUS-MODULAR STRUCTURE

[Abstract of article by Ivanov, I. M.]

[Text] The paper deals with optimizing transformations applied during the construction of algorithms with an asynchronous-modular structure (AM-algorithms) to increase their speed.

UDC 51:330.115

DICHOTOMIC RETRIEVAL OF ONE ORDERING PROBLEM SOLUTION

[Abstract of article by Danil'chenko, A. M., and Panishev, A. V.]

[Text] The algorithm for solution of the problem under consideration is based on the idea of the method of dichotomy, which illustrates the possibility of considerable decrease of computations of the scanning reduction in comparison with other methods.

UDC 519.8

GENERALIZED STOCHASTIC METHOD OF CENTERS

[Abstract of article by Mikhalevich, M. V.]

[Text] An algorithm is proposed for the solution of problems of stochastic programming, one based on the ideas of methods of centers, penalty and barrier function. Its convergence is proved. Possible modifications of the algorithm are presented.

UDC 519.8

MARGINAL RATIOS FOR LINEAR PROBLEMS OF MULTISTAGE STOCHASTIC PROGRAMMING

[Abstract of article by Yastremskiy, A. I.]

[Text] Marginal ratios are obtained for a linear multistage problem of stochastic programming under rather non-strong assumptions regarding the probabilistic distribution patter for random parameters.

UDC 007:518.9

NOTE ON ALGORITHMS IN THE JOHNSON ONE-ROUTE PROBLEM

[Abstract of article by Dushin, B. I.]

[Text] Algorithms are considered for solution of the Johnson one-route problem with the number of lathes n = 3 and 4. A new estimate of the function--a problem solution criterion--is obtained.

UDC 518.9

COMPOSITION OF GAMES WITHOUT SIDE-PAYMENTS

[Abstract of article by Vilkov, V. B.]

Compositions of games without side-payments are considered. Questions of the existence of a kernel (solution) in the composition of games are studied as a function of either the presence or absence of a kernel (solution) in the initial games.

UDC 518.9

OPTIMUM ORDERING OF FLOW GRAPH VERTICES

[Abstract of article by Reva, V. N.]

[Text] The problem of optimum ordering of the flow graph vertices is reduced to the problem for which the solution algorithm is known in the case of parallel successive graphs.

UDC 007:518.9

H-THEOREM AND CONVERGENCE TO EQUILIBRIUM FOR FREE POLYLOCUS POPULATIONS

[Abstract of article by Kun, L. A., and Lyubich, Yu. I.]

[Text] The authors prove a theorem of enthropy growth in the process of microevolution of a free polylocus population. Convergence to equilibrium in such populations is determined.

UDC 51:681.3.06

METHOD OF DESCRIBING CONTEXT CONDITIONS

[Abstract of article by Zaytman, G. A., and Kholodenko, O. A.]

[Text] A new class of grammar, context-free grammars with memory (CFM-grammars), is introduced. They represent an ordinary formation of CF-grammars with a possible ascription of memory to rules of the operations output over the stacks.

[365-2174]

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ABSTRACTS FROM THE BOOK 'QUESTIONS IN CYBERNETICS. INTELLECTUAL DATA BANKS'

Moscow VOPROSY KIBERNETIKI. INTELLEKTUAL'NYYE BANKI DANNYKH in Russian 1979 signed to press 24 May 79 pp 5, 17, 25, 49, 70, 93, 132, 147, 157, 158, 168, 183

[Abstracts of papers in the book edited by L.T. Kuzina, Moscow, USSR Academy of Sciences, Scientific Council on the Comprehensive Problem of "Cybernetics", 1,000 copies, 192 pages]

INTELLECTUAL DATA BANKS (IBD)

[Abstract of paper by Kuzin, L.T., pp 5-16]

[Text] General questions of the design of intellectual data banks (IBD), the structure and location of an IBD in a cybernetic system, as well as various cybernetic models for the representation of knowledge in an IBD are treated in this paper. A classification is given for the language tools utilized in the knowledge representation systems.

SYSTEMS FOR THE REPRESENTATION OF LINGUISTIC KNOWLEDGE

[Abstract of paper by Besshapov, V.P. and Sharkov, S.V., pp 17-24]

[Text] A brief review of approaches to the representation of linguistic knowledge is presented in this paper: PROGRAMMAR, ATN, APS. The syntaxis of a metalanguage of algorithms for phrase analysis in the APS method and examples of the writing of algorithms are given for the phrase analysis of a natural language for each method.

SYSTEMS FOR THE REPRESENTATION OF CONCEPTUAL KNOWLEDGE USING FRAMES

[Abstract of paper by Rybina, G.V., Stroganova, N.A., Fardzinova, M.I. and Khramov, A.A., pp 25-48]

[Text] The specific features of systems for the representation of conceptual knowledge are treated, where these systems are based on frames: a new type of structure for declarative-procedural type data. The structure, types of slots and kinds of linked procedures for the various frames of some knowledge representation systems are analyzed. The mechanisms and functions for the retrieval and changing of the frame base are presented.

A SYSTEM OF KNOWLEDGE REPRESENTATION USING SEMANTIC NETWORKS

[Abstract of paper by Vol'fengagen, V.E., Voskresenskaya, O.V. and Gorbanev, Yu.G., pp 49-69]

[Text] A graphical representation of a semantic network is treated in this paper and a description is given for a semantic network using a structural logic language based on a typed λ-calculus. An expanded notation of the semantic network is treated, including the concepts, frames, logic and quantitative quantors, predicate quantors, logic links and modal operators. Determinate and time measures of the network are treated. A semantic network is understood to be a semantic model of knowledge and a semantic model of a relational data bank.

ON ONE ORGANIZATION OF AN INTELLECTUAL DATA BANK USING FRAMES

[Abstract of paper by Vol'fengagen, V.E., Voskresenskaya, O.V., Vasil'yev, V.I. and Ivanchenko, V.V., pp 70-92]

[Text] The possibility of applying the concept of a (logic) type to the formalization of the major components of an intellectual data bank is studied; programs for input messages in a natural language; frames which model knowledge about the external world. The possibility of using continuous structures in the construction of the semantic interpretation of typical languages is demonstrated. The typical languages (syntaxis level) are used to describe the major components of the data bank.

AN INTELLECTUAL PROGRAMMING SYSTEM

[Abstract of paper by Il'inskiy, N.I., Kuzin, L.T. and Strizhevskiy, V.S., pp 93-131]

[Text] A description of a system for programming data processing tasks is described in the paper, where the system possesses intellectual properties. Relational representations of the data and a model of the calculations comprise the basis for the intellectual programming system (ISP). The concept of the ISP is presented, the system structure is discussed and its functions and some specific features of the realization are analyzed.

QUESTIONS OF THE DEVELOPMENT OF AUTOMATED INSPECTION SYSTEMS

[Abstract of paper by Pivovarov, V.F., Mikhaylova, L.I., Strizhevskiy, V.S. and Chogovadze, G.G., pp 132-146]

[Text] Automated inspection systems for various functions are analyzed in this paper: for the examination of the document turnover of OASU [automated control systems for a sector of industry] and ASU [automated control systems] for gathering the data for the construction of simulation models and loading data banks; a comparative evaluation is given for them and promising trends for the development of such systems within the framework of an intellectual programming system are indicated as well as the possibilities for the generation of automated inspection systems.

AN INTERPRETER FOR CONTEXT-FREE CONTROLLED PARAMETRIC PROGRAM GRAMMARS

[Abstract of paper by Volchenkov, N.G., pp 147-157]

[Text] Questions related to the construction of a subject independent interpreter for context-free controlled parametric program grammars (BUPPG) are treated in this paper.

[Bibliography]

11. "Programmirovaniye na yazyke REFAL" ["Programming in the REFAL Language"], Preprints of the IPM [not further defined] of the USSR Academy of Sciences, Nos. 41, 43-44, 48-49, Moscow, 1971.

ATNL: A LANGUAGE FOR THE REPRESENTATION OF LINGUISTIC KNOWLEDGE IN NATURAL LANGUAGE SYSTEMS

[Abstract of paper by Khoroshevskiy, V.F., pp 158-167]

[Text] The use of a professionally limited natural language is proposed in this paper as a service language, while a special system of linguistic knowledge representation is proposed for the realization of the interface, where the system is based on the formalization of a network representation of grammars. The input language of such a system and examples of the use of this system for the realization of dialog with a user are discussed in this paper.

THE REPRESENTATION OF INFORMATION IN THE DECISION MAKING SYSTEM OF AN INTELLECTUAL ROBOT

[Abstract of paper by Yerokhin, Ye.A., Vasil'yev, V.N. and Sudeykin, M.I., pp 168-182]

[Text] Questions of the information organization in the decision making system of an intellectual robot are treated in this paper. Frames are used as the information units for the construction of the knowledge base where the frames are specified by means of a pseudophysical Z-language which is developed. Specific types of frames are proposed for the goals interpretation subsystems and the planning of the operations, which comprise the decision making system of the robot. Additionally, a structure of applied program packages which realize the system is treated, and the characteristics of the decision making system are adduced.

A SYSTEM WHICH PERCEIVES QUERIES IN A NATURAL LANGUAGE: RESPONSE GENERATION AND SEMANTICS

[Abstract of paper by Baklanov, V.M. and Rodionov, Ye.V., pp 183-192]

[Text] Subsystems for the semantic processing of an interrogation and the generation of the response, used in a query--response system are treated in this paper. Algorithms for the individual steps of the subsystems are described. Specific examples are given for the processing of unit queries. The specific features of the operation of the algorithms in a dialog mode are indicated separately.

[339-8225]

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DATA MODELS AND DATA BASE SYSTEMS

Moscow MODELI DANNYKH I SISTEMY BAZ DANNYKH. TRUDY SOVMESTNOGO SOVETSKO-AMERIKANSKOGO SEMINARA MOSKVA 14-23 NOYABRYA 1977 G in Russian 1979 pp 2, 200-201, 218-219

[Annotation, table of contents and excerpts from book of Proceedings of the Joint Soviet-American Seminar on Data Models and Data Base Systems, held in Moscow on 14-23 November 1977, edited by B. Suvorov and A. Dale, Central Institute of Economics and Mathematics, USSR Academy of Sciences, Izdatel'stvo "Nauka," 3250 copies, 224 pages]

[Text] Annotation

The collection includes the reports of Soviet and American specialists in the theory and methodology of development of automated information systems. The themes of the reports embrace a broad range of problems--from description of the principles of construction and the functioning of specific systems to the substantiation of fundamental positions of the theory of automated information systems.

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[Excerpts]

In the Computer Center of the USSR Academy of Sciences a dialog system also is being developed which is to "understand" the written speech of man, "become acquainted with" various facts and laws of the world investigated by man and "be able" to analyze and adopt decisions on methods of solving posed tasks. We would like the text presented below to be regarded not only as a description of an alterate programming system or language, but also as a description of a new style of computer work. That style assumes that man assigns to the system a description of initial and resulting data (the situation) but does not indicate a specific working algorithm, but the system independently analyzes the task and selects the needed actions. Man must actively intervene in all stages of the functioning of the system to make additional corrections and select optimum paths of solution; that intervention proceeds in the form of dialog with the system in a natural language, limited to the professional lexicon.

We will not try to achieve universal results all at once. The minimum goal consists in the creation of a working system in a relatively short period of time with the use of small but very qualified manpower resources. The selected structure and the software used ought to permit the natural development of the system to achieve more ambitious results in the future.

The dialog logical information system is intended for work as an intermediary between man and traditional means of computer technology in the solution of practical problems. The dialog logical information system (DILOS) represents a set of programs in the LISP language.

In the Computer Center of the USSR Academy of Sciences the DILOS system has been realized as a group of programs in the LISP language [20]. The use of that powerful language permits relatively easily modifying and adjusting the system. In addition, it presents no special labor to transfer the DILOS systems to other computers equipped with a translator from the LISP language and a developed system of collective use [21].

The main data base in the USSR Academy of Sciences Computer Center has been realized by the resources of the PUL'T collective use system [22] together with the DISPAK operating system [23]. All the practical programs and data are stored in the PUL'T system archives and access to them is provided by special system programs. Translators of universal programming languages (ALGOL-60, FORTRAN, PASCAL, etc) are produced by the operating system, which also can be considered a component of the main data base.

A model data base for the BESM-6 has also been created in the form of files of the PUL'T system.

In principle it is possible to work with a distributed main data base, when separate programs or data sets are stored and processed with different machines that are combined into an information network. With such an organization of the computer system it is advisable that the DILOS system and the model data base be disposed in the electronic computer that is a unit of the information network. Various units can contain copies of the DILOS system and "local" model data bases corresponding to the specific interests of the scientific collectives that "own" unit computers.

The DILOS system is still used for experimental purposes in the organization of interaction with packets of applied programs and data bases orientated toward different areas of application: the development of new industrial regions, the modeling of ecological systems, the automation of planning, etc. We hope that the dialog regime in combination with the use of a natural language and logical analysis of models of the external environment will prove to be one of the most rational methods of systems research, which will be widely used in everyday practice.

[2174-353]

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CSO: 1863

ABSTRACTS FROM THE COLLECTION 'PROBLEMS IN THE USE OF DATA BASE MANAGEMENT SYSTEMS'

Kiev PROBLEMY ISPOL'ZOVANIYA SISTEM UPRAVLENIYA BAZAMI DANNKYH in Russian 1979 pp 85-89

UDC 681.518:519.878

APPROACH TO PLANNING DATA BASES AND APPLIED PROGRAMS

[Abstract of article by Shlyapak, R.A.]

[Text] The structure of internal level data is examined for SUBD OKA, a network of special kind or intersection of hierarchies. An algorithm is proposed which represents the structure of conceptual level data for an intersection of hierarchies. 2 figures, 3 tables, references: 6.

UDC 025.4.036

METHODS OF ESTABLISHING STABLE CONNECTION BETWEEN USERS AND AN AUTOMATED SCIENTIFIC DATA RETRIEVAL SYSTEM

[Abstract of article by Pshenichnaya, L.E. and Koltun, A. Ya.]

[Text] The exceptional importance of the problem of familiarizing users with the information resources of a specific automated information retrieval systems is proven and original methods for its solution are proposed. The article is of interest to specialists in the field of automated scientific data retrieval and data base management systems. references: 10.

UDC 681.3.06.50

UTILIZATION OF A TRAINING INFORMATION BANK FOR INDIVIDUALIZATION OF THE TEACHING PROCESS

[Abstract of article by Morozov, K.A., Komkova, V.N. and Faybisovich, L.N.]

[Text] The question of using data bases (training information) to create means of automating the teaching process is discussed. The study considers the question of using data bases (training information) to create means of automation of the teaching process. The proposed organization of the data base corresponds to the structure of traditional organization of teaching material (for example: course, section, topic, concept). Information in the data base is recorded from punched cards or under dialog conditions. As a result, this organization of the data base makes it possible to simplify the process of obtaining various versions of teaching assignments for use in automated instruction. references: 3.

UDC 62-52:681.3.06.2

EXPERIENCE IN ELABORATING AND USING SUBD BASED ON OPTIMIZATION PPP TO CONSTRUCT THEORY AND GAME MODELS

[Abstract of article by Kondrat'yev, A.I.]

[Text] Questions of SUBD elaboration arising in construction of theory and game models based on optimization PPP are discussed. 1 table, references: 3.

UDC 681.3.016

CREATION OF INFORMATION AND REFERENCE SYTEM BASED ON A DESCRIPTIVE CLASSIFICATION SYSTEM

[Abstract of article by Kurchenko, V.D.]

[Text] The experience gained in creating an information and reference system based on a library of standard programs using a specially elaborated data system to describe means of programming and mathematical support of ASU is presented. Classification of system users is given and questions of creating additional programming devices are examined. Problems of mapping the hierarchical structure of arrays in the system's linear memory are investigated. references: 6.

UDC 025.4.036

SUBJECT MATTER DEFINITION MODELS OF DATA BASES IN DOCUMENT RETRIEVAL SYSTEMS

[Abstract of article by Pshenichnaya , L.E and Koltun, A. Ya.]

[Text] The INFORMATOR system is described in the article; it is proposed to use it to tackle the problem of familiarizing users with the data base subject categories in document retrieval systems. The INFORMATOR system is currently realized in the YeS disc operating system and is a superstructure on the ASPID applied program package, although with minor changes it is compatible with any package of programs for IPS design. references: 3.

UDC 681.3.01

ON THE HIERARCHICAL STUCTURE OF PROBLEMS AREAS

[Abstract of article by Litvinov, V.V.]

[Text] The question of the time dependence of problem solution plan design as a function of the complexity of the graph of the problem area is studied. Methods are described for constructing a problems area as an variable hierarchical structure which can be tuned to the characteristics of the problem flow. As a result of tuning, time required to construct the solution is greatly reduced. Tuning is accomplished on the basis of statistical information accumulated during operation of the program package organized in the form of a hierarchical problems area. references: 2.

UDC 681.3.06

THE SPOK SYSTEM AS A SYSTEMOLOGICAL OBJECT

[Abstract of article by Alekseyenko, Ye. A.]

[Text] Several questions of representing the teaching course programming system elaborated at the Institute of Cybernetics of the Ukrainian Academy of Sciences (SPOK) as a systemological object are discussed. It is proposed to formally describe the operation and morphology of SPOK. Basic properties of SPOK are formulated as member of the class of dialog-type technical programming systems. references: 5.

UDC 681.3.06.51

SYSTEM FOR SOLVING SEVERAL PROBLEMS OF ARTIFICIAL INTELLIGENCE

[Abstract of article by Belov, V.N., Branovitskiy, V.I., Getsko, L.N., Dovgyallo, A.M. and Kudryavtseva, S.P.]

[Text] Basic aspects of the PROLOG system are discussed: input language and data base organization. As an example of one problem which can be solved using PROLOG is cited the construction of a system for access to a training data base in a constrained natural language. 1 figure, references: 7.

UDC 681.3.06.51

POSSIBILITIES OF STRUCTURAL ORGANIZATION OF AN AUTOMATED TRAINING COURSE

[Abstract of article by Butko, A.I., Vysotskiy, Yu. I., Davydov, V.I.]

[Text] For efficient use of the SPOK system, it is proposed to use a set of so-called "white" subroutines, i.e., instead of a long process of writing the course algorithm, it is necessary to supplement models of subroutines with specific content. It is shown how simple procedures can be used to determine and shape the core of the curriculum, which greatly facilitates the work of authors in writing automated teaching courses. 1 figure.

UDC 681.3.06

AUTOMATED TEACHING AT THE MOSCOW CENTER OF ASU

[Abstract of article by Komkova, V.N.]

[Text] Practical results are cited in the article from incorporation of an automated teaching system; basic problems of automated instruction are defined as well as means to tackle these problems. Automated teaching curricula elaborated at the Moscow Training Center of ASU based on the SPOK system are enumerated.

[359-8617]

8617
CSO:1863

PROGRAMS OF THE CENTRAL INSTITUTE OF ECONOMIC MATHEMATICS

[Editorial Report] Moscow PROGRAMMY I ALGORITMY in Russian 1979, a publication of the Central Institute of Economic Mathematics of the USSR Academy of Sciences, provides listings of programs for solving various mathematical economic problems. Each of the following issues was printed in 1979 and had a printing of 450 copies.

Issue No 88 gives an 1100-step Fortran-IV program for solving the general quadratic programming problem.

Issue No 90 contains a short program called MIXTUR [a non-Russian name] for modeling multidimensional selection involving covariant matrices. The required JCL cards are also given.

A PL/I statistical analysis program using multidimensional regression analysis appears in issue No 91.

Issue No 92 lists the DISCOD [non-Russian name] PL/I program for introducing nonquantitative data into discriminant analysis.

Issue No 93 contains a 113-line ALGOL program for BESM computers. The programs solves nonlinear programming problems using the Weisman method.
[369-P]

CSO: 1863

UDC 681.51:681.3

THE USE OF THE FORMULA DESCRIPTION LANGUAGE FOR OUTPUT OF MACHINE DOCUMENTATION

Moscow PRIMENENIYE YAZYKA FORMUL'NOGO OPISANIYA DLYA VYDACHI MASHINNOY DOKUMENTATSII, Report at Fourth Conference of Young Specialists and Scientists of the Institute of Precision Mechanics and Computation Techniques, USSR Academy of Sciences, Apr 78, Preprint of the Institute No 10, 1979, 11 pages

KONOPKIN, V. N.

[From REFERATIVNYY ZHURNAL. TEKHNICHESKAYA KIBERNETIKA in Russian No 4, Apr 80 Abstract No 4.81.698 by S. G. Romanova]

[Text] Problems are presented related to the use of the language of formula description of logical systems. It is noted that the use of the schematic diagram as the basic document in the design of computers becomes increasingly inconvenient with larger levels of integration. The primary shortcoming of the schematic diagram is the two-dimensional recording of information, which is difficult to read; the large format of the resultant document; and the difficulty in tracing specific signals. It is noted that one possible description of circuits is the use of the language of Boolean expressions. However, complete formulas reflecting the variation in outputs as a function of inputs for large devices are cumbersome and lose their direct relationships to the hardware, one of the main requirements in the development of computer systems. A language is suggested for description of logical basic elements, allowing expressions to be written in a row without losing their direct relationship to the hardware. Problems of production of formulas for logical basic elements considering unused contacts and the commutative nature of certain operations are analyzed.
[350-6508]

APPLICATIONS

AUTOMATING THE PLANNING OF CONTROL SYSTEMS

Moscow AVTOMATIZATSIYA PROYEKTIROVANIYA SISTEM UPRAVLENIYA in Russian 1979 signed to press 23 Nov 79 pp 2-5

[Foreword to the book edited by V.A. Trapeznikov (editor-in-chief), I.V. Prangishvili, V.L. Epshteyn, A.G. Mamikonov, I.G. Dmitriyeva and D.M. Berkovich, 205 pages, 14,000 copies]

[Text] Foreword

The publication of the results of theoretical and applied research, as well as experience with practical designs in the field of the automation of control system planning is continued in this collection. Substantial scientific and engineering successes have recently been achieved in this urgent and promising area of scientific and engineering progress.

The papers in this collection deal with the results of research and developmental work on the problem of automating the planning of control systems, being carried out by the leading scientific research and planning and design organizations in Moscow, Kiev, Minsk and other cities in the nation. It is natural that these results reflect the state of the art and trends characteristic of the various scientific schools and the various applications areas; it is not only difficult to objectively evaluate them, or even compare them from a single viewpoint, but it is not expedient either. Another important factor: there has been a marked expansion in the front and increase in the scientific level of the research.

All of the papers in the collection can be broken down into three groups (although extremely conidtionally). Included in the first group are procedural and theoretical papers of a rather general nature. The results contained in them can be useful to researchers and developmental workers on various classes of automated control and data processing systems. This is true primarily of the paper by A.S. Grinberg on models of the process of complex system planning, in which the experience acquired by the author in the design of automated production control systems (ASUP) is systematized and formalized, something has made it possible for him to come to generalizing conclusions and propose specific recommendations for the efficient organization of the functioning of automated planning systems.

N.I. Dmitriyev and B.I. Yarushkin described the results of a study of information schemes for data processing, specified by a description of the data and the relationships between them, and propose a procedure for the synthesis of information scheme logic which is invariant with respect to the configuration of the computer environment. This procedure has undergone a practical check in the development of the engineering plans for ASU's [automated control system] and has proven to be rather efficient.

The paper of B.T. Shreyber and V.I. Keydan is a brief survey of the basic approaches to organizations for interfacing the user to the control system, where the user is a nonspecialist in the hardware and software fields. For this kind of linkage, the authors propose a special language, which presupposes the teaching of a system of a professional user vocabulary for the purpose of further dialogue in a language in a language close to a natural language for a certain subject area.

In the same group of papers included in this area is the aritcle by G.L. Smilyanskiy, M.A. Oksanicha and L.M. Tabakova which deals with the primary function and proposes a procedure for the automated planning of ASUP graphical documentation. A paper by P.M. Vinogradskaya is devoted to the primary reasons and an efficient procedure for solving multiple criteria problems of the choice of planning solutions in the automated planning of complex systems.

A procedure for the organization of an efficient solution of a set of mutually related ASUP problems taking into account the impact of dropouts and failures of computer equipment components, is treated in the article of V.P. Kuzina. The paper of O.P. Kuznetsov is devoted to theoretical studies of the possibility of saving memory volume when storing routines and texts in a natural language as well as descriptions of finite automats.

The second group is comprised of papers in which data is given on the initial (experimental) variant of a complex for the automated planning of control systems, designed around concepts in accordance with a step by step program for the realization of the scientific research project of ARIUS [automating the development of integrated control systems] scientific research project. This is the paper by V.G. Volina and V.A. Gruzmana, which is devoted to the general organization of the hardware and operational packets, which are the basis for the program software of the ARIUS experimental complex, as well as the paper by V.I. Bodyakin, V.I. Ivanitskiy and V.L. Epshteyn, in which the principles of the design of a terminal system for the ARIUS experimental complex and the organization for the execution of its basic functions are treated.

Included in this same group is the article by V.I. Senichkin, which deals with a formalized procedure intended for the automated generation of a hierarchical data base with tool packet of the ARIUS experimental complex, and the paper by O.A. Mamikonovaya, devoted to the solution of the problem of the program design of the optimum form of a document based on the solution of a nonlinear discrete programing problem.

The papers of the third group reflect of results of experience with the application of the methodology and language tools of ARIUS to the design of ASU's of primarily an organizational type.

The paper of V.A. Lototskiy, A.S. Mandel' and A.V. Khrustalev is devoted to the problem of the utilization of ARIUS language tools in the development of two ASUP subsystems for the Pervoural'skiy New Pipe Plant; the paper of Yu.V. Baskov, et al., is devoted to the general problem of the automated planning of the organizational and production process ASU of the Tobol'sk Petrochemical Complex, based on the concepts and tools of ARIUS, while the paper by V.F. Lizhevskiy is devoted to the application of ARIUS language tools to the description of one of the material and technical supply ASU subsystems.

Experience with the application of ARIUS methodology and tools attests to their rather wide orientation, the acceptable complexity in mastering them, and finally, the obvious and significant economic impact of the ARIUS concept.

The editorial staff of the collection plans to publish in its next issue the materials of the plenary reports of the All-Union Conference on the Automation of Control System Planning, which was held in Suzdal on 17 -- 19 April, 1979.

[248-8225]

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ABSTRACTS ON THE AUTOMATION OF CONTROL SYSTEM PLANNING

Moscow AVTOMATIZATSIYA PROYEKTIROVANIYA SISTEM UPRAVLENIYA in Russian 1979 signed to press 23 Nov 79 pp 202-204

[Abstracts of papers in the book edited by V.A. Trapeznikov (editor-in-chief), I.V. Prangishvili, V.L. Epshteyn, A.G. Mamikonov, I.G. Dmitriyeva and D.M. Berkovich, 14,000 copies, 205 pages]

[Text] Abstracts of Papers in the Collection

MODELS FOR THE GENERATION AND FUNCTIONING OF PLANNING SYSTEMS FOR COMPLEX FACILITIES (USING THE EXAMPLE OF AN ASUP)

[Abstract of paper by Grinberg, A.S., pp 6-27]

[Text] A set of models for the generation of a planning system (SP) is described, which is based on the sequential description of the process of the transformation of relationships in a set of plan variants. The functioning of the SP describes a set of models for the planning stages of an ASUP [automated production control system].

The set of problems which can be solved in the generation and functioning of a planning system and which define the approaches to SP automation is defined on the basis of the set of models.

THE LOGIC SYNTHESIS FOR AUTOMATED CONTROL SYSTEM INFORMATION SCHEMES

[Abstract of paper by Dmitriyev, N.I. and Yarushkin, B.I., pp 28-46]

[Text] Procedures and tools for automating the planning of information schemes for data processing are treated. Such schemes are the model representation of the data and program software for an ASU and are specified by a description of the data and the relationships between them. The primary task is the synthesis of information schemes at the logic level regardless of the configuration of the computer complex.

THE AUTOMATED DESIGN OF A DATA BASE WITH A HIERARCHICAL STRUCTURE

[Abstract of paper by Senichkin, V.I., pp 47-58]

[Text] A method of the automated design of a hierarchical structure data base is treated which is based on the representation of the information flow as an ensemble of mutually related tables, in accordance with which the data flow is realized. A formal description is given of the analysis procedure for the attributive components of the structural elements of the information flow during the process of hierarchical segmentation of the logic entries of the data base.

LANGUAGE TOOLS FOR INTERFACING A NONPROGRAMMER TO A CONTROL SYSTEM

[Abstract of paper by Shreyber, B.T. and Keydan, V.I., pp 59-79]

[Text] The questions of interfacing a nonprogrammer to the data base of a control system are treated. It is proposed that the interaction be built on the basis of structural formulas: stable structures existing in a natural language. The mathematical principles and major components of the language of structural formulas are given. The generality of the proposed approach in the plan for the construction of the data base is demonstrated as well as the latest developments in the field of relational data bases.

ON THE STRUCTURAL REPRESENTATION OF COMPLEX TEXTS IN A COMPUTER MEMORY

[Abstract of paper by Kuznetsov, O.P., pp 80-93]

[Text] Networks of texts (T-networks) are analyzed: acyclical graphs, to the vertices of which the texts are assigned. Questions of the complexity of the realization of texts by T-networks are studied. It is shown that all sufficiently high capacity sets of one-dimensional representations of T-networks are not context free languages.

THE MAJOR FUNCTIONS OF THE AUTOMATED PLANNING OF GRAPHICAL DOCUMENTATION FOR ASUP PLANS

[Abstract of paper by Smilyanskiy, G.L., Oksanich, M.A. and Tabakov, L.M., pp 94-102]

[Text] A procedure is proposed for the automated planning of graphical documentation of ASUP [automated production control system] project plans, the basis of which is a heuristic programming algorithm.

THE AUTOMATION OF THE PROCESS OF PLANNING THE FORMS OF DOCUMENTS

[Abstract of paper by Mamikonova, O.A., pp 103-109]

[Text] The problem of the automated design of the form of a document based on introduced optimality requirements is treated. Its mathematical formulation is given as a nonlinear enumeration problem in mathematical programming. The solution of the problem on a computer is described and the calculation results are given.

THE PROGRAM SOFTWARE FOR THE ARIUS EXPERIMENTAL COMPLEX

[Abstract of paper by Volin, V.G. and Gruzman, V.A., pp 110-121]

[Text] The structure of the ARIUS [automation of the development of integrated control systems] complex, and the functional designation of its components are treated. The main steps in the functioning of the instrumental package [the package for designing the system to user requirements] are singled out, where these steps correspond to the generation of the elements of the information project plan. The algorithm for the interaction of the program components of the operational package is described.

ON THE CONSTRUCTION OF AN ARIUS TERMINAL COMPLEX

[Abstract of paper by Bodyakin, V.I., Ivanitskiy, V.I. and Epshteyn, V.L., pp 122-132]

[Text] The functional structure of an ARIUS terminal complex and the principles for the construction of its major systems using display technology are treated. Examples are given for the experimental realization of the main functions of the complex.

THE APPLICATION OF THE ARIUS LANGUAGE TOOLS TO THE SOLUTION OF PLANNING AND CONTROL PROBLEMS FOR STOCKS OF SEMI-FINISHED PRODUCTS

[Abstract of paper by Lototskiy, V.A., Mandel', A.S. and Khrustalev, A.V., pp 133-143]

[Text] Experience with the design of the planning and control subsystem for stocks of hot-rolled blanks (the semi-finished product of pipe production) at the Pervoural'skiy New Pipe Plant is described. It is shown that with the use of the ARIUS language tools, the number of variables generated by means of standard functions amounts to 87 percent of the overall number of variables.

THE POSSIBILITIES FOR THE APPLICATION OF ARIUS LANGUAGE TOOLS TO THE MAIN CLASSES OF PETROCHEMICAL PRODUCTION TASKS

[Abstract of paper by Baskov, Yu.V., Ivanitskiy, V.I., Kulmagambetov, A.R., Leonova, O.A. and Chistyakov, A.A., pp 144-161]

[Text] The results of a study of the possibility of the application of ARIUS language tools to the major classes of tasks characteristic of petrochemical production are given, taking into account the various levels in the control hierarchy. The necessity of developing the technology for the automated planning of ASU's under ARIUS conditions is shown and some examples of service programs supplementing ARIUS capabilities are given.

EXPERIENCE WITH THE APPLICATION OF ARIUS LANGUAGE TOOLS TO THE DESCRIPTION OF OPERATIONAL CONTROL TASKS IN MATERIAL AND TECHNICAL SUPPLY

[Abstract of paper by Lizhevskiy, V.F., pp 162-175]

[Text] A set of tasks of an integrated ASU for material and technical supply in the "Monitoring of product deliveries at the territorial level" subsystem is described by means of the ARIUS language tools. The conclusion is drawn that when describing the delivery tasks, complete formalization is achieved which is particularly effective when working with large volume data flows.

THE PRINCIPLES FOR THE CONSTRUCTION OF THE AUTOMATED "VYBOR" SYSTEM

[Abstract of paper by Vinogradskaya, T.M., pp 176-184]

[Text] The process of decision making, as a result of which the require ments placed on the automated "Vybor" ["Selection"] system and its information support are analyzed. An example is given for the make-up of the "Vybor" system for the solution of economic problems.

THE AUTOMATED PLANNING OF AN ALGORITHM FOR THE COMPUTER SOLUTION OF SETS OF INTERRELATED ASUP PROBLEMS

[Abstract of paper by Kuzin, V.P., pp 185-201]

[Text] A standardized algorithm for the computerized solution of complexes consisting of tens of informationally interrelated ASUP [automated production control system] problems is treated, where this algorithm provides for increased reliability of the solution and which has seen industrial service in the nation's largest enterprises.

[248-8225]

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ABSTRACTS FROM THE COLLECTION 'DATA PROCESSORS AND DATA TRANSMISSIONS DEVICES'

Kiev PREOBRAZOVATELI FORMI INFORMATSII I SREDSTVA PEREDACHI INFORMATSII in Russian pp 112-118

UDC 681.3.087.42

PRINCIPLES OF CONSTRUCTION OF PROGRAMMABLE DATA PROCESSORS

[Abstract of article by Brayko, Yu. A.]

[Text] The class of programmable data processors (PFI) is considered. Stages of planning of programmable PFI are analyzed. A criterion is proposed for evaluating the effectiveness of such processors. 2 figures, references: 3.

UDC 681.3:621.317.002

ON SEVERAL QUESTIONS OF EXPANDING FUNCTIONAL POSSIBILITIES OF RADIO MEASURING INSTRUMENTS

[Abstract of article by Kozachkovskiy, A.D.]

[Text] Developmental trends of automated radio measuring instruments are indicated; basic groups of analog radio measuring instruments suitable for automation are specified; possibilities of functional expansion of instruments in each group using LKP and microprocesssors are examined. references: 4.

UDC 681.326-181.43

ALGORITHMS FOR SUPPRESSION OF RANDOM PULSED TRAINS IN ANALOG-DIGITAL CONVERSION

[Abstract of article by Alipov, N.V.]

[Text] Linear conversions permitting creation of analog-digital converters (ATsP) of continuous and variable signals with high noise immunity are considered. Analytical relaitonships of such converters are cited. Recommendations are made for planning of noise-immune ATsP. 1 table, references: 4.

UDC 681.335

ANALYSIS OF ERRORS OF A COMPENSATION ATsP WITH NORMALIZED SIGNAL IN THE FORM OF PHASE SHIFT ORIENTED TOWARDS APPLICATION IN AUTOMATED STRENGTH TESTING SYSTEMS

[Abstract of article by Stokay, V.P.]

[Text] The most substantial systematic errors of compensation ATsP are analyzed. Recommendations are made for reducing error components due to temperature instability of control and load circuit resistors of a multiple input phase inverter, as well as compensators and communications lines. references: 7.

UDC 332.14

ANALYSIS OF MEASUREMENT ERROR OF THE ACTUAL VALUE OF VOLTAGE WITH SIMULTANEOUS USE OF TIME AND LEVEL QUANTIZATION

[Abstract of article by Malinovskiy, B.N., Lozovik, V.G. and Makov, D.K.]

[Text] Components of total error are analyzed for measurement of the actual value of voltage using operations of time and level quantization. It is shown that errors from quantization should be considered jointly. Expressions are derived to evaluate total error. references: 2.

UDC 681.325.5

ORGANIZATION OF MULTIPLEXING PROCESSORS BASED ON MINI-COMPUTERS

[Abstract of article by Kondalev, A.I. and Cherevko, A.A.]

[Text] A generalized block diagram of a multiplexing processor based on a mini-computer is cited which includes 11 functional modules. It is shown that these modules can be used to build various kinds of KP both according to functional purpose, structure, and method of data multiplexing. 1 figure, 1 table, references: 7.

UDC 621.321.03

ON CONSTRUCTION OF A SYSTEM OF MEDICAL AND BIOLOGICAL DATA EXCHANGE FOR SEVERAL INSTITUTIONS OF THE UKRAINIAN ACADEMY OF SCIENCES AND MINISTRY OF HEALTH

[Abstract of article by Zharovskiy, S.N.]

[Text] Basic requirements for an inter-institute system of data exchange (SOD) oriented toward a specific class of problems are considered. A description of a SOD based on common communications channels is cited which is realized using the "ODA-20" equipment and dedicated telephone lines. 1 figure, 2 tables.

UDC 681.335

HIGH-SPEED ANALOG-DIGITAL CONVERTOR OF THE BIT SERIAL TYPE

[Abstract of article by Fabrichev, V.A.]

[Text] A description of a high-speed analog-digital converter elaborated by the author is cited. Work of the basic subassemblies of the converter is considered; calculation of error based on derived test data is carried out; characteristics of ATsP are indicated. 1 figure, 2 tables, references: 4.

UDC 681.335

ANALOG-DIGITAL FUNCTION GENERATOR FOR CONTROL SYSTEMS

[Abstract of article by Pasekov, L.P. and Oleynikov, A.G.]

[Text] An analog-digital function generator of angular and linear motion is considered which realizes the Wolder algorithm and is intended for conversion of output signals of SKVT, selsyns, potentiometric sensors of continuous and variable voltage. 1 figure, references: 3.

UDC 621.321.03

TELEVISION STANDARD CONVERTER FOR GENERAL USER STATIONS

[Abstract of article by Bunin, S.G. and Kazakov, Yu. B.]

[Text] A device for compression of the TV signal spectrum for transmission along a narrow-band communications channel and re-conversion for scanning in a standard television receiver is described. The device is for a system of information mapping of user stations of general information and reference systems. 2 figures.

UDC 681.335+681.324

HIGH-CURRENT TsAP FOR MONITORING/MEASURING SYSTEMS

[Abstract of article by Klochan, P.S. and Lavrent'yev, V.N.]

[Text] Technical circuit methods of improving the parameters of TsAP are analyzed as illustrated by devices elaborated by the authors for monitoring and measuring systems. It is shown that structures with bit serial compensation of error are advisable for small IC and discrete component TsAP, while structures with a common error correction circuit should be used for LSI IC TsAP. 3 figures, 1 table, references: 2.

AUTOMATED ATsP RANGE SELECTOR BASED ON A PROGRAMMABLE AMPLIFIER

[Abstract of article by Romanov, V.A.]

[Text] An IC programmable amplifier with automatic zero-bias error compensation is considered. An automated ATsP range selector is described which is built on the basis of the given programmable amplifier. Parameters are cited for automated range selectors and recommendations are made for use of such devices in ATsP. 3 figures, references: 5.

UDC 621.374.32:681.148.82

ON PARASITIC FREQUENCY MODULATION OF MAGNETIC CASSETTE MEMORIES OF AUTOMATED LABORATORY EXPERIMENT SYSTEMS

[Abstract of article by Tynskiy, I.P.]

[Text] The statistical characteristics of a signal reproduced from magnetic tape based on the effect of parasitic frequency modulation occurring as a result of instability of magnetic recording carrier travel are considered. Formulas are derived for calculation of the probability density curves of cycling time delay of the magnetic recording channel threshold sensor. 2 figures, references: 3.

UDC 621.397.01

ANALYSIS OF THE EFFECTIVENESS OF COLLECTION AND TRANSMISSION OF DATA VIA GROUP CHANNELS USING THE "CYCLICAL INTERROGATION" ALGORITHMS

[Abstract of article by Zayko, V.D.]

[Text] The average interaction time of a central device with user terminals and the data transmission waiting time are defined. A relationship is built between this time as a function of the length of data words being transmitted per cycle, and the number of terminals connected to the common channel. The effect of transmission of service and address information on the reduced rate of data transmission is examined. 3 figures, references: 5.

UDC 681.3:621.317.002

ANALYSIS OF TIME INDICATORS OF A PNK COUPLED WITH A MICROPROCESSOR

[Abstract of article by Kuznetsov, S.N.]

[Text] Relationships are derived for the conversion time of a voltage-to-code converter (PNK) as a function of the number of bits for equipment, programming and combined versions of PNK design. The merits and shortcomings of each version are examined; the advisability of designing equipment and combined PNK is proven. 2 figures, references: 3.

[359-8617]

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CSO: 1863

NEW BOOK ON USE OF HYBRID COMPUTING COMPLEXES IN MODELING STUDIES

Moscow MODELI PRYAMOY ANALOGII in Russian 1979 pp 2-6, 238-62

[Annotation, table of contents, foreword, and section of chapter 8 of book "Modeli Pryamoy Analogii" (Direct Analogy Models) by I. M. Tetel'baum and Ya. I. Tetel'baum, Moscow, Nauka Glavnaya Redaktsiya Fiziko-Matematicheskoy Literatury, 1979]

[Excerpts] Annotation

This book considers the application of electrical analogues of processes with varying physical characteristics to the investigation of a broad range of scientific and technical problems. A model experiment in the language of electrical circuits, based on the direct analogy technique, permits a graphic physical representation of the problem and insures reliable results.

The book elaborates techniques of electrical and machine modeling using analogue as well as digital and hybrid models. It demonstrates ways to use series-produced computers and methods of devising specialized units. The text is enhanced with a large number of examples.

The book is intended for a broad range of scientific workers, engineers, and advanced college students who employ modeling in their work. It has 269 illustrations and 115 bibliographic entries.

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Foreword

The present book sets forth the basic ideas of constructing direct analogy models and the principles of their application. It demonstrates ways to use series-produced computers for machine mo eling by the direct analogy technique and ways to devise specialized units. The text is accompanied by a large number of examples from various technical fields. The purpose, however, is by no means to describe designs and plans for specific types of modeling units; they are used only to illustrate general points.

The book has three parts. The first part contains a general description of modeling methods and reviews questions of similarity and the precision of modeling. The second part is devoted to modeling physical systems with concentrated parameters described by conventional differential equations. The third part reviews the modeling of physical fields, that is, boundary problems that require the solution of differential equations in partial derivatives.

The methodology of our presentation is based on long years of experience teaching the corresponding lecture courses in modeling and analogue and hybrid computing equipment at the Moscow Order of Lenin Energy Institute in the specializations of "computing equipment" and "engineering electrophysics."

The work of one of the authors at the All-Union Petroleum-Gas Scientific Research Institute for Modeling Petroleum Deposits helped with summarization of the material in the area of hybrid and digital modeling. This is one of the leading areas of application of new machine modeling equipment today.

The book is intended for a broad range of scientific workers, engineers, and advanced college students who use modeling methods on analogue and digital computers in their work.

The authors express their profound gratitude to B. Ya. Kogan for his kind criticism and valuable advice and to A. A. Petrov, editor of the book, for his valuable remarks and active participation in preparing the book for publication.

I. M. Tetel'baum and Ya. I. Tetel'baum
Moscow, 1979

[8.3. Hybrid "Grid-Digital" Computing Complexes]

Let us review some additional specifications of domestic hybrid computing complexes of the "R grid-digital computer" type. They use medium-sized digital computers (30,000 ops/second). The Saturn-1 and Saturn-2 complexes have a main memory consisting of eight magnetic core storage units of 4,096 words apiece, magnetic drums capable of 50,000-150,000 words, and tape and disc storage. Later modifications of the complexes envision the use of YeS series digital computers. For visual representation of information the Saturn-1 complex has a color display (video terminal with a 59-centimeter screen on the diagonal and four memory cubes of 2,048 words apiece) and a graph plotter; the Saturn-2 has a black-and-white display and graph plotter.

Figure 8.32 below shows a simplified flowchart of the Saturn-1 hybrid computing complex [47]. The main element of the analogue part of this type of complex is the grid block with digitally controlled resistors controlled from the digital computer. The selection of conductances

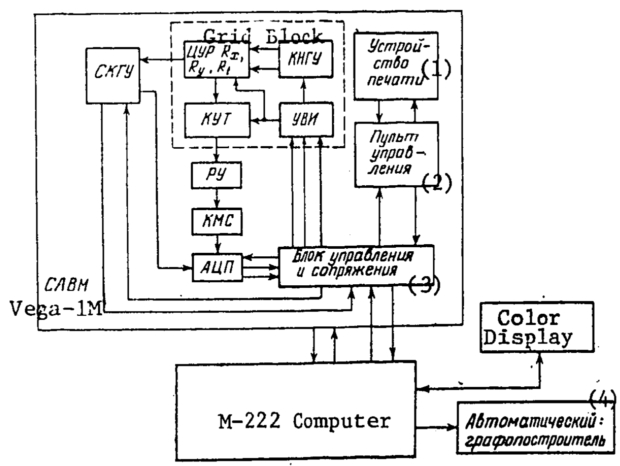

Figure 8.32. Flowchart of the Saturn-1 Hybrid Computing Complex

Key: (1) Printer;
(2) Control Console;
(3) Control and Coupling Unit;
(4) Automatic Graph Plotter;
CKГУ -- Special Boundary Conditions Channel;
ЦУР -- Digitally Controlled Resistors (R_x, R_y, R);
КНГУ -- Channels for Assigning Initial and Boundary Conditions;
КУТ -- Junction Point Switch;
УВИ -- Data Input Unit;
РУ -- Isolation Amplifier;
КМС -- Grid Module Switch;
САВМ -- Grid Analogue Computer.

in the Vega-1M analogue processor of the Saturn-1 complex is done by parallel switch-on. Conductance control is accomplished by means of relay contacts. The Saturn-1 has 1,024 junction points with 18-position resistors R_x, R_y, and R_t (see Figure 8.33, next page). They can assume values between 15.6 ohms and two megaohms, as well as zero and infinity.

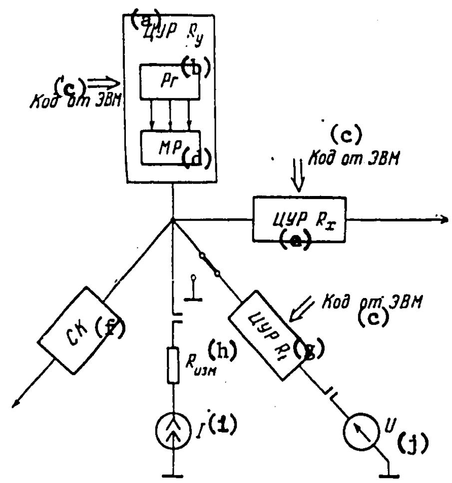

Figure 8.33. Diagram of a Junction of the Saturn Hybrid Computing Complex

Key: (a) Digitally Controlled Resistor R_y;
(b) Register;
(c) Code from the Computer;
(d) Resistor Store;
(e) Digitally Controlled Resistor R_x;
(f) Switch Circuit;
(g) Digitally Controlled Resistor R_t;
(h) Measurement Resistor;
(i) Source of Current;
(j) Digitally Controlled Voltage Source.

In addition, at each junction point there are unified channels for initial and boundary conditions that can work in either the regime of current source I or voltage source U; the setting time for initial data for the full grid does not exceed 10 seconds.

The Vega-2 analogue processor of the Saturn-2 complex contains 2,048 junction points with 14-position resistors R_x, R_y, R_z, and R_t and unified channels for boundary and initial conditions. The Vega-2 grid is broken up into 32 separated sub-blocks of 64 junctions points apiece with free switching of sub-blocks into a single modeling grid. In this case each block has an autonomous data input system with backup storage to store the values of the sub-block parameters. The time required to measure and register the parameters of a full grid is 1.3-1.4 seconds.

The Saturn-1 complex has a block of specialized boundary conditions with 64 channels [47]. This block consists of a digitally controlled resistor, an "ideal diode," and current and voltage sources for modeling constraints. They can be used together or separately. The channels are coupled and the configuration of the domain assigned by means of cord switching on a plug-in switching panel.

In domestic third-generation hybrid computing complexes (the Omega-2 belongs to this class) built with extensive use of microelectronic elements, the junction point has a more complex structure, although it used digitally controlled conductances with small bit configurations. In one of the variations, for example, the junction point consists of five magazines of digitally controlled conductances in the form of integrated film-type resistors which are switched by means of MOS (metallic oxide semiconductor) switches. The bit configuration is significantly reduced compared to the Saturn-1 complex; the grid resistors have four positions, whicle the resistors in the power supply circuit have six and eight bit positions. The Omega-1 complex, which has 512 junctions, is constructed of fixed resistors and controllable current guides.

Current grid-type hybrid computing complexes use two-stage commutators. The Saturn-1, for example, has a general relay commutator of grid modules and a relay measurement commutator located in the magazines of the block of initial and boundary conditions. The Saturn-2 also has a junction point commutator that is broken into two stages. The first -- relay -- stage is placed in the grid block in the junction point magazine; the second -- contactless -- stage is included in the measuring unit. The automatic measuring unit works at a speed of 160-200 milliseconds for the entire grid in this case. The measuring unit makes it possible to measure the potentials of junction points, the gradients of potentials, and the voltages of the boundary condition channels.

In microelectronic hybrid complexes of the Omega-2 type one runs into problems arising from the fact that data conversion times in analogue-digital converters are commensurate with access time to storage. It is suggested, therefore, that a two-stage commutator with several integrated analogue-digital converters be used to insure rapid scanning of the analogue grid and removal of data.

In conclusion we should point out that combining digital and analogue equipment in the "grid-digital" hybrid complex offers great opportunities for devising data representation equipment. When the number of junctions of the grid is increased, the labor-intensiveness of measuring voltages at junctions of the grid grows and, most importantly, it becomes more complex to compare measurement results in order to analyze the field. Therefore, further development of the electrical grid technqiue requires automation of this work. Various types of information representation devices may be required depending on the type of problem being solved with the model. In some cases it is advisable to observe the qualitative picture of the field as a whole visually or to construct graphs of the relationships between voltages and time for junctions of the grid; in other cases one must also know the tendencies of changes in the field when comparing different variations of initial conditions and obtain precise groups of isolines of the field on the basis of a large number of discretely assigned values at junctions of the grid. Surveying means of representation, graph plotters, and automatic recorders may be used to represent the results of voltage measurements at junctions of the grid.

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AUTOMATED SYSTEM FOR MONITORING DIGITAL SEISMIC PROSPECTING STATIONS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 4, 1980 signed to press 21 Mar 80 pp 17-19

[Article by G. K. Bogatkin, candidate of engineering science, and engineers N. V. Maksimov, B. Ye. Fishman and S. Yu. Bocharov, in section II. "Instruments and Means of Automation"]

[Text] Increase the technical equipment of geological prospecting operations, build and put into production new highly productive equipment, automated drilling rigs, apparatus and instruments.
"Basic Directions for Development of the USSR National Economy for 1976 to 1980."

The prospects for developing seismic prospecting in the country are linked to devising and introducing digital seismic prospecting stations (TsSS) which have a broad dynamic range and high accuracy in recording seismic information, high reliability and a long useful life [1]. In addition to the further improvement of the parameters of the digital seismic prospecting stations, increasing the number of channels, employing various devices for initial processing of seismic information, as well as using microprocessors, raising station efficiency is closely linked to improving the system for monitoring the quality of work and of control of it during production and of maintenance of the stations in the period of operation.

The specific characteristics of modern multichannel digital seismic prospecting stations as objects of monitoring are the presence of several dozens of analog and digital parameters, the need to evaluate them according to the results of cumulative measurements, the interrelation and broad range of parameter values, the requirement for high accuracy in monitoring with a large volume of computations, etc. This inevitably leads to complexity of the monitoring and measuring equipment, a large volume of computational and logical operations, and enlisting highly skilled personnel to maintain the stations. In solving the problems of monitoring multichannel analog-digital systems, which include digital seismic prospecting stations, one can see two basic directions: the use of built-in and stationary monitoring equipment.

Digital seismic stations, being mobile, require built-in equipment designed primarily for functional monitoring during station operation.

Using microprocessors for monitoring makes it possible to expand the list of controllable parameters in the stations and to raise the accuracy of measurements. However, microprocessor monitoring systems have not yet been used in full measure in domestic practice, although, naturally, more effective results are expected in this area in the near future.

The second direction is associated with solving problems of monitoring the stations by using automated monitoring systems (ASK) based on sources of sample signals and computers. This is all the more timely, considering the wide use of computers in geophysics, since it ensures the identity of equipment for monitoring the individual parts of the stations (right down to testing printed boards) and the station as a whole both in producing and certifying the stations as well as during operation.

The major principles for building automated monitoring systems and various equipment for testing and diagnostics of digital electronic apparatus have been adequately reflected in the technical literature [2-8]. But till now little has been said about the principles of building problem-oriented systems and the distribution of functions between hardware and software when monitoring multichannel mobile analog-digital systems, such as digital seismic prospecting stations. Also, methods for monitoring the stations by using computers or microprocessors are still lacking in the technical literature and standard technical documentation.

One can assume that as the aggregated complexes of the GSP [State System of Industrial Instruments and Automation Equipment] are developed, and precisely after the development and introduction of the aggregated system of geophysical equipment (ASGT), there will be a transition to the unified system of metrological support of production and to exploitation of this equipment.

This article deals with several problems in building automated systems for monitoring geophysical stations based on aggregate principles which have recently been widely used during the development of various computational and measuring complexes and monitoring and control systems.

Peculiarities of Building Automated Systems for Monitoring Seismic Prospecting Stations

Organization of effective monitoring and diagnostics in the general case requires examination of all stages in building digital seismic prospecting stations. This process can be consolidated into three basic stages: planning, production and operation. This concept is needed to clarify the functions of the automated monitoring system and the composition and distribution of its facilities both by stages and in each of them.

In the production stage for the digital seismic prospecting stations, and while maintaining and operating them, it is advisable to use stationary facilities of the automated monitoring system, the structure and composition of which are determined as a function of the purpose of the stations with due regard for the peculiarities of their application. Thus, the appropriate division of functions and facilities of the system will be observed in the sphere of production itself, for example, with subcontracted shipments, when unit production is provided for at subcontracting organizations with subsequent shipment of items to one head enterprise which manufactures additional units and assembles and adjusts the stations.

For subcontractors specializing in the manufacture of one type of product, specialization of the automated monitoring system will also be in order. For the head enterprise where it is possible that not only seismic prospecting stations are produced, but also other geophysical apparatus, for example, gas logging stations, specialized processors, etc., centralized automated monitoring systems are required.

During operation of the digital seismic prospecting stations, maintenance tasks can be handled by using the autonomous facilities of the automated monitoring system located at specialized maintenance centers deployed directly in the regions of operation of the mobile seismic stations.

It is evident that requirements for the structure of the automated monitoring system can be very varied just as a function of where the system is used.

Current approaches to building automated monitoring systems often assume independent development of facilities for monitoring and diagnostics. Some of them provide for building specialized systems with a permanent structure based on apparatus of a specific type, while others call for general-purpose systems intended to handle multipurpose monitoring tasks. Both of these approaches have their shortcomings. Specialized systems characteristically lack functional flexibility, while general-purpose systems have too much equipment which leads to complexity and high cost and complicates development and operation [2]. These shortcomings show up most clearly when manufacturing small series and diversely planned items such as geophysical apparatus.

Under these conditions, the most promising solution is the aggregated principle of building automated monitoring systems; based on a unitized-module organization, it enables meeting the most varied requirements of both a tactical-technical and an economic nature.

Monitoring the Basic Characteristics of Digital Seismic Prospecting Stations

The basic functions of a digital seismic prospecting station are amplification of seismic signals with minimal distortion and high identity between the channels [trakt] of the amplifier channels [kanal], conversion of analog signals into digital form, initial processing of seismic information and recording the results on magnetic tape in a form convenient for computer processing. The structural diagram of a station is shown in figure 1. In the process, exacting requirements are made on the preamplifiers and the analog-code converters (PAK), which determine the accuracy of the station as a whole, concerning nonlinear distortion; phase, amplitude and frequency characteristics; nonlinearity of conversion, etc. Monitoring the station's analog parameters accounts for up to 80 percent of the total work, and the monitoring operations are performed repeatedly during both production and operation of the station. Considering that the station puts out digital information and the recording format allows direct input to a computer through magnetic tape storage units, most preferred is the method of monitoring station characteristics during which the test generator signal, after passing through the station recording channel, is recorded on magnetic tape and the measuring information obtained is processed on a computer.

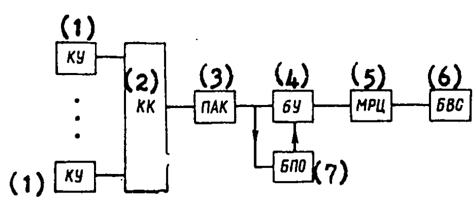

Fig. 1. Schematic diagram of digital seismic prospecting station:

Key:

1. KU -- channel amplifiers
2. KK -- channel commutator
3. PAK - analog-code converter
4. BU -- control unit
5. MRTs - magnetic digital recorder
6. BVS - seismic signal reproduction unit
7. BPO - unit for preliminary processing of information, which stores and correlates signals

The expediency of this method has been confirmed by its use in several foreign seismic stations. Thus, this method is used in the (U.S.) MDS-8 seismic station to check noise, nonlinear distortion, discrimination of the frequency characteristic of the amplifier filters, nonlinearity and error of the analog-code converter and a number of other parameters. The presence in the station's recording format of a large quantity of varied service information makes it possible to perform on a computer diagnostics of the operation of the station's units.

This list will be expanded considerably with elaboration of suitable methods of monitoring and diagnostics.

Consequently, in the process of the overall monitoring and diagnostics of the station, the automated monitoring system will be operating in a time sharing mode; in doing so, the system hardware will generate the test signals, while the software, i.e. the computer, will process the information obtained and record the results of monitoring and diagnostics. The data obtained on the station parameters can be used to introduce appropriate corrections during interpretation of the seismic information.

Monitoring and Diagnostics of Digital Seismic Prospecting Station Components

Monitoring and diagnostics of the various units, assemblies and circuit elements are necessary during production and operation of digital seismic prospecting stations. The most rational and proven principle of building an automated system for monitoring and diagnostics is the method of aggregation based on a system of unified monitoring units (UBK) which are to operate in an autonomous mode or in interaction with a computer as part of a common automated monitoring system. In the process, the unified monitoring units themselves may contain replaceable modules. Such flexible organization of automated monitoring systems and unified monitoring units permits rapid rearrangement of a monitoring system and diagnostics of various types of station assemblies or simultaneous monitoring of various geophysical apparatus. The structural diagram of a unified monitoring unit is shown in figure 2.

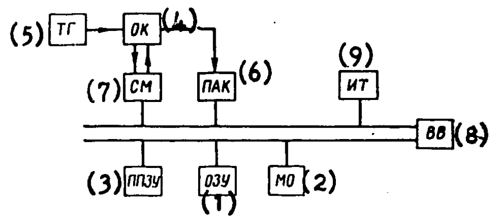

Fig. 2. Structural diagram of a unified monitoring unit (UBK):

Key:
1. OZU -- main memory
2. MO -- information processing module
3. PPZU - programmable read-only memory (PROM)
4. OK -- object of monitoring (unit, assembly, board, rack assembly)
5. TG -- test-generator of standard signals
6. PAK -- measuring analog-code converter
7. SM -- interface module
8. VV -- input/output controller for control of information exchange with computer
9. IT -- Information display (digital display, graph plotter, oscilliograph, digital printer, etc.)

The unified monitoring unit performs monitoring and diagnostics of the object in an autonomous mode, and control can be either manual or automatic.

A computer should be automatically connected to the automated monitoring system if the main memory of the unified monitoring unit does not have a suitable program to perform an operation, for example, monitoring of a new assembly or identification of a malfunction not previously encountered. In this case, the unified monitoring unit serves as an external terminal for the computer. In the manual mode of operation of the unified monitoring unit, the operator uses the computer to work out a new program for operation of the unified monitoring unit and the new program is automatically recorded in the unit's main memory. Then this operation will be performed automatically by the unit without operator participation. When monitoring complex units, external storage can be used, for example, the magnetic tapes in a YeS EVM [unified system of electronic computers].

The capability of the unified monitoring unit to operate in an autonomous mode when a set of replaceable modules is available reduces outlays not only for time and apparatus when a shift is made to monitoring new items, but also expenses for users of digital seismic prospecting stations for operating needs and training of maintenance personnel, since the apparatus and programs used during adjustment and check-out of the station at the manufacturing plant can be used in the operation stage. In the process, the customer need acquire only the replaceable modules and package of new programs for his existing unified monitoring units.

In addition, this unified monitoring unit structure permits organization of new forms of maintenance, such as users setting up exchangeable stocks of programs for monitoring and diagnostics; determining station or component malfunctions based on recording information on the nature of the malfunction on a magnetic cassette and sending the cassette to the user with recommendations for eliminating the malfunction; remote diagnostics when a unified monitoring unit installed in a remote shop will be operating over telegraph communication lines together with a computer in the automated monitoring system at the manufacturing plant or at the user's regional maintenance center.

Unified units of automated monitoring systems for monitoring and diagnostics of digital electronic devices can be built on the principle of logic testers, working on the serviceable-defective method, and of signature analyzers and on a mixed principle [6, 9, 10]. A modification of a digital storage oscillograph [11] used in the role of a unified monitoring unit is especially promising; it can be used in the manual or automatic mode for monitoring and diagnostics of digital and analog units in the stations. This instrument combines in itself the functions of a multichannel storage oscillograph and a self-programming logic tester. It is best to use digital controllable generators as the test-generators in the unified monitoring units. Under the modular organization of the unified monitoring unit, in the mode of monitoring station components, the programmed part of the automated monitoring system handles the functions of control of functioning of the entire system, processing of mass data, simulating malfunctions, check-out of programs for the unified monitoring unit, and recording results of monitoring and diagnostics. The hardware portion of the automated monitoring system generates standard signals, processes information according to specialized programs and outputs it. Modern computer system components can be used as individual modules of the unified monitoring units.

Generalized Structural Scheme of Automated Monitoring of Digital Seismic Prospecting Stations

Figure 3 shows a generalized block diagram of an aggregated automated monitoring system for monitoring and diagnostics of a digital seismic prospecting station in the process of production and operation. For the central computer in the automated monitoring system, it is best to use a system of small computers, which have adequate hardware and software for this application.

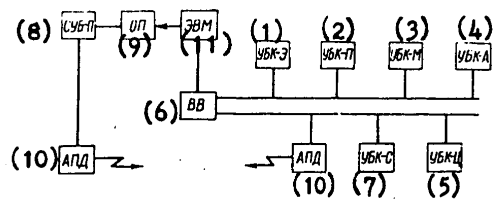

Fig. 3. Generalized block diagram of automated monitoring system:

Key:

1. UBK-E -- units for input monitoring of elements
2. UBK-P -- units for monitoring printed boards
3. UBK-M -- units for monitoring assembly of bunched conductors
4. UBK-A -- units for monitoring analog assemblies
5. UBK-Ts -- units for monitoring digital assemblies
6. VV -- input/output controller
7. UBK-S -- units for monitoring parameters of the digital seismic prospecting station
8. SUB-P -- unified monitoring unit system for user of the station
9. OP -- communication through exchange of programs
10. APD -- data transmission equipment for communication between computer and unified monitoring unit--user by telegraph
11. EVM -- computer

Compared to individual monitoring beds or automated systems with a permanent structure, the suggested structure of an automated monitoring system will provide: a sharp reduction in the labor intensity of monitoring and diagnostics of apparatus both at the manufacturing plant and for the user; a decrease in time outlays, capital investment and required number of highly skilled specialists for organization of production, maintenance and operation of new modifications of digital seismic prospecting stations; monitoring and diagnostics when necessary of assemblies of various digital geophysical apparatus (provided they are specifically standardized); the possibility of establishing circulation of standardized units for the automated monitoring system with replaceable modules and software for them; substantial reduction in time for monitoring and diagnostics of geophysical apparatus at operational sites; creation of a common exchangeable stock of programs for diagnostics of assemblies of geophysical apparatus for station users; identity of methods and facilities for metrological support of production and operation, and an increase in objectivity and reliability of monitoring geophysical digital apparatus; and the possibility of organizing a common production quality control system between the station producer and user.

An automatic monitoring system based on computers and standardized modular units with programmed control has the potential capability for continuous improvement and development without disrupting the functioning of the system as a whole.

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UDC 621.039.517:681.142.4

COMPUTER SOLUTION OF PROBLEMS OF REACTOR THERMOPHYSICS

Moscow RESHENIYE ZADACH REAKTORNOY TEPLOFIZIKI NA EVM in Russian 1979 signed to press 10 May 79 pp 2-4, 142-143

[Annotation, table of contents and foreword from book by Valeriy Ivanovich Subbotin, Vasiliy Mikhaylovich Kashcheyev, Yevgeniy Vadimovich Nomofilov and Yuriy Sergeyevich Yur'yev, Atomizdat, 1800 copies, 144 pages]

[Text] Annotation

The methods and results of computer solution of some problems of the thermophysics of nuclear power plants are presented. The book describes experience in the calculation of velocity and temperature fields during the movement of liquid in channels of arbitrary form, in the distributors and collectors of reactors, in tanks and cold traps during mixed convection and in the cassettes of reactors, heat exchangers and steam generators during transverse and longitudinal movement of the coolant.

The authors have examined the two-dimensional problem of two-phase dispersely circular flow in an irregularly heated pipe and solved it for the particular case of a stationary regime of flow during a heat-transfer crisis.

The authors discuss questions of the finite-difference presentation of differential equations, the convergence and stability of interational processes and the accuracy of solutions. Some results have been reduced to generalizing formulas and recommendations and have been illustrated in comparison with experimental data.

The book is intended for thermal physics engineers engaged in the designing and planning of nuclear power plants, graduate students and undergraduates in the corresponding specialties.

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[Excerpts] Foreword

In the present book the authors, on the basis of practically only their own work, done in the Power Physics Institute, examine characteristic but still relatively little treated in the literature problems of the thermophysics of nuclear reactors, including the formulation, computer methods of solution and the analysis of results. The solution of some problems has been reduced to generalizing formulas and recommendations. Although all the problems were formulated during the planning of nuclear power plants, in their themes, formulation and methods of solution they naturally draw close to general problems of hydrodynamics and heat transfer and are solved with use of the achievements of computational mathematics and heat-exchange theory.

The book is intended for thermal physics engineers engaged in the designing and planning of nuclear power plants and also can be useful to graduate students and undergraduates of technical VUZ's of the corresponding specialties.

The authors express their appreciation to P. L. Kirillov, P. A. Ushakov and N. I. Vuleyev for useful advice and critical comments.

The authors express their special thanks to their associates who participated in the creation of programs and numerous computer computations, and especially to L. I. Vladimirova, A. D. Yefanov, S. V. Kanukhina, A. P. Kolmakov, S. A. Matyushina, S. I. Morozova, Yu. V. Muranov, T. V. Pykhtina, T. M. Romanova and V. M. Trevgoda.

The authors consider it their duty to express appreciation to Ya. V. Shevelev for much attention and interest in the editing of the book.

[355-2174]

2174
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PARALLELIZATION OF THE COMPUTATIONAL PROCESS IN DIFFERENTIAL MAPPING

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 3, 1980 pp 12, 20

[Article by Georgiy Yevgen'yevich Pukhov, academic secretary of the Department of Physico-Technical Problems of Power Engineering, Ukrainian SSR Academy of Sciences, manager of the Sector of Electronics and Modeling, IED [not identified], Ukrainian SSR Academy of Sciences, Kiev, and Voytenkov, Igor' Nikolayevich, senior scientific associate of the same sector]

[Excerpts] A possible approach to the construction of high-capacity modeling structures and systems oriented toward the investigation of objects and processes described by differential equations is based on the application of the mathematical apparatus of differential mapping on the basis of the Taylor formula [1].

The principal merit of the computer technology synthesized with the use of differential mapping is high precision of modeling, predetermined by the possibility of providing practically any required small error in the integration of differential equations [2-5].

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APPLICATION OF ONE CLASS OF LANGUAGES FOR DESCRIPTION AND TRANSFORMATION OF HYBRID COMPUTER SYSTEM BLOCK DIAGRAM

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 3, 1980 pp 20, 23-24

[Article by Nikolay Ivanovich Senchenko, candidate of technical sciences and lecturer, Khar'kov Institute of Municipal Construction Engineers, and Aleksey Pavlovich Tereshchenko, computer chief of the same institute, and Yuriy Nikolayevich Yakushev, chief engineer of the Gosbank computer center, Khar'kov]

[Excerpts] In the solution of problems with hybrid computer systems with automatic commutation, a need arises for the transformation of block diagrams, the switching off of one or more computer units and the introduction of several circuits and new compact computer units.

Block diagrams are transformed during the parallel solution of several problems with hybrid computer systems [1], in the presence of computer unit defects, in the process of dynamic scaling, etc.

Because the language of internal intrepretation introduced in [2] is not very suitable for such purposes, it is necessary to develop an intermediate language which would permit describing block diagrams and also constructing simple and effective algorithms for the transformation of computer circuits. In the present article it is proposed that a plex-language be used for those purposes [3,4].

In conclusion let us note that the proposed plex-language can also be used to describe block diagrams of analog-digital computers and digital integrating structures consisting of computer units of various types.

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[364-2174]

2174
CSO: 1863

UDC 53.072:51:681.3:621.394.74

OPTIMIZATION OF THE COMPOSITION OF HARDWARE AND OPERATING EXPENDITURES FOR COMMUNICATION CHANNELS IN ELECTRONIC COMPUTER NETWORKS

Kiev ELEKTRONNOYE MODELIROVANIYA in Russian No 3, 1980 pp 58, 62-63

[Article by Petr Akimovich Petrenko, candidate of technical sciences, deputy director, Nikolay Nikolayevich Kovalenko, senior engineer, and Ol'ga Fedorovna Timoshenko, engineer of the Kiev Computing and Data Processing Center of Glavukrneftegazstroy]

[Excerpts] At the present time there is no generally accepted method of planning optimum electronic computers of large dimensions which takes into consideration all network parameters. In [1-3], for example, it is proposed to construct an economic network on the basis of one or two parameters.

Most methods of planning the topology of communication networks are based on the heuristic approach, that is, the initial set of network nodes is broken down into subsets of smaller dimensions, after which subnetworks are constructed and optimized for each of the subsets, subnetworks of which are combined into a single network in a certain way. However, a method of optimum breakdown of the initial network into separate parts has not been worked out.

In [4] the initial information of the initial network is broken down into separate regions geographically and administratively. In that case the topology of each network region, as a rule, represents a radial-hierarchic structure. One can class among such networks a number of electronic computer networks of a branch character, oriented toward data processing in a ministry, department or large association, the organization of which is territorially separate.

Important stages in the planning of such computer networks are the determination of the throughput capacities of the communication channels, selection of the optimum composition of the data transmission equipment, the recording of minimum expenditures on the operation of communication channels and the disposition of equipment at network information points.

In [4,5] algorithms are proposed for optimization of the composition of data transmission equipment in a network and an algorithm is proposed for their optimum disposition at the points where data are gathered and determination of the throughput capacities of communication channels. These algorithms assume averaging of the cost of renting communication channels per unit of time and the times of data transmission from each data source. As a result of that the functional reflecting the cost of the data transmission equipment and rent of communication channels of a network region will have an approximate value.

In the present article a more precise method of solving this problem of practical importance is proposed.

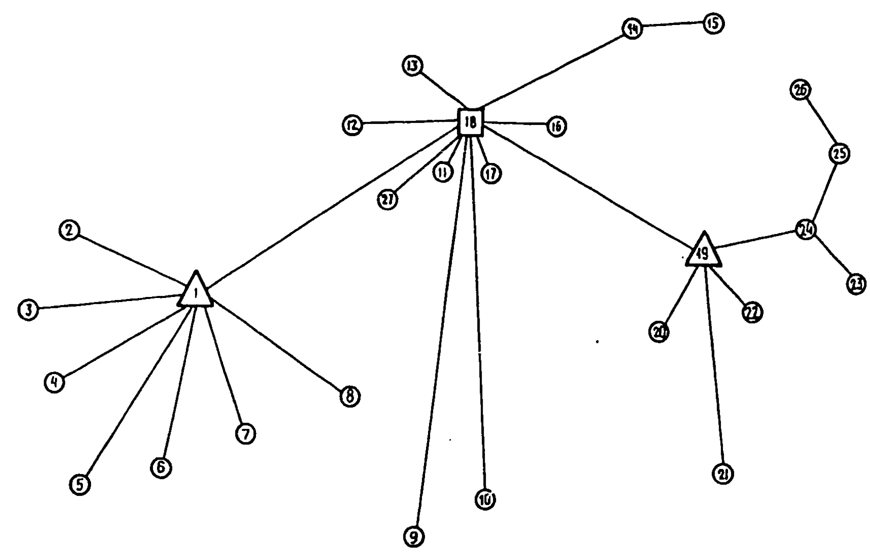

Fig 3. Block diagram of the branch network of data transmission for enterprises of the Ministry of Construction of Petroleum and Gas Industry Enterprises in the Ukrainian SSR.

In conclusion let us note that the described method of calculating centralized computer networks was used in the creation of a branch data transmission network for enterprises in the Ukrainian SSR. A block diagram of that network is presented by Fig 3 and the starting data for calculations are presented in Tables 3 and 4. The program for solution of the problem is written in the FORTRAN language. As is evident from Tables 5 and 6, in which the results of the calculation are presented, when high-speed equipment is used the cost of communication channel rent decreased considerably in comparison with the increase in the cost of equipment.

Table 4

A № п/п	B Наименование оборудования, шифр, страна-разработчик	C Скорости передачи данных (бит/с) 50	75	100	200	600	1200	2400	D Сметная стоимость (тыс. руб.)
1	Телеграфный аппарат пятиэлементного кода (ЕС-8592), ГДР	×	×	×					$a_1=a_2=a_3=0{,}7$
2	АП-2 (ЕС-8502), ВНР				×				$a_4=21$
3	АП-3 (ЕС-8503), НРБ, ВНР					×	×		$a_5=a_6=21$
4	АП-4 (ЕС-8504), СССР					×	×	×	$a_7=165$
5	МПД-3 (ЕС-8403), СССР								56
6	АП-4 (ЕС-8504), СССР								140
7	АП-64 (ЕС-8564), ВНР								100
8	МПД-1 (ЕС-8410), ВНР								102
9	ТТН-4800 (ЕС-8062), ВНР								1,2
10	ТЕТА-1210, ВНР								28
11	ТЕТА-1220, ВНР								28
12	ЕС-8002, ВНР								0,3
13	ТМХ-2400 (ЕС-8421); ВНР								52
14	БАРС, СССР								60

A -- No
B -- Item of equipment, serial number, country of origin
C -- Data transmission rate, bits/s
D -- Estimated cost, 1000 rubles
1 -- Five-unit teleprinter (YeS-8592), GDR
2 -- AP-2 (YeS-8502), Romania
3 -- AP-3 (YeS-8503), Bulgaria, Romania
4 -- AP-4 (YeS-8504), USSR
5 -- MPD-3 (YeS-8403), USSR
6 -- AP-4 (YeS-8504), USSR
7 -- AP-64 (YeS-8564), Romania
8 -- MPD-1 (YeS-8410), Romania
9 -- TTN-4800 (YeS-8062), Romania
10 -- TETA-1210, Romania
11 -- TETA-1220, Romania
12 -- YeS-8002, Romania
13 -- TMKh-2400 (YeS-8421), Romania
14 -- BARS, USSR

Table 5

A № п/п	B Информационный пункт	C Тип оборудования и шифр a I вариант	 b II вариант	D Стоимость (тыс. руб.) a I вариант	 b II вариант
1	6	АП-2 (ЕС-8502)	АП-3 (ЕС-8503)	21	21
2	7	АП-2 (ЕС-8502)	АП-3 (ЕС-8503)	21	21
3	3	АП-2 (ЕС-8502)	АП-3 (ЕС-8503)	21	21
4	8	АП-2 (ЕС-8502)	АП-3 (ЕС-8603)	21	21
5	5	АП-3 (ЕС-8503)	АП-3 (ЕС-8503)	21	21
6	4	АП-2 (ЕС-8502)	АП-3 (ЕС-8503)	21	21
7	2	ТА (ЕС-8592)	АП-3 (ЕС-8503)	0,7	21
8	1	ТМХ-2400 (ЕС-8421)	БАРС	52	60
9	21	АП-3 (ЕС-8503)	АП-3 (ЕС-8503)	21	21
10	24	АП-3 (ЕС-8503)	АП-3 (ЕС-8503)	21	21
11	25	АП-3 (ЕС-8503)	АП-3 (ЕС-8503)	21	21
12	26	ТА (ЕС-8592)	АП-3 (ЕС-8503)	0,7	21
13	23	ТА (ЕС-8592)	АП-3 (ЕС-8503)	0,7	21
14	22	ТА (ЕС-8592)	АП-3 (ЕС-8503)	0,7	21
15	20	ТА (ЕС-8592)	АП-3 (ЕС-8503)	0,7	21
16	19	ТМХ-2400 (ЕС-8421)	БАРС	52	60
17	14	АП-2 (ЕС-8502)	АП-3 (ЕС-8503)	21	21
18	17	АП-2 (ЕС-8502)	АП-3 (ЕС-8503)	21	21
19	11	АП-2 (ЕС-8502)	АП-3 (ЕС-8503)	21	21
20	9	АП-2 (ЕС-8502)	АП-3 (ЕС-8503)	21	21
21	12	АП-2 (ЕС-8502)	АП-3 (ЕС-8503)	21	21
22	13	АП-2 (ЕС-8502)	АП-3 (ЕС-8503)	21	21
23	15	ТА (ЕС-8592)	АП-3 (ЕС-8503)	0,7	21
24	16	АП-2 (ЕС-8502)	АП-3 (ЕС-8503)	21	21
25	10	АП-3 (ЕС-8503)	АП-3 (ЕС-8503)	21	21
26	13	ТА (ЕС-8592)	ТА (ЕС-8592)	0,7	0,7
27	18	ТМХ-2400 (ЕС-8421)	БАРС	52	60

Key to Table 5:

A -- No
B -- Information point
C -- Equipment type and model
D -- Cost, 1000 rubles
a -- variant I
b -- variant II
1 to 6 -- AP (YeS)
7 -- TA (YeS-8592) AP-3 (YeS-8503)
8 -- TMKh-2400 (YeS-8421) BARS
9 to 11 -- AP (YeS) AP (YeS)
12 to 15 -- TA (YeS) AP (YeS)
16 -- TMKh-2400 (YeS-8421) BARS
17 to 22 -- AP (YeS) AP (YeS)
23 -- TA (YeS) AP (YeS)
24 - 25 -- AP (YeS) AP (YeS)
26 -- TA (YeS) TA (YeS)
27 -- TMKh-2400 (YeS-8421) BARS

Table 6

A Общая стоимость оборудования (тыс. руб.)		B Стоимость аренды каналов связи (тыс. руб.)	
a I вариант	b II вариант	a I вариант	b II вариант
496,9	643,4	4403,7	1040,8

Key to Table 6:

A -- Total cost of equipment, 1000 rubles
B -- Communication channel rental, 1000 rubles

a -- variant I
b -- variant II

[364-2174]

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UDC 681.34

METHODS OF ANALOG-DIGITAL MODELING IN PROBLEMS OF THE PROTECTION OF VESSELS AGAINST CORROSION

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 3, 1980 pp 81, 82-83, 83, 87

[Article by Aleksandr Mikhaylovich Vishnevskiy, candidate of technical sciences, Leningrad, and Rostislav Aleksandrovich Pavlovskiy, doctor of technical sciences, professor, Leningrad]

[Excerpts] The great metal-intensiveness of shipbuilding and the constant destructive effect of an aggressive external environment (sea water) on vessels give rise to a need to develop effective methods of protecting structures against corrosive destruction. The control of corrosion of metals in shipbuilding is a complex and multifaceted problem that includes a complex of scientific, planning and technological tasks. One such task consists in determining the distribution of electric current on the surface of corroding structures. Its solution is especially important in estimating the intensity of contact corrosion, that is, corrosion connected with the galvanic interaction of different metals in electrical contact*, and also in the selection of the parameters of protective or cathodic protective defense against corrosion [1].

Since the indicated questions must be solved, as a rule, in the stage of planning of vessels, methods of calculation and modeling acquire special importance in their solution.

The underwater part of a modern vessel represents a multielectrode system. Its electrodes are various structural elements of the vessel, made of various metals and interacting galvanically. Serving as such galvanically active elements on Fig 1, for example, are the casing sheathing (1), the screw propellers (2), rudders (3), bottom-outboard fittings (4) and devices used to protect against corrosion (5).

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*Local destructions of metal as a result of contact corrosion are directly connected with the current density of the corrosion $\pi = \pi_e \cdot f$, where π is the depth of local destruction, π_e is the electrodynamic equivalent (constant for a given metal) and f is the anodic current density.

Therefore finding the distribution of the corrosion potential on the underwater part of a vessel is reduced in the general case to solution of the external boundary-value problem under nonlinear mixed boundary conditions with piecewise constant values of parameters on individual sections of the boundary surface.

Analytical solution of the task of finding the corrosion potential is possible only for very simple calculation models, based on substantial idealization of geometric and electrochemical characteristics of real corroding structures.

In estimating the possibilities of numerical methods oriented toward the application of digital electronic computers it should be taken into consideration that when the grid method is used, for example, the dimensions of the tasks under consideration amount to 10^4 to 10^5 nodes. The limited speed and volume of the immediate-access storage of modern digital computers practically exclude application of the grid method to solve problems in the protection of vessels against corrosion in the general situation.

The method of boundary integral equations, the use of which in solving the tasks under consideration is given in [2,3], has substantial advantages in this respect. That method permits reducing the equivalent dimensions of the task and can be effectively used to solve problems in a linear formulation (in particular for $\rho_{cr} \gg b_a$; b_k; ρ_π = constant). Even in that case, however, the expenditures of machine time are fairly considerable (over 10 hours for the BESM-6 digital computer at an order of magnitude of the approximating system of linear equations of $N \; 10^3$). As for nonlinear problems, the solution of which by the method of iterations leads in essence to a series of solutions of a number of linear problems, including use of the method of integral equations for problems of large dimensions, involve still greater difficulties.

On the basis of the above let us note that methods of electronic modeling with analog and analog-digital computers have special importance in tasks of finding the corrosion potential*.

In modeling the distribution of the corrosion potential it is important to correctly select the coefficients of similarity and scale.

At the present time, to protect vessels against corrosion the method of electrical grids is used, with reference to which the following have been developed: a procedure for calculation of step grid resistances in the

*The application of methods of physical modeling is limited by the need to make special models of vessels or separate outboard structures in each specific case.

approximation of curvilinear surfaces in different coordinate systems [2,5]; a procedure for the calculation of supplementary resistances in the assignment of boundary conditions (2) [2]; and a procedure for the experimental determination of the attenuation network parameters [6] approximating an unlimited region for an arbitrary structure of a modeled field [2].

Realization of the method of electrical grids on small universal grid analog computers (of the types of the EI-12, MSM-1 and USM-1), additionally equipped with attenuators, permits solving tasks in the protection of separate vessel equipment and structural elements against corrosion.

A specialized MARS analog computer (an analog model with an adjustable grid) has been developed for tasks in the protection of a vessel as a whole against corrosion.

The three-dimensional grid of the given analog computer is made in the form of a parallelepiped and divided into a number of zones (Figure 2). Zone of variable conductivity 1 has 8580 nodes and contains single-discharge magazines of conductivities with the ratio 1:2:2:5. In that zone the curvilinear surface of the vessel is approximated and boundary conditions of type (2) are set. The zones of constant conductivities (detailed 2 and rarefied 3) are interconnected by a transitional zone with the ratio 1:4. On the periphery of the rarefied zone is a second transitional zone that serves for the connection of a three-dimensional attenuator approximating the external region not replaced by a grid.

The total dimensions of the MARS analog computer grid are 84 x 40 x 44 (in spacings of the detailed grid) and the total number of nodes is 31,580.

The achievement of such universality (the possibility of realizing various algorithm for analog-digital modeling and the solution of tasks of various dimensions) is assured with the modular decentralized principle of construction of analog-digital computer complexes. Figure 5 presents a block diagram of such a complex. The data recording system, which includes universal current-voltage assignment channels and the data take-off system, the basis of which is formed by the node commutator, have a modern structure that provides the possibility of increasing the capacity of the analog-digital computer complex through the connection of additional modules.

For optimum organization of the entire computational process a three-processor structure of the complex is rational, one which includes two digital processors (besides the grid processor). In that case the first digital processor (the digital computer of the complex) is used mainly to perform standard operations of the iterative cycle. A specialized or a universal digital computer of average capacity (for example, one of the ASVT-M or SM EVM series) can be used as such a processor.

For preliminary preparation of the task for solution and subsequent processing of the obtained results it is effective to use a universal digital

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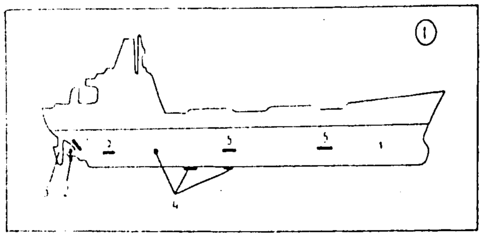

Figure 1.

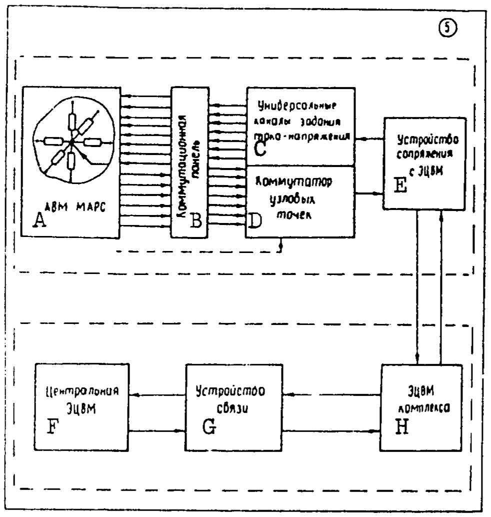

Figure 5.

A -- MARS analog computer
B -- Switchboard panel
C -- Universal current-voltage assignment channels
D -- Node commutator
E -- Digital computer coupling device
F -- Central digital computer
G -- Coupling
H -- Digital computer complex

computer with an equivalent capacity of the order of 100,000 operations per second.

Analysis of time expenditures shows that for a total number of about 3000 boundary nodes the time required for solution is about 20 minutes.

In conclusion, let us note that the application of methods of analog-digital modeling permits considerably expanding the class of boundary-value problems solvable in the area of the protection of vessels against corrosion.

The considered algorithms and the analog digital computer complex structure can also be used to solve problems analogous information of the theory of potential in various technical applications.

[364-2174]

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UDC 681.34.001.573

SYSTEM FOR CONCURRENT COMPUTER SIMULATION OF ANALOG-DIGITAL UNITS OF COMPUTING DEVICES

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 3, 1980 pp 88, 93

[Article by Vladimir Stepanovich Fomichev, candidate of technical sciences, lecturer, and Vera Vladimirovna Mazurek, senior engineer, Leningrad Electrical Engineering Institute]

[Excerpts] The modeling system examined in the present article is a component part of the system for automation of the planning of radio equipment. It presents the user the possibility of breaking an investigated circuit down into parts, checking the work of each part separately and systematiccally adding new parts to the checked part of the circuit. Each circuit part that can be described and modeled separately from the rest of the circuit is called a unit.

The present version of the modeling system permits the use of three types of units: elementary, Boolean and algorithmic.

The described modeling system has been realized with a BESM-6 electronic computer. The total volume of the programs is about 10,000 FORTRAN operators. The latest version of the system is now undergoing tests.

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[364-2174]

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ABSTRACTS FROM THE JOURNAL 'ELECTRONIC SIMULATION'

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 3, 1980 pp 109-112

UDC 530.17:621.721

SIMULATION THEORY AND ITS METHODS

[Abstract of article by Lebedev, Andrey Nikolayevich, doctor of technical sciences, professor of Leningrad Electrical Engineering Institute]

[Text] The author deals with the classification of models and methods developed within the simulation theory to solve the two basic problems of model choice and data transformation. The methods are general enough and serve as the basis of particular special methods in various fields of science and technology.

UDC 681.333

AUTOMATED SIMULATING SYSTEMS BASED ON ANALOG AND ANALOG-DIGITAL OPERATIONAL UNITS

[Abstract of article by Kolomiytsev, Yuriy Nikolayevich, senior scientific associate, Kuybyshevsk Polytechnic Institute]

[Text] The article presents estimates of the number of digital computer arithmetic operations performed in solving the Dirichlet simulation problem for the Poisson equation in a rectangular domain. The principles of realization of a net type of electronic simulator are analyzed from the point of view of the level of automation of the iterative processes.

UDC 681.332.6:621.9-52

APPLICATION OF INTEGRATING COMPUTING STRUCTURES TO REALIZE DYNAMIC MODELS OF AUTONOMOUS ROBOT MANIPULATION DEVICES

[Abstract of article by Guzik, Vyacheslav Filippovich, candidate of technical sciences, department head, Taganrog Radio Engineering Institute, and Piterskiy, Aleksandr Ivanovich, engineer, Taganrog Radio Engineering Institute]

[Text] The paper deals with construction of a model of the dynamics of motion of the manipulator of an autonomous robot on the basis of parallel DIS. Functional dependences and the solution of differential equations are reproduced by numerical integration of generating differential equations by DIS.

UDC 62.50

A METHOD OF SIMULATING ORIENTED NETWORK GRAPHS WITH RESTRICTIONS

[Abstract of article by Mesyats, Vladimir Vasil'yevich, design office chief, "Elektroizmeritel'" Production Association, Zhitomir]

The author examines methods of digital-analog simulation and computation of network-networks with absolute calendar limitations of the form "not earlier" and "not later."

UDC 681.888.677

DIGITAL SIMULATION IN THE STATISTICAL INVERSE ANTENNA PROBLEM

[Abstract of article by Zhukov, Vladislav Borisovich, candidate of technical sciences, senior scientific associate, Leningrad, and Ostrovskiy, Dmitriy Borisovich, candidate of technical sciences, senior scientific associate, Leningrad]

[Text] The paper deals with a solution of the general problem of antenna array synthesis in the presence of random errors of amplitude-phase distribution of excitation at the opening and variance of the environmental parameters. The effect of variance of the parameters is taken into account in an approximation of the method of smooth disturbances.

UDC 681.3.016.2

PROCEDURE FOR PROBLEM SOLUTION IN DATA PROCESSING SYSTEMS

[Abstract of article by Andon, Filipp Illarionovich, candidate of physical and mathematical sciences, section manager, Special Design Bureau for Mathematical Machines and Systems, and Polyachenko, Boris Yefimovich, engineer, both of the Institute of Cybernetics, Ukrainian SSR Academy of Sciences, Kiev]

[Text] Problems in the organization of problem solution in data processing systems are studied. The procedure assures a minimum number of exchanges between levels of the system memory. The functioning algorithm is presented.

UDC 621.365.5

DIGITAL MODEL OF ELECTRICAL HEATING PROCESSES IN AN INDUCTION HEATER

[Abstract of article by Makhmudov, Kakhraman Mansurovich, candidate of technical sciences, lecturer, Smirnov, Nikolay Nikolayevich, engineer, and Shein, Aleksandr Borisovich, graduate student, all of Leningrad Electrical Engineering Institute]

[Text] The paper deals with a digital model of a continuous forge billet-pushing induction heater. The model permits calculating the parameters and analyzing the operating conditions of the "inductor-charge" system with different control algorithms.

UDC 621.372.061:681.142

DECOMPOSITION AND DEPARALLELIZATION OF THE SOLUTION OF LINEAR EQUATIONS OF STATE OF MULTIDIMENSIONAL CIRCUITS AND SYSTEMS

[Abstract of article by Nagornyy, Leonid Yakovlevich, doctor of technical sciences, professor, Kiev Institute of Civil Aviation Engineers]

[Text] Algorithms are proposed for the decomposition and block deparallelization of the solution of linear equations of state by one and multiprocessor structures for multidimensional circuits and systems.

UDC 517.92

COLLOCATION METHOD FOR LINEAR PERIODICAL DELAY SYSTEMS

[Abstract of article by Ronto, Nikolay Iosifovich, candidate of technical sciences, senior scientific associate, Sector of Electronics and Simulation, Institute of Electrodynamics, Ukrainian SSR Academy of Sciences, Kiev]

[Text] A formalization is proposed for the composing of algebraic equations for the method of trigonometric collocation. Convergence of the method is demonstrated.

UDC 536.1.12:621.38.032

MATHEMATICAL SIMULATION OF ELECTRIC AND HEAT FIELD INTERACTIONS IN SYSTEMS OF THE METAL-SEMICONDUCTOR TYPE

[Abstract of article by Glushchenko, Andrey Arsen'yevich, doctor of physical and mathematical sciences, department head, Zhuk, Vladimir Leonidovich, graduate student, Strikha, Vitaliy Illarionovich, doctor of physical and mathematical sciences, professor, and Chayka, Georgiy Yevgen'yevich, candidate of physical and mathematical sciences, lecturer, all of Kiev State University]

[Text] The authors examine the mechanism of temperature distribution of the nonuniform crystal lattice in the system metal-semiconductor during passage of an electric current.

UDC 541.13:621.35+517.949

STUDY OF NONLINEAR ELECTROCHEMICAL CIRCUITS BY MEANS OF TAYLOR TRANSFORMS

[Abstract of article by Bondar', Igor' Lazarevich, candidate of technical sciences, lecturer, and Kostin, Nikolay Aleksandrovich, candidate of technical sciences, lecturer, both of Dnepropetrovsk Institute of Transport Engineers]

[Text] The method of Taylor transforms is applied for the first time to nonlinear electrochemical circuits and the results of the calculations are presented.

UDC 658.012.011.56-192

ALGORITHM FOR SOLUTION OF THE MULTIPARAMETRIC PROBLEM OF OPTIMIZING THE PARAMETERS AND STRATEGIES OF MAINTENANCE

[Abstract of article by Vovk, Larisa Ivanovna, senior engineer, and Shishonok, Nikolay Andreyevich, candidate of technical sciences, sector manager, both of the Institute of Automation, Kiev]

[Text] A FORTRAN-4 language algorithm is proposed for the digital computer, one which solves the one-criterion multiparametric optimization problem with two types of restrictions for maintenance systems in the case where an analytical form of the target function is unknown.

UDC 681.325.6.001.4

CORRECTNESS OF SYNTHESIS OF CONTROL-SUITABLE DEVICES USING ELEMENTS WITH A HIGHER DEGREE OF INTEGRATION

[Abstract of article by Romankevich, Aleksey Mikhaylovich, candidate of technical sciences, lecturer, Kiev Polytechnic Institute, Drozd, Aleksandr Valentinovich, senior engineer, Odessa Polytechnic Institute, and Valuyskiy, Vyacheslav Nikolayevich, candidate of technical sciences, assistant, Kiev Polytechnic Institute]

[Text] An approach is suggested to the synthesis of control automata protected against failure provided that their circuits have a higher degree of integration.

UDC 681.142

INVESTIGATION OF THE ACCURACY OF A DISCRETE-ANALOG NET PROCESSOR

[Abstract of article by Prokof'yev, Vladimir Yevgen'yevich, doctor of technical sciences, department head, Odessa Polytechnic Institute, and Azarov, Gennadiy Nikiforovich, candidate of technical sciences, assistant, Khar'kov Polytechnic Institute]

[Text] The node element of a discrete-analog net processor is investigated theoretically. The equivalence of solutions obtained with discrete-analog and "continuous" nets is demonstrated.

UDC 62-5:681.1-19

USE OF FREQUENCY CHARACTERISTIC TO FIND INOPERATIVE UNIT IN A CONTINUOUS OBJECT

[Abstract of article by Shamin, Valeriy Borisovich, senior scientific associate, Gorkiy branch, All-Union Scientific Research Institute for Normalization in Machine Building]

[Text] The author examines problems in the detection of an inoperative unit in a continuous object by the frequency method without requiring the introduction of additional reference points.

UDC 681.3

APPLICATION OF ROT'S ALGORITHM FOR CONTROL OF THE COMBINATION PART OF DISCRETE CIRCUITS CONTAINING MEMORY ELEMENTS

[Abstract of article by Pelekhov, Sergey Petrovich, graduate student, and Khadzhinov, Vladimir Vital'yevich, candidate of technical sciences, senior scientific associate, both of the Sector of Electronics and Simulation, Institute of Electrodynamics, Ukrainian SSR Academy of Sciences, Kiev]

[Text] A procedure is proposed for generating tests for discrete circuits with memory elements. Examples of tests generated by the proposed procedure are examined and it is shown that the procedure is an algorithm.

UDC 621.372.57

AMPLITUDE STABILIZATION OF CONTROLLED OBJECTS HAVING UNSTABLE STRUCTURES BY MEANS OF LOOP CORRECTING REGULATORS

[Abstract of article by Vakhnyuk, Boris Petrovich, assistant, Dnepropetrovsk State University]

[Text] A method is examined for obtaining transfer functions of an analog correcting loop which satisfies the requirements of stability of a closed control system.

UDC 681.332.6

APPLICATION OF PROJECTION METHODS TO SIMULATE STABILIZATION PROBLEMS

[Abstract of article by Filippenko, Tat'yana Kuz'minichna, graduate student, Sector of Electronics and Simulation, Institute of Electrodynamics, Ukrainian SSR Academy of Sciences, Kiev]

[Text] The use of projection methods in stabilization problems is examined. A circuit is described which simulates such a system of homogeneous linear differential equations, the solution of which is stabilized and projected on an arbitrary surface.

UDC 621.394.154

ERROR DETECTOR

[Abstract of article by Zhurakovskiy, Yuriy Pavlovich, candidate of technical sciences, lecturer, Gnatovskiy, Vitaliy Vasil'yevich, senior scientific associate, and Khomenko, Aleksey Igorevich, engineer, all of Kiev Polytechnic Institute]

[Text] The paper deals with the field of application, operating principle and a block diagram of a device for detecting errors, designed for laboratory tests of equipment which transmits discrete information with multipositional signals. Recommendations are given for calculating the parameters and subassemblies of the device.

[364-2174]

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PROCESSING OF PHYSICAL INFORMATION

Kiev VVEDENIYE V KIBERNETICHESKUYU TEKHNIKU, OBRABOTKA FISICHESKOY INFORMATSII (An Introduction to Cybernetic Technology. The Processing of Physical Information) in Russian 1979, pp 2, 251-252-253

[Annotation, references and table of contents from the book under the general editorship of corresponding member of the Ukrainian Academy of Sciences, B. N. Malinovskiy, by B. N. Malinovskiy, V. P. Boyun, L. G. Kozlov, V. P. Solov'yev, Ukrainian Academy of Sciences, Order of Lenin Institute of Cybernetics, Naukova Dumka, 2900 copies, 256 pages]

[Text] This monograph gives an analysis of the characteristics of physical signals, examines the features of algorithms for processing them and defines the requirements for the efficient processing of physical information in real time. Some principles for the effective organization of physical information processing are considered, including issues in the transformation, processing and restoration of physical signals in relation to system requirements. Methods for increasing the efficiency of physical information processing are proposed. Examples of the hardware implementation of devices for initial processing of information for high speed processes are given.

This book will be useful to engineering, technical and scientific workers concerned with questions of the design and use of the means of automation.

112 illustrations, 7 tables, References: pp. 245-251 (166 titles)

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UDC 51:681.3:007:519.1

METHOD OF PLANNING COMPUTER CIRCUIT AND PROGRAMMING EQUIPMENT

Kiev METODY PROYEKTIROVANIYA SKHEMNOGO I PROGRAMMNOGO OBORUDOVANIYA EVM in Russian 1979 pp 2, 84

[Annotation and table of contents of collection edited by A. A. Letichevskiy, doctor of physico-mathematical sciences, 500 copies]

[Text] Questions of elaboration of methods of computer planning and their mathematical support as well as optmization of programs and control computer complexes, organization of computations in multiprocessor systems are considered.

The collection is intended for specialists working in the field of creation of autoamted planning systems, as well as for students and graduate students of the corresponding specialities.

Chief editor--A. A. Letichevskiy, doctor of physico-mathematical sciences

Editor of this edition--A. B. Godlevskiy, candidate of physico-mathematical sciences.

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8617
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UDC 519.62.682.6+519.714.+519.8

QUESTIONS OF SIMULATION OF COMPLEX SYSTEMS

Kiev VOPROSY MODELIROVANIYA SLOZHNYKH SISTEM in Russian 1979 pp 2, 89

[Annotation and table of contents of collection edited by T. P. Mar'yanovich, candidate of physico-mathematical sciences, 500 copies]

[Text] Questions of elaboration of programming and analytical methods of study and planning of complex systems are discussed in the collection.

Particular attention has been given to problems of selecting a configuration of computer systems of some class in early stages of planning, optimization of parameters of complex systems during simulation, creation of modern applications packages and systems.

The collection is intended for scientific and technical engineering workers using modern computerized simulation hardware in their investigation of complex systems.

Chief editor--T. P. Mar'yanovich, candidate of physico-mathematical sciences

Editor of this edition--T. K. Kukhta, candidate of physico-mathematical sciences

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THEORY OF OPTIMUM SOLUTIONS

Kiev TEORIYA OPTIMAL'NYKH RESEHNIY in Russian 1979 pp 2, 105-106

[Annotation and table of contents of collection edited by V. S. Mikhalevich, academician, Ukrainian Academy of Sciences, 550 copies]

[Text] The collection entitled "Theory of Optimum Soltuions" deals with the investigation of a wide range of problems related to optimum decision-making.

Questions of optimum control, mathematical programming, theory of games, and so forth are considered.

The collection is intended for engineers and scientific coworkers engaged in elaboration of methods of optimization and their practical application in the national economy, and may also prove useful to students and graduate students at vuzes majoring in applied mathematics.

Chief editor--V. S. Mikhalevich, academician, Ukrainian Academy of Sciences
Editor of this edition--E. I. Nenakhov, candidate of physico-mathematical sciences.

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PLANNING AND CONTROL IN DIGITAL PRODUCTION SYSTEMS

Moscow METODY I MODELI PLANNIROVANIYA I UPRAVLENIYA V DISCRETNYKH PROIZVOD-STVENNYKH SISTEMAKH. SBORNIK TRUDY. Methods and Models for Planning and Control in Digital Production Systems. A Collection of Works) in Russian, vypusk 14, 1977, p 3

[Table of Contents from book edited by I. M. Makarov, Institut problem upravleniya, 500 copies, 80 pp]

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MULTICOMPUTER ASSOCIATIONS

Riga MNOGOMASHINNYYE ASSOTSIATSII (Institute of Electronics and Computer Technology) in Russian 1979 54 pp

YAKUBAYTIS, E. A.

[From REFERATIVNYY ZHURNAL. AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 1980 Abstract 4B75 by V. T. Mitroshina]

[Text] Currently a substantial pool of Unified System computers and minicomputers of various types is operated at various administrative levels and in large industrial associations and research centers in the nation. The information-computational tasks accomplished and the relatively high level of personnel training make acute the question of combining these computers into multicomputer associations assuring comprehensive information processing.

The study deals with problems of developing multicomputer associations of the Uzel type (single-node computational network) and of the Set' type (multinodal computational network). The structure of the basic logic element of the association--the System, is analyzed, and types of specialization of Systems and their combination into Uzel and Set' are considered. Methods for incorporating Unified System computers and International System small computers into associations are examined. Figures 15; references 7.

[361-1386]

UDC 681.325

RECONSTRUCTION OF UNIFORM FUNCTIONS OF TWO VARIABLES BY MEANS OF TIME-PULSE TECHNOLOGY

Ryazan' TEORIYA I METODY POSTROYENIYA IMPUL'SNYKH VYCHISLITEL'NYKH USTROYSTV. TRUDY RASSHIRENNOGO ZASEDANIYA NATSIONAL'NOY KOMMISSII SSSR MEZHUNARODNOY ASSOTSIATSII PO ANALOGOVYM VYCHISLENIYAM, RYAZAN' 1977 [Theory and Methods of Constructing Pulsed Computational Devices. Proceedings of the Expanded Session of the USSR National Commission under the International Association for Analog Computations, Ryazan' 1977] in Russian 1978 pp 198-202

BUCHENKOV, A. P.

[From REFERATIVNYY ZHURNAL. AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 1980 Abstract No 4 B447 by T. M. Kuznetsova]

[Text] The problem of reconstructing uniform functions of two arguments is considered. It is solved with the aid of a functional time-pulse converter utilizing frequency as the control parameter. A diagram of the converter is presented. By averaging the flow of periodic pulses of a special shape, the converter serves to extend the class of reproducible uniform functions to functions of any degree of uniformity.

A procedure for computing the tuning coefficient of the functional converter is presented. The procedure is used to construct its special circuit, which is part of the computational device on board flight vehicles. The procedure serves to develop 2 algorithms realizable by ALGOL programs: the program for verifying the uniformity of the tabulated function of two arguments, and the program for approximating the function of the auxiliary argument by means of a linear function and an exponential polynomial. Figures 9; references 202.

[361-1386]

UDC 681.51:519.86

MODELS FOR PREDICTING THE VALUE OF GOLD ON THE INTERNATIONAL MARKET

Moscow SBORNIK TRUDOV INSTITUTA PROBLEM UPRAVLENIYA (Collection of Works of the Control Problems Institute) in Russian No 18, 1978 pp 14-21

DIKUSAR, V. V., DRANEV, Ya. N., MARKOV, V. V. and SMOL'YAKOV, A. F.

[From REFERATIVNYY ZHURNAL. TEKHNICHESKAYA KIBERNETIKA in Russian No 4, Apr 80 Abstract No 4.81.528 from the Resume]

[Text] One of the most important tasks in the control of the economy of a nation is prediction of the price of gold on the international market. Performance of this task is rather complex, since it is influenced by ~50 political, economic and psychological factors (for example the course of the dollar, the course of events, inflation, etc.). A significant volume of statistical information is available concerning these factors. Various models are suggested for prediction of the price of gold over certain periods of time in advance (a week, a month, a quarter, a year, etc.). The numerical realization of specific problems based on these models is oriented toward the use of a universal modeling system. Predictions of the price of gold are presented and compared with actual prices. Figures 2; references 8.

[350-6508]

INSTRUMENT-MAKING ACHIEVERS IN SOCIALIST COMPETITION

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 5, 1980 pp 1, 2

[Article by N. A. Doncheyev, chief of the Administration of Labor Organization, Wages and Worker Cadres, Ministry of Instrument Making, Automation Equipment, and Control Systems (Minpribor)]

[Excerpts] Collectives of enterprises and organizations of the Minpribor, following the decisions of the 25th CPSU Congress and instructions of the General Secretary of the CPSU Central Committee, Chairman of the Presidium of the USSR Supreme Soviet, comrade L. I. Brezhnev, have expanded social competition. This permitted them to complete ahead of schedule, on 7 December 1979, the plan for 4 years of the Tenth Five-Year Plan for volume of production, and on 28 December 1979 the annual plan for sales of production.

In 4 years of the Five-Year Plan the output of instruments, means of automation and computers has increased by 60 percent, and of consumer goods by 40 percent. The proportion of articles bearing the state Mark of Quality has increased considerably and amounted to 32.7 percent in the total volume of commodity production. Nine hundred and twenty ASU's have been put in operation. More than 3000 types of new articles have been organized.

The 1979 plan for finished product sales was fulfilled by 101.5 percent with a growth of 9.9 percent over 1978, for gross commodity production by 100.8 percent, for profit from industrial activity by 100.1 percent, and profit increased by 12.6 percent over 1978.

Socialist obligations adopted by the ministry for 1979 were fulfilled: labor productivity increased by 8.2 percent as against a pledge of 7.9 percent; considerably more commodities were produced for cultural and standard of living purposes and everyday household use than were designated; sector obligations were fulfilled with respect to the development and introduction of automated enterprise management systems and main automated systems systems for the control of technological processes into industrial operation, increase of the production of control computer complexes of the International System of Small Computers type, and the delivery to users of numerical program control devices.

The Kiev "Elektronmash" Production Association is one of the largest in the branch. The association plans, develops and produces computer hardware, control computer complexes and peripherals, and also puts in operation and adjusts computer hardware of users. By 7 October 1979, the second anniversary of the USSR Constitution, the association had completed the Five-Year Plan for growth rates of labor productivity. It completed the task of 4 years of the Five-Year Plan for commodity production by 1 December, and for volume of startup and adjustment work by 5 December 1979. The percentage of articles bearing the state Mark of Quality in the total volume of commodity production was brought to 56.9 percent. In 1979 the SM-3, SM-4, M-4030-1 and M-6000 control computer complexes were awarded the state Mark of Quality.

In accomplishing a broad complex of work on the creation of new types of numerical program control devices and on the elevation of their technical level the collective of the Leningrad Electromechanical Plant Production Association in 1979 completed the development and started series production of six new machine tools and industrial robots: the 2MChZ, 2S85, and two modifications of the 2U32, the UTsM-30 and the UtsM-663. More than 55 percent of the numerical program control devices produced by the association have been awarded the state Mark of Quality. Thanks to the numerical program control devices produced by the association in 4 years of the Tenth Five-Year Plan more than 4500 machine-tool operators have been released in the national economy. The task of 4 years of the Five-Year Plan for output of product was fulfilled by 7 November, and for labor productivity by 6 June 1979. For steady assurance of the fulfilment and overfulfilment of plan tasks and assumed socialist obligations, high results in the All-Union socialist competition and successes in the education of working people the association bears the title of model enterprise of instrument-making.

The managing board of Minpribor and the Presidium of the Trade-Union Central Committee have summed up the results of the All-Union socialist competition of production collectives of the sector. Acclaimed as winners in the fourth quarter of 1979 and awarded the Challenge Red Banner of the Minpribor and the Trade-Union Central Committee were 17 collectives, in particular the Saranskiy Instrument-Making Plant, the Zhitomirskoye "Elektroizmeritel'" Production Association, the Kishinevskoye "Volna" Scientific Production Association, the Petrodvortsovyy Clock Plant, the Rizhskiy Jewelry Plant, the Zapsibspetsavtomatika" Production Association for the Installation and Adjustment of Automation Systems (Novosibirsk), etc.

Challenge Red Banners of Minpribor and the Trade-Union Central Committee for results in the All-Union socialist competition in the second half of 1979 were awarded to the Moscow organizations the State All-Union Central Scientific Research Institute of Complex Automation, the Institute of Problems of Control, the Scientific Research Institute of Heat Power Engineering Equipment, the Leningrad All-Union Scientific Research Institute of the Technology of Electric Machinery and Equipment Manufacture and the State Institute for the Planning of Instrument Plants, and also NIItekhnopribor (Smolensk).

[362-2174]

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PACKAGE OF APPLIED PROGRAMS 'POWER PLANNING'

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 5, 1980 pp 3,4

[Article by S. A. Andreyev, engineer]

[Excerpts] Programs of the package perform the following functions: calculation of calendar operating schedules, calculation and analysis of working center loads and determination of the working center time fund.

The package is delivered to the user in the form of distribution tape, the source programs from which are transferred to a magnetic disk. The file on a magnetic disk is called the master primary file and has a serial index organization. Each recording of the master primary file represents a card of an OR-language operator. The master primary file is modified to adjust programs of the package in accordance with the requirements of the user and is fulfilled in the process of generation by means of an operator routine. As a result of modification the necessary variant of the functional content of the package of applied programs and the latter is adjusted to the structure of the data base of a specific system.

The package is designed for use of the Unified System of Electronic Computers and works under the control of a disk operating system or operating system of the Unified System.

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ONE ASSOCIATION'S CONTACTS WITH THE USSR NATIONAL ECONOMIC ACHIEVEMENTS EXHIBITION

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 5, 1980 p 45

[Article by A. B. Chuplinskas, general director of the "Sigma" Computer Equipment Production Association]

[Excerpts] The Vil'nyus "Sigma" Computer Equipment Production Association has been in existence 14 years. It includes five enterprises and two planning and design organizations which are very young. The main enterprise of the association, the Vil'nyus Computer Plant imeni V. I. Lenin, marked its 20th anniversary on the eve of the 60th anniversary of the Great October Revolution. The enterprise, which has grown on an almost empty place, started its production biography with simple cash registers; in later years its articles became more complicated and acquired ever-greater fame; perforators, electronic analyzers, decoding machines and computer complexes have a reputation for precision not only in our country but also abroad.

Giving attention to the scientific and technological propagandizing of its achievements, the Vil'nyus Computer Plant imeni V. I. Lenin has since 1962 been a participant in the Exhibition of Achievements of the National Economy of the USSR. The EV80/ZM electronic punched-card calculator was the first unit displayed at the Exhibition, in 1962, and received a third-degree certificate; for its creation 15 workers and designers were awarded silver and bronze medals.

The PR-80/45 reproducer-perforator, the PS-80 counting perforator, the RPM80-2MS collator and the "Ruta" EVP80-2 electronic computer perforator have been awarded certificates and gold and silver medals of the Exhibition of Achievements of the National Economy of the USSR.

A result of the creative labor of designers, technologists and workers of the "Sigma" association is the "Ruta-110" complex of computer equipment, created for the first time in the USSR, which is intended for the processing of business and economic data and the creation of medium-sized ASU's and has been awarded a gold medal, a first-degree certificate, three silver and 17 bronze medals of the Exhibition of Achievements of the National Economy of the USSR.

A large thematic exhibit entitled "Experience of work of the 'Sigma' association on improvement of the organization of production" in the "Computer Equipment" pavilion in the Exhibition of Achievements of the National Economy of the USSR was organized in 1975 according to 10 main themes: "Renewal and improvement of the quality of production," "Technology, mechanization and automation," "ASU," "Social development of the collective," etc. Each theme was presented by means of diagrams, tables, illustrations, special prospectuses and also extensive methodical material. Also demonstrated were full-scale models of the M5000 punchcard computer complex, the new R-421 magnetic disk store, the computer planning of printed circuit plates, etc. A short motion-picture film and a one-hour radio transmission have been prepared.

The workers of the association maintain close contacts in the compilation of exposition plans and methodical material with the workers of the "Computer Equipment" pavilion, especially with the director, B. N. Koryshev, and engineer N. B. Mozhayeva, and methodical and organizational help is rendered by engineer A. B. Shirokova and the chief engineer of the pavilion, I. V. Litvinov, in the organization and carrying out of measures in scientific and technological propagandizing.

In 1979, in close collaboration with the workers of the "Computer Equipment" pavilion, the association took an active part in the thematic exhibit "Means of mechanization and automation of computer work," at which the "Elektromekhanika" Production Association (Penza) and the Vil'nyus Planning and Design Bureau ASU were exhibitors. The M5100 computer complex, the R414 magnetic disk store and the R810 data preparation system were demonstrated by the association.

At that exhibition the application of computer complexes of the M5000 type and ASU's in the nation economy on the basis of complexes of the M5000 type was shown. Specific examples of the collection, transmission and processing of data were presented, and of the influence of ASU's on the change of economic indicators and the functioning of ASU's by factors. Also given are the structure of the annual saving, the informational connections of the ASU developed by the Vil'nyus Planning and Design Bureau ASU and in effect at the Rezekne Canned Milk Combine.

By resolution of the Main Committee of the Exhibition of Achievements of the National Economy of the USSR, for achieved successes and participation in the exhibition in 1979 the "Sigma" Production Association was awarded a first-degree certificate, and the workers of the association that were participants in the exhibition were awarded 87 medals.

In 1980 new articles of the association will be demonstrated in the "Computer Equipment" pavilion.

[362-2174]

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ABSTRACTS FROM THE BOOK 'QUESTIONS IN CYBERNETICS. MODERN DOCUMENT SYSTEMS'

Moscow VOPROSY KIBERNETIKI. SOVREMENNYYE DOKUMENTAL'NYYE SISTEMY in Russian 1979 signed to press 3 Oct 79 pp 3, 23, 45, 55, 68, 82, 93, 109, 118, 127, 145

[Abstracts of papers in the book edited by V.N. Avtokratov and A.N. Sokova, Moscow, Sovetskoye Radio Publishers, 1,000 copies, 155 pages]

MODERN DOCUMENTATION SYSTEMS FROM THE PERSEPCTIVE OF DOCUMENT MANAGEMENT

[Abstract of paper by Sokova, A.N., pp 3-23]

[Text] The content of the concept of document management is given and the commencement of "practical" document management and the major stages in its development up to the present time are treated. Proposals are put forward for the definition of a document type and a systematic approach to document management. Some theoretical and practical proposals are formulated for the standardization of documentation systems.

MATRIX FORMALIZATION OF DOCUMENT DATA

[Abstract of paper by Vorob'yev, G.G., pp 23-45]

[Text] A new informational-structural approach to content analysis is treated from the viewpoint of thesaurus theory, where this approach includes the determination of the parameters of the language, document and text. A classification is given for auxiliary thesauruses of a document both with respect to the level of abbreviation and the level of formalization. The value of matrix formalization of the data contained in a document to the solution of data retrieval problems is demonstrated.

A STRUCTURAL APPROACH TO THE CREATION OF A SCIENTIFIC AND TECHNICAL INFORMATION NETWORK IN THE LITHUANIAN SSR

[Abstract of paper by Zuyus, Yu., pp 45-55]

[Text] The design and development of a scientific and technical information network in the Lithuanian SSR is treated, the significance of which for management was noted by the 25th Congress of the CPSU. The author proposes a number of approaches to setting up a republic information network and analyzes the information system of the Lithuanian SSR in accordance with these approaches.

DOCUMENT SYSTEMS AND CONTROL SYSTEMS

[Abstract of paper by M. Gaaze-Rapoport, pp 55-68]

[Text] General approaches to the design of a control system are treated. The large part played by document flows in control systems is shown. The conclusion is drawn that it is necessary to use experience with the development of document systems in the design of control systems. Some of the difficulties of a procedural and psychological nature are enumerated which are related to the utilization of document information in control systems.

TOWARDS A THEORY OF SEMANTIC INFORMATION

[Abstract of paper by Vorob'yev, G.V., pp 68-82]

[Text] The nature and properties of semantic information related to human intellectual activity as an information system are treated within the framework of general information theory. Particular attention is devoted to the informational processes of the perception of information by man, as well as the specific features of the functioning of large and superlarge information systems, a component of which is a human being.

ON CERTAIN ASPECTS OF THE DEVELOPMENT OF A STANDARDIZED DOCUMENTATION SYSTEM FOR THE MANAGEMENT OF ARCHIVE AFFAIRS

[Abstract of paper by Avtokratov, V.N., Tshenko, A.V. and Sokova, A.N., pp 82-93]

[Text] The major problems which arise in the development of a sectorwide documentation system for the management of archive affairs are formulated, as well as possible ways of resolving them. The specific functions of archive work and concepts of document chains which provide for their realization are treated. The problem is characterized as possibly a new approach to the study of archive work - in its relation to other information systems.

ON ONE CONCEPT OF INTEGRATED AUTOMATED SCIENTIFIC AND TECHNICAL INFORMATION SYSTEMS

[Abstract of paper by Artamonov, G.T., pp 93-109]

[Text] Questions of the design of an integrated automated scientific and technical information system are treated. The criteria for the selection of the most efficient type of topical dictionary are given, where this dictionary makes it possible to maximally utilize human dialog with a computer.

ON SOME PROBLEMS OF DOCUMENT MANAGEMENT IN REFINING THE ORGANIZATION OF HIGHER EDUCATION IN THE USSR

[Abstract of paper by Gusel'nikov, I.I., pp 109-117]

[Text] A classification is given for higher school document systems and the status of their major complexes. The deficiencies and some approaches to improving the educational documents are analyzed.

MAN AND TEXT IN AUTOMATED INFORMATION SYSTEMS

[Abstract of paper by Kuznetsov, O.A., Korenev, A.N. and Khromov, L.N., pp 118-127]

[Text] Questions of the perception and processing of textual information in modern automated retrieval systems are treated. The possibility of training subscriber-users in methods of accelerated perception of textual information without reducing the quality of its assimilation is demonstrated. The results of training a group of directors of the staff of the Presidium of the Supreme Soviet of the USSR are analyzed. The conclusion is drawn that it is necessary to broaden the development of work to study methods of accelerated perception of information by subscriber-users.

QUESTIONS IN TRADITIONAL ARCHIVE SEARCH

[Abstract of paper by Avtokratov, V,N., pp 127-145]

[Text] In heuristically sophisticated forms, traditional archive search is a scientific activity rich in content, in which the singling out of sources is linked to the acts of first recalling them. In this paper, the importance of the factor of the origin of documents and the flexibility of the archive search structure are underscored. This is fundamentally the personal search of a scholar, accompanied by psychological emotional experiences, in which case especially successful results take on an event coloration.

AN INFORMATION RETRIEVAL SYSTEM FOR ARCHIVE MATERIALS (DEVELOPMENTAL EXPERIENCE)

[Abstract of paper by Rozauskas, Yu.A., pp 145-154]

[Text] The characteristics of the "Orientir" system are given, which was developed during 1968-1974 by the staff of the Archive Administration of the Council of Ministers of the Lithuanian SSR and the Central State Archives of the Republic. The "Orientir" system is a system with an information search language of a classifier-descriptor type, which is oriented towards multiple aspect search in all modes, from manual to automated. The idea of the expediency of developing classificational-descriptor search systems for the materials of large archives is put forward.

[338-8225]
8225
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IMPROVEMENT OF PRICE FORMATION DURING FUNCTIONING OF AN AUTOMATED SECTOR CONTROL SYSTEM

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 5, 1980 p 41

[Article by Candidate of Economic Sciences K. A. Kirnarskaya and Engineer A. M. Polyanskaya]

[Excerpt] Sector price formation represents a complex system that embraces the entire set of prices corresponding to the list of articles produced by the enterprises, production associations and scientific production associations of the sector. With consideration of the sequence of development and introduction of products into production, wholesale prices are divided into the prices of test samples, of batches, of adjustable series, temporary and list prices. In addition, there are prices on single orders and also a system of surcharges and rebates established for improved quality of production, additional technical and operating characteristics of articles, and also for products for export. Participating in the process of the development, coordination and approval of wholesale prices are the workers of the economic services of enterprises, scientific research institutes, design offices, industrial associations and the Planning and Economic Administration of the Ministry of Instrument Making, Automation Equipment, and Control Systems (Minpribor). Wholesale prices are approved for the production of instrument-making on different levels. At the same time, regardless of the type of price or the level of its approval, the economic interests of producers and consumers of production and of the national economy as a whole must find reflection in it.

The entire complex system of price formation in the sector, connected with distinctive features of the formation of each type of prices, specific features of production, the adopted procedure of price formation and other factors, exerts a substantial influence of the selection of directions and ways to improve prices and price formation in instrument-making.

In the presence of a large list of produced articles, renewed under the conditions of scientific and technological progress at accelerated rates, expansion of the assortment, improvement of the quality of production and intensification of khozraschet methods of administration of the sector, elevation of the level of economic justification of wholesale prices and effectiveness of the solution of price questions requires improvement of price formation of the sector in the following directions: 1) further improvement of the methodology and procedure of price formation; 2) the development of models of the structure of prices of the sector which permit changing to the use of electronic computers in processes of price formation; 3) the creation of the subsystem "Prices" in the automated sector control system.

The improvement of sector price formation with consideration of the search for interconnected and interaction solutions appears to be very effective. In the All-Union Scientific Research and Planning Institute of Automated Sector Control Systems (Moscow) complex scientific research and planning work is being done complexly on the improvement of sector price formation. The price services of subsector institutes participate in that work.

In the present article, due to its small volume, only those directions of methodological developments are shown that are directly connected with the work being done on the automation of price calculations in the sector.

Distinctive features of the substantiation of prices for instruments, the specific features of work organization and the state of information about various types of prices are determining the justified directions and limits of automation of price formation processes, the need for task selection and the selection of the sequence of their solution. Only with such an approach is it possible to assume that expenditures on the solution of price problems in an automated regime will be economically justified.

[362-2174]

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CONFERENCES

UDC 621:391:519.725

NOISE-IMMUNE DATA ENCODING AND COMPRESSION

Moscow-Tashkent CHETVERTAYA VSESOYUZNAYA SHKOLA-SEMINAR PO VYCHISLITEL'NYM SETYAM [4th All-Union School-Seminar on Computer Networks] in Russian Part 4 Section 6 1979 131 pp

[From REFERATIVNYY ZHURNAL, TEKHNICHESKAYA KIBERNETIKA No 1, 1980 Abstract No 1.81.257 by T. M. Kuznetsova]

[Text] The authors of the articles in this collection discuss questions of the coding protection of complex numbers, the use of Lagrange codes to correct errors of the combined type, the encoding of documentary information in a star-shaped network, the realization of the (Rid-Solomon) code over a simple field, the detection and correction of errors with Lagrange codes, and the iterative decoding of spline functions for an abbreviated representation of information. They analyze the special features of the use of noise-immune encoding in the semiconducting memory of mini- and microcomputers and the correcting potentialities of several basic representations of nonpositional systems. They also propose algorithms for compressing experimental data in a unit of a local scientific information processing network, a data transmission method based on a change of phase in a pseudorandom sequence, multipath sequential decoding algorithms, and algorithms for optimum erasures and their realization on the basis of a (Viterbi) decoder. The authors also investigate several code products in computer networks, optimized threshold decoders of abbreviated codes, and codes for man-computer communication. They study methods for compressing data and conducting a single-trial data search, the limits of the achievable transmission rate in a single encoding model for a channel with multiple access, and the weight spectra of the class of cyclic codes. Figures.

[221-11746]

PROCEEDINGS OF CONFERENCE ON PROBLEMS IN THE AUTOMATION OF INFORMATION PROCESSES IN THE SOCIAL SCIENCES

Moscow VSESOYUZNOYE SOVESHCHANIYE PO PROBLEMAM AVTOMATIZATSII INFORMATSIONNYKH PROTSESSOV V OBLASTI OBSHCHESTVENNYKH NAUK. CHAST' I (ALL-UNION CONFERENCE ON PROBLEMS IN THE AUTOMATION OF INFORMATION PROCESSES IN THE AREA OF THE SOCIAL SCIENCES. PART I) in Russian 1979 pp 3, 5-9

[Introduction and table of contents from book containing reports presented at conference, Institute of Scientific Information on the Social Sciences (INION), USSR Academy of Sciences]

[Text] Materials of the All-Union Conference on Problems in the Automation of Information Processes in the Area of the Social Sciences are published in the present collection. The conference was prepared by the Institute of Information on the Social Sciences of the USSR Academy of Sciences and was held at that institute from 28 to 30 November 1977.

Participating in the conference were representatives of sector and republic centers of information on the social sciences and centers of information of institutes of the Social Sciences Section of the Presidium of the USSR Academy of Sciences and other organizations.

The texts of the reports and speeches have been published from manuscripts presented by the authors.

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[368/2174]

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BRIEF SURVEY OF THE 1979 INFORMATION AND MEASURING SYSTEM CONFERENCE

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 5, 1980 p 46

[Article]

[Excerpts] The IIS-79 conference was held in Leningrad in December 1979. Participating in its work were about 500 specialists representing more than 150 organizations from 35 cities. Eight sections functioned. The conference heard and discussed 96 reports.

The plenary sessions were devoted to discussion of the main directions of development of information-measuring systems (IIS) and computer and data processing complexes (IVK). On the opening day, besides the address of greeting of Doctor of Technical Sciences E. I. Tsvetkov, reports were presented on distinctive features of the development and synthesis of IIS.

In session No 7 on "Microprocessor technology in the IIS and IVK," eight reports were presented. The work of the section showed active interest in the application of microprocessors in electric measuring equipment. Work on the creation of measuring and computing equipment is being done on a broad front, but a number of factors hold back that direction. Among them, as was noted at the session, are the absence of coordination of work on the creation of microprocessors and electric measuring equipment and, consequently, of standard solutions in the planning of hardware and software and of guarantees of delivery of microprocessor devices on the part of manufacturers, and also an extreme shortage of diagnosis and testing equipment.

[362-2174]

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CSO: 1863

MOSCOW CONFERENCE ON INTER-LINK CONTROL SYSTEMS

Moscow IZVESTIYA AKADEMII NAUK SSSR. TEKHNICHESKAYA KIBERNETIKA in Russian No 2 1980 pp 204-205

[Article by A.V. Akhmetzyanov and M.V. Meyerov: "Multi-link Control Systems"]

[Text] The Fourth All-Union Conference on Multi-link Control Systems was held in Moscow during the period 25-27 December 1978. More than 250 specialists from 27 cities in the Soviet Union participated in it.

In opening the conference, Academician B.N. Petrov commented upon the great successes that have been achieved recently in developing the theory of multi-link control systems and he described the principal trends to be followed in future studies. In particular, he revealed that the results of structural and qualitative studies, obtained in recent years, have made it possible to realize considerable success in developing methods for optimizing the dynamic regimes of multi-link systems and he underscored the future prospects and the need for concentrating effort on these trends.

During the plenary meeting, reports were delivered by M.V. Meyerov "A New Stage in the Development of the Theory of Multi-link Systems" (a review of the development was furnished and results describing the principal trends and prospects in both the field of theory and in the sphere of applications were provided) and by I.V. Prangishvili "Microprocessor Control Computer Systems" (the effectiveness of their use for solving tasks concerned with controlling multi-link systems was revealed and the principal results, problems and prospects for development were provided).

Four sections carried out work during the conference and 104 reports were delivered on the following subjects.

Qualitative theory of multi-link systems. A review was undertaken of those problems concerned with stability involving the use of Lyapunov's functions, problems of control and observation, stabilization of unsteady dynamic systems and an equivalent change in an initially controlled system to a more simple type. Discussions were held on the methods proposed for the analysis and synthesis of multi-link control systems.

Simulation, identification and decomposition of multi-link systems. A large group of reports was dedicated to the study of the structural links of cynamic systems and to the possibility of their decomposition (Here extensive use is made of the methods for the theory of graphs). Questions concerned with the identification (using statistical methods) and construction of systems having a hierarchical structure of control were examined.

Optimization of multi-link systems. Methods were examined in a number of reports for optimum and quasi-optimum control over linear multi-link systems having an integral criterion for quality and also systems having common parameters. An examination was undertaken of a number of special linear and non-linear programming tasks, which arise during the optimization of multi-link systems. Theoretical problems were studied: optimum conditions, vectorial optimization, special optimal controls, hierarchical structure of optimization and so forth.

Application of the theory of multi-link systems. A majority of the reports were dedicated to problems concerned with optimum control over the planning and operation of oil deposits. An examination was undertaken of the tasks associated with the synthesis of optimum systems for controlling petro-chemical and petroleum refining processes, heat and power engineering projects, nuclear reactors, steel smelting units, cold rolling mills, heating stoves, electric drives for paper making machines, irrigation systems and the planning of transport operations.

Among the theoretical problems presented during the conference, the following are singled out as examples. In A.I. Astrovskiy's report, the task of observing unsteady linear systems, in special classes which permit operations involving the use of Chebyshev's system of functions, was examined. The report by F.M. Kirillova and V.M. Marchenko was dedicated to the problem of changing an initial linear system, with a delay, into a certain standard type, where the task under examination amounts to an algebraic problem of universality. In the report by by V.I. Utkin and A.S. Vostrikov, there is a discussion of the principles involved in establishing control over non-linear and unsteady objects, based upon the selection of a large coefficient of strengthening and the realization of a sliding regime on a certain multiformity. In the report by O.S. Yakovlev, for a certain class of non-linear objects, a solution was proposed for the task of finding a large number of feedback laws, which will ensure an asymptotic stability for an undisturbed status of an object (the second method of Lyapunov was used for solving the task).

The report by B.N. Petrov, S.F. Babak, B.G. I.Yu. Yusupov and B.G. Il'yasov was dedicated to the new interpretation of the classical concepts of the structural method, which is based upon the concept of independent parameters of a system, which appear as digital characteristics of a real system, regulated within certain limits or subjected to external parametric disturbances. A comparative analysis of the standard forms of Lyuyenberger, Budin, Zhordan and their modifications for equivalent representation of multi-dimensional linear systems were furnished in the report by Yu.A. Nurges. Methods were presented by Yu. I. for analyzing the interrelationships between autonomous contours, for the purpose of singling out relatively independent input-output pairs, for which purpose the matrices for coefficients of mutual effects were introduced, the elements of which are determined using the inverse system of the studied object of control and it revealed a high effectiveness for the method for planning multi-link systems. Integral models in the tasks for analyzing and synthesizing systems with a lag were examined in the report of M.S. Brikman, where an integral equation of Voltaire of the second type was proposed as the overall model for linear unsteady systems having a lag.

In the report by A.V. Akhmetzyanov and B.S. Vselyubskiy, the discrete tasks for optimization of multi-stage processes having an arbitrary structural link between the system's parameters and the partially-additive criterion of quality, were examined. The behavior of optimal trajectories in the vicinity of special control sectors was studied in the report by Ya.M. Bershchanskiy. In the report by V.V. Gorokhovik, the required conditions were proposed for optimizing the maximum type principle and special controls in the class of tasks examined were introduced and studied.

The following reports may serve as examples of the application of the theory of multi-link systems in various branches of the national economy. In the report by M.V. Meyerov, V.N. Kulibanov, M.L. Litvak and I.V. Fleyshman, a complex solution was proposed for a number of tasks associated with the optimal planning of an oil deposit, while taking into account the history of development. The task of optimum heating of an oil bed through the use of a system of boreholes, as point sources of heat, is examined in the report by A.A. Abbasov, S.I. Margovskiy and N.D. Musayev. In the report by A.V. Akhmetzyanov and R.T. Bulgakov, as an example of a task for optimizing repair services for boreholes at oil deposits, questions concerned with optimum control over interrelated mass servicing networks during the final interval of time. As an example of the firing process for sheet glass, sub-optimum control over a linear system having common parameters, using a small electronic computer, was presented in the report by V.V. Kafarov, I.N. Dorokhov and Ye.M. Izhvanova. In the report by O.Yu. Pershin, a mathematical model for an extreme task of joint planning of direct and return shipments of liquefied gas for the national economy. In the report by V.N. Buyakas and Yu.V. Chekulayev, a model was proposed for describing the movement of a school of fish at a macro-level, in the form of an equation for the movement of a two-dimensional extensive environment and an experimental confirmation of the adequacy of the model was presented.

The reports delivered during the conference were distinguished by a high theoretical level. They testify to a substantial expansion in the use of theoretical methods and multi-link systems for solving control tasks in various branches of industry and the national economy. The means for further developing this theory are outlined in the decision adopted during the conference.

[332-7026]

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NEW COLLECTION OF ARTICLES ON CONTROL OF MOVEMENT

Novosibirsk DINAMIKA UPRAVLYAYEMYKH SISTEM in Russian 1979 pp 2-6, 72, 153, 209-210

[Annotation, table of contents, foreword, and excerpts of articles of book "Dinamika Upravlyayemykh Sistem" (Dynamics of Controlled Systems) Novosibirsk, Izdatel'stvo Nauka Sibirskoye Otdeleniye, 1979, 1,450 copies]

[Excerpts] Annotation

This collection contains material from the Third All-Union Chetayev Conference on Analytic Mechanics, Stability and Control of Motion. It is the second in a series of three. The first volume from the conference was "Problemy Ustoychivosti Dvizheniya,Analiticheskoy Mekhaniki i Upravleniya Dvizheniyem" [Problems of Stability of Motion, Analytic Mechanics, and Control of Motion], published by Nauka Publishing House, Novosibirsk, in 1979. The third, "Teoriya Ustoychivosti i Yeye Prilozheniya" [Stability Theory and Its Applications] will be published in 1979. The books consider questions of the theory of optimal control and describes techniques of synthesizing equations, control under conditions of incomplete information, and control of manipulators and legged vehicles. Applied problems are solved using examples of industrial automated control systems.

The book will be of interest to a broad range of scientific workers as well as to specialists who work on problems of control and stability of motion.

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Foreword

The collection here offered to the reader contains reports presented at the "Control of Motion" section of the Third All-Union Conference on Analytic Mechanics, Stability Theory and Control of Motion dedicated to the 75th anniversary of the birth of Nikolay Gur'yevich Chetayev. The conference was held in June 1977 in Irkutsk.

The articles included in the present collection deal with various problems of control of moving objects, control theory, systems with incomplete information, and special problems of controlling different classes of mechanical systems. The bulk of the articles reflect the traditional subject matter of the Chetayev conferences: research on control theory. They consider questions of synthesizing optimal or close to optimal control of linear and nonlinear objects, the existence of optimal control in nonlinear systems with due regard for constraints and special conditions, investigation of functionals to the maximum, and construction of solution algorithms. Considerable attention is focused on problems related to the observability and controllability of systems, deriving controllability conditions, control under conditions of unknown disturbances, incomplete information on the coordinates of the object and the like.

There are interesting articles that investigate special problems of control of motion, optimal control of systems containing a liquid element, nonlinear systems including concentrated and distributed elements, and stochastic systems.

Compared to the previous conference in Kazan' in 1972, this one dealt more with research having a practical orientation and concerend with questions of synthesizing control systems for flying craft with compensation for outside influences and construction of algorithms for platform-less control of the maneuvering of space craft, digital modeling, and refining computing formalisms. New research topics were the issues of investigation of the dynamics and structure of control of self-contained robots, manipulator-robots, legged vehicles, and oscillatory systems.

Several articles are offered to provoke discussion. In general the articles in the collection give a picture of the current state of the field of the theory and practice of control of motion, the advances that have been achieved, and the main lines of investigation. We hope that the material in this book will have a stimulating effect on the further development of important research in the scientific field in our country.

Mathematical Modeling of the Motion of Complex Mechanical Systems by the Method of Controlling Reactions of the Couplings (V. V. Velichenko and I. I. Volkova)

Modeling the movement of complex mechanical systems by computer requires solving the problem of automatically compiling differential equations of movement and developing rational methods of integrating them. The use of Lagrangian equations for this purpose involves a number of technical and fundamental difficulties. The former are related to the need to carry out analytical computations on the computer and the complexity of the algorithms for calculating the formula for energy in a system of a random type; the latter are related to the unsolved character of these equations relative to the higher derivatives and the resultant necessity of multiple reference to higher-order matrices in the process of their numerical integration. Computation time in this case is proportional to the cube of the number of degrees of freedom of the system being described, which is a significant obstacle in the problem of modeling the dynamics of systems with several dozen degrees of freedom in real time.

This article presents a modeling technique worked out over several years at the Moscow Physics-Technical Institute. It consists of substituting an equivalent control problem for the initial mechanical problem. The method is based on control interpretation of the forces of the reactions of the mechanical couplings. The dependent mechanical system under study, a system with couplings, is considered as a set of independent, distinct, controlled solid bodies. The objective of control is, within the time interval under consideration, to return all the functionals describing mismatches in couplings in the initial system to zero simultaneously; the control forces act upon the bodies of the system at the point of application of the coupling reactions.

Digital Modeling of a Complex System of Motion Control (V. V. Kazakov, O. B. Kerber, and G. R. Sazykin)

This article is devoted to experimental and practical work on synthesizing a complex control system for the movement of an object having six degrees of freedom. The objective of control was to bring the object to a given point in space. Rigid constraints were imposed on both the nature and limits of changes in parameters of movement and their ultimate values.

Minicomputers in the Control Circuit of a Legged Vehicle (D. Ye. Okhotsimskiy, A. K. Platonov, Ye. I. Kugushev, and V. Ye. Pavlovskiy)

A research project was conducted in 1971-1977 at the Institute of Applied Mathematics of the Academy of Sciences USSR to devise an atuomatic control system for a legged vehicle. Control algorithms were formulated for a legged vehicle moving on a plane surface [1], a cylindrical surface [2], and over broken terrain [3]. In the latter two cases it was assumed that the device had a surveillance-information system that measured the characteristics of the terrain being crossed [4]. Mathematical modeling with visualization of a model of a legged vehicle moving on a model of the terrain projected on a display screen was used in working out the control algorithms. Modeling made it possible to formulate the design requirements for a dummy of the legged vehicle [5]. An automatic control system for a dummy legged vehicle is now being devised on the basis of the algorithms already written.

Structure of the System

During development of the control system for the dummy legged vehicle it proved advisable to include a minicomputer as well as the large (central) computer. The central computer, a BESM-6, working in a time-sharing mode on the basis of information received from the surveillance-information system, constructs a model of the terrain being crossed, lays out a route, shapes the programmed movement that the legged vehicle must make, and maintains a dialogue with the operator. The minicomputer works directly in real time to control the dummy, takes readings from the sensing devices of the vehicle and records them, performs primary processing of signals from the surveillance-information system, and exchanges data with the central computer. The minicomputer can also perform the functions of diagnosing the equipment of the dummy and dialogue with the operator.

An M-6000 computer was used for this intermediate stage in the control system. It has a very elaborate system for exchange with external devices, including devices for communication with objects, and makes it possible to connect the machine to such nontraditional external units as, for example, a legged vehicle.

The Self-Contained Control System

The first stage in development of the two-step control system was to devise a self-contained system to control the dummy from the M-6000. The input information for this system is the programmed movement of the vehicle, which is given in the form of a table of angles of the leg hinges. The servo system operated on the M-6000 was able to carry out programmed movement using the readings of the angle sensors mounted in the hinges of the vehicle's leg and the end sensors on the feet of the legs.

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PUBLICATIONS

AUTOMATION OF SCIENTIFIC RESEARCH BASED ON THE FIAN COMPUTER COMPLEX

Moscow SISTEMY AVTOMATIZATSII NAUCHNYKH ISSLEDOVANIY I IKH PROGRAMMNOYE OBESPECHENIYE. TRUDY FIZICHESKOGO INSTITUTA IMENI LEBEDEVA in Russian Vol 112, 1979 pp 3-7

[Article by A. V. Kutsenko and Yu. V. Stupin from the collection "Sistemy avtomatizatsii nauchnykh issledovaniy i ikh programmnoye obespecheniye. Trudy fizicheskogo instituta imeni Lebedeva," Izdatel'stvo Nauka, 1,800 copies, 106 pages]

[Text] The wide range of scientific research conducted at the Physics Institute in the field of quantum radiophysics , plasma physics and plasma accelerators, nuclear physics, solid-state physics and in the field of space research and theoretical physics places new requirements on the needs of automation and processing of scientific research data. Automation and intensification of scientific research based on the use of computer equipment acquire decisive significance. Automation of scientific research at the institute is based on four modern engineering advances: 1) the Unified Computer Series--for large scientific calculations, processing large information files and multiple use of a centralized memory (data banks, high-level languages, program libraries and so on); 2) Mir and Wang type computers--for scientific and engineering calculations in laboratories; 3) Middle-level computers (the Eclipse, PDP11/70 and M-4030 and mini- and microcomputers--for gathering and preliminary information processing, control of experiments (installations) and scientific calculations; and 4) the CAMAC system--for encipherment of data and for communications of experimental installations with minicomputers. Problems which require long calculation time are solved on the BESM-6 computer at other institutes.

1. The Structure of the FIAN Computer Network

The types of the institute's computers and the characteristics of problems solved on computers are presented in the table.

Automation of scientific research is based on the TRA/1 (Elektronika-100I), PDP-11, Nova-2 and M-6000 minicomputers. Scientific and engineering calculations are carried out on the Mir-1, Mir-2, WANG 2200C and Nairi computers.

Structure of Institute's Computers and Characteristics of Problems Solved On Computers

No. of Item	Computer	Characteristics of Problems Solved
1	YeS-1010, YeS-1040, Dnepr-2	Automation of information gathering, storage and processing from physical installations operating on the S-25R accelerator in the direct computer communications mode.
2	Elektronika-100 Elektronika-100I	Automated processing of film information on PUOS and SAMET installations obtained on the S-25R accelerator, the Serpukhov accelerator and so on.
3	M-6000	Automation of experimental information control and processing on the RT-22 radio telescope.
4	TPA/1	Automation of information gathering and preliminary processing on the stellarator. Modelling of plasma phenomena. Automation of information gathering from shower and semiconductor detectors based on nanosecond logic and CAMAC blocks on the synchrotron at 689 MeV. Automation of lidar investigations of the moon.
5	Nairi, PDP-11/05	Preliminary selection of events and statistical monitoring of the operation of the physical apparatus on the installation for investigation of extensive atmospheric showers.
6	Nairi-2	Automation of operations in the Nairi-2 system and the Fourier spectrometer in real time.
7	Nova-2	Automation of the operation of crystallization installations (apparatus) based on the CAMAC system.
8	PDP-11/04	Automation of experiments on the installation to investigate thermonuclear fusion.
9	PDP-11/05	Automation of various research installations.

10	MIR-1, Mir-2, WANG	Making scientific and engineering and technical calculations.
11	M-220, YeS-1020, Vidioton-1010BM, PDP11/70, Eclipse	Scientific data processing and problem-solving.

Experimental data and scientific calculations are processed on the M-220, YeS-1020, PDP11/70, Eclipse and also the Videoton 1010BM computers. The Dnepr-2 computer operates in experiments on the line with the accelerator and the YeS-1040 computer is used to process experimental data.

Minicomputers and small computers are organized into centralized systems, which enhances the efficiency of the computer equipment used [1, 2].

2. The Main Trends of Automation

Automation of scientific research at the institute is being developed in the following main directions:

--automation of data gathering, storage and processing and control of experiments on large physical installations (the S-25R computer and so on, the RT-22 and DKR-1000 radio telescopes, the Liven'-2 stellarator, laser installations, installations to investigate extensive atmospheric showers, lunar lidar, crystallization installations and so on);

--automation of individual experiments: low-frequency separation and separation of repeated frequencies from noise, spectrograph control, encipherment of individual pulses and slowly variable signals, measurement of fluorescence spectra, polarization of fluorescence, control of Fourier spectrometer operation and so on;

--automation of information processing in centralized use systems based on FORTRAN, Basic, FOKAL, Assembler and other programming languages; automation of expanded libraries and scientific programs; automation of conversion, emulation and other devices;

--creation and development of channels for information exchange among the institute's basic machines, laboratory installations (systems) and computers of other institutions with subsequent output to statewide automated systems;

--management of archives, data banks and computer software included in the automation and processing systems.

Automation of experiments is based on the CAMAC system. The structure of a typical system for automation of information gathering and processing experiments is given in Figure 1. The system includes a minicomputer and the CAMAC crate with standard modules--the crate controller, timer, multiplexor, analog-digital converter and so on [3].

The experimental software contains a set of programs which ensure solution of the postulated problem on the computer: various types of standard software (operating system, loaders, editor, translator, program libraries and so on) and also programs related specifically to the experimental data: data (gathering) input, storage, preliminary processing (normalization, sorting, various calculations and so on) and result output program packets and special transportable input-output programs (drivers) compatible with the machine's operating system (similar to the drivers of other input-output devices). Both standard and special operating systems for operation in the dialogue mode are used for real-time operation.

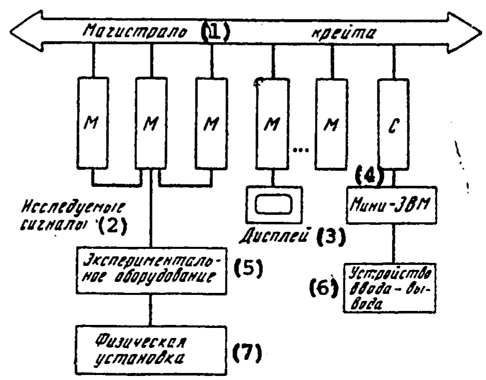

Figure 1. Structure of Typical System for Automation of Experiments on Data Gathering and Processing of Physical Investigations: M--multiplexor, timer, analog-digital converter and other modules; C--controller.

Key:

1. Crate main
2. Investigated signals
3. Display
4. Minicomputers
5. Experimental equipment
6. Input-output device
7. Physical installation

3. Typical Systems for Automation of Physical Experiments

The typical structure of an automation system based on the TRA/1 minicomputer in which the CAMAC standard is not used is presented in Figure 2. The first automation systems were constructed on this principle [1]. The TRA/1 minicomputer is connected by the interface flowsheet to the physical electronics of the experiment. The flowsheet is connected to the program-control channel of the TRA/1, providing independent two-way transmission of 12-digit words from the computer to the multiplexor and vice versa. The multiplexor changes the format and encoding of data in the buffer register of the commutator according to the standard used in the TRA/1.

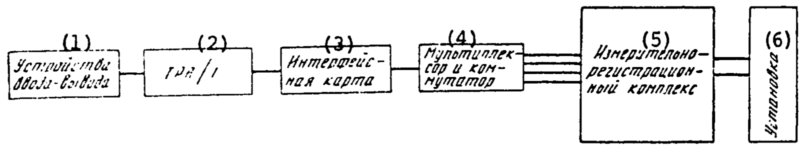

Figure 2. Typical System for Automation of Experiments Based On the TRA/1 Minicomputer

Key:

1. Input-output devices
2. TRA/1
3. Interface flow sheet
4. Multiplexor and commutator
5. Measuring-recording complex
6. Installation

The typical structure of the automation system based on the M-6000 minicomputer is presented in Figure 3 [4]. The interface card is connected to the standard 2K conjugation of the M-6000 computer and to the block for communications and conversion of signal levels from the recording device. The recording device contains an analog commutator, digital voltmeter and timer. The computer gathers, stores and carries out preliminary processing of information and controls the experiment.

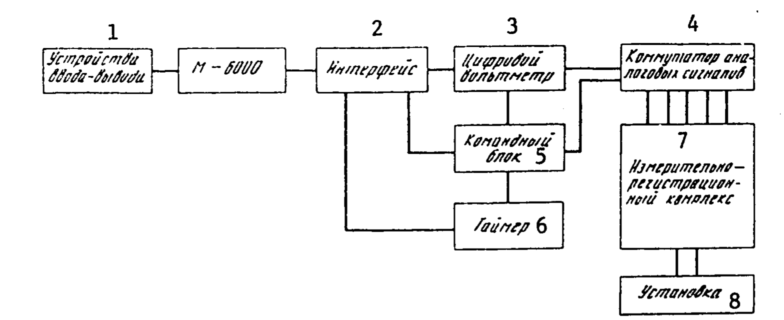

Figure 3. Typical Experiment Automation System Based on M-6000 Minicomputer

Key:

1. Input-output devices
2. Interface
3. Digital voltmeter
4. Analog signal commutator
5. Instructions block
6. Timer
7. Measuring-recording complex
8. Installation

The typical automation system used in different nuclear physics experiments, cosmic ray physics and other experiments at the institute is presented in Figure 4. The system includes a PDP-11/05 minicomputer, the CAMAC crate and input-output peripheral (teletype, display, puncher and so on).

The Nova-2 minicomputer with electronics in the CAMAC standard is used to automate crystal-growing experiments. The typical structure of the automation system is presented in Figure 2. The system includes the Nova-2 minicomputer, the crate controller and set of CAMAC modules.

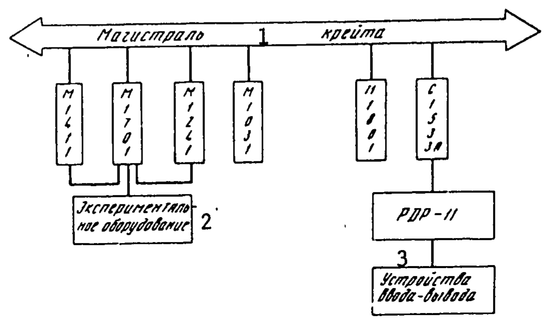

Figure 4. Typical Automation System Based on Equipment of the Borer Company: 1411--timer; 1701--multiplexor; 1241--analog-digital converter; 1031--input-output register; 1533A--PDP-11 controller; 1801--display interface

Key:
1. Crate main
2. Experimental equipment
3. Input-output devices

4. Centralization of Information Processing

Preliminary processing of stored data is usually carried out in automation systems. Final processing, modelling of processes and scientific calculations are usually carried out on central basic computers. The principles of information transmission between the laboratories' minicomputers and the central YeS EVM based on the CAMAC crate have been developed [5]. Remote computers are connected through modules 500 to the CAMAC system's crate main. The crate contains the module for communicating with the central YeS EVM. The exchange processor based on the TRA/1 minicomputer controls the operation of the main through the system's crate controller.

5. Prospects for Development of the FIAN Computer Network

A step by step increase of the central computation capacities based on the YeS EVM and complex automation by using the branched network of minicomputers of large research installations are planned according to the automation projects.

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MODEL OF A SYSTEM FOR COMPLEX AUTOMATION OF LARGE RESEARCH INSTALLATIONS BASED ON THE MINICOMPUTER NETWORK

Moscow SISTEMY AVTOMATIZATSII NAUCHNYKH ISSLEDOVANIY I IKH PROGRAMMNOYE OBESPECHENIYE. TRUDY FIZICHESKOGO INSTITUTA IMENI LEBEDEVA in Russian Vol 112, 1979 pp 8-12

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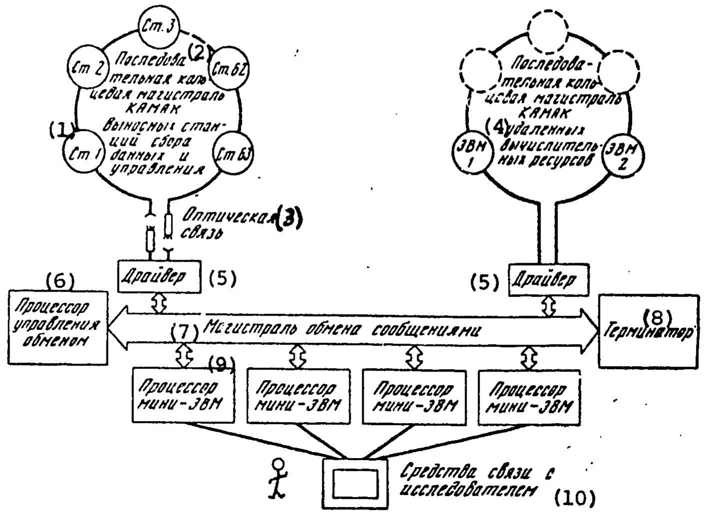
[Excerpts] The proposition that departure from the generally accepted model of Neyman background computer and conversion to a model of multiple-user computers leads to the possibility of solving most computer problems by using simpler hardware with relative simplicity of the software can now apparently be regarded as indisputable [1-3]. This proposition was taken as the basis in developing the model of the system for complex automation of large research installations, examples of which may be accelerators, radio telescopes, stellarators, laser installations and other unique research complexes.

Technical Realization of the Model

The systems modules of the Kinetic Systems Company [7], organized on the basis of a system crate, or the unified information exchange line (UMSO) and the corresponding systems blocks developed at the Institute of Automatics and Electrometry of the Siberian Department of the USSR Academy of Sciences [8] can now be used as the main hardware for realization of the model. Minicomputers of any models, including various types, can be used as processers. The actuating modules of the CAMAC standard are selected according to the problems.

Other versions, among which the use of microprocessers at portable stations is of greatest interest, may also be considered. Analysis of the possibility of using microcontrollers such as the MACAMAC of the Borer Company, the ICAM-10 of the Schlumberdge Company, the 3880 of the Kinetic Systems Company and the CAM 1.15-1 of the KFKI Institute (Hungary) for the considered



Model of Automation System

Key:

1. Step 1
2. Sequential CAMAC ring system of portable data gathering and control stations
3. Optical communications
4. Sequential CAMAC ring system of remote computer resources
5. Driver
6. Exchange control processer
7. Message exchange line
8. Terminator
9. Minicomputer processer
10. Means of communicating with investigator

CAMAC model showed that this solution provides a number of advantages determined by transfer of the computer resources to the immediate vicinity of the functional assemblies of the physical installation.

The considered model was the basis for developing the plan of the system for automation of the powerful Del'fin laser installation.

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A MULTIMACHINE SYSTEM FOR AUTOMATION OF THE POWERFUL DEL'FIN LASER INSTALLATION FOR INVESTIGATION OF THERMONUCLEAR FUSION (DRAFT)

Moscow SISTEMY AVTOMATIZATSII NAUCHNYKH ISSLEDOVANIY I IKH PROGRAMMNOYE OBESPECHENIYE. TRUDY FIZICHESKOGO INSTITUTA IMENI LEBEDEVA in Russian Vol 112, 1979 pp 13-48

[Article by N. G. Basov, O. N. Krokhin, A. V. Kutsenko, G. V. Sklizkov, L. K. Subbotin and S. I. Fedotov from the collection "Sistemy avtomatizatsii nauchnykh issledovaniy i ikh programmnoye obespecheniye. Trudy fizicheskogo instituta imeni Lebedeva," Izdatel'stvo Nauka, 1,800 copies, 106 pages]

[Excerpts] 3. Block Diagram of System in the CAMAC Standard

The diagram is designed to realize the main advantages of the CAMAC system, mainly, the possibility of rapid development of the system. The diagram is designed for use of the latest engineering achievements of the CAMAC standard to satisfy most fully the requirements of the Del'fin installation. This solution also has an opposite aspect: the system in the CAMAC standard is known to assume some redundancy iand consequently increased cost.

Portable stations and the sequential main line. A block diagram of the system in the CAMAC standard is shown in Figure 1. This diagram envisions an installation in each section and in the Del'fin chamber of portable stations consisting of several sequential crates (P1, P2 and so on). The direction and number of communcations lines connecting the stations to the physical apparatus are shown in the figure. Each crate contains a L-1 type controller designed for standard inclusion of it into the sequential main line. The latter is a cable containing nine twisted pairs of conductors with byte-by-byte transmission (traffic speed of 40 Mbits/s) and two twisted pairs with bit transmission (traffic speed of 5 Mbits/s). The sequential main line is connected to the branch main line of the system through a driver placed in one of the branch crates (crate V1).

Each station is structurally placed into a major shield for noise protection and emerges onto the main line through the optical transmission line.

The branch main line organizes data exchange between all constituent parts of the system (portable stations, processors, peripherals and so on). The main line is structurally made in the form of a standard CAMAC rack on which up to seven crates can be placed (structurally and logically). The main line is controlled from a specially allocated minicomputer which should have a branch driver matching the computer operation to the CAMAC branch main line. With this organization, each bay crate should have a type Al controller for inclusion into the branch main line. The main line developed in this manner and the equipment connected to its crates, including the portable stations, becomes independent of the type of computer. If necessary, the controlled computer, together with the branch driver, can be replaced by a different computer without any changes in the remaining apparatus.

Computer resources and minicomputers. The block diagram assumes that several minicomputers are used as the computer resources. Five minicomputers designed to complete the problems conditionally assigned to them are shown in Figure 1.

Besides the problems assigned to individual processors, the Del'fin may contain problems where the speed of one processor is inadequate to provide an answer within a limited time. In these cases the problem is broken up and solved by several processors simultaneously. Thus, for example, all five minicomputer processors can be switched at the beginning of the cycle to solve a problem to determine the suitability of the cycle for a light discharge (prediction of the total energy and dimensions of the light in the beam and comparison to criteria).

Display of data and communications with the operator. The system for automation of the research installation assumes that the investigator must be included in the experimental chain as an operating link. Success is determined by how successfully the given problem is solved.

The means of communicating with the operator provided in the considered system are designed to create two modes: at the stage of adjusting the assemblies and of the entire Del'fin installation (the computer is the operator's assistant) and at the operating stage (the operator is the computer's assistant). The means of data display shown in Figure 1 permit theoperator to receive the patterns enumerated in Table 2 which contain in processed form the information about functioning of all the system assemblies and permits operational interference of man in case of failures.

The block diagram considered above is one of the possible versions of realizing the overall scheme of organizing the system in the CAMAC standard (see the figure in the preceding article). A crate main line (instead of a branch main line) may be selected as a compromise for data exchange and other versions may also be considered. The feasibility of one or another selection is determined to a significant degree by the quantitative characteristics of the complex of problems being solved and can be justified after detailed development of individual subsystems.

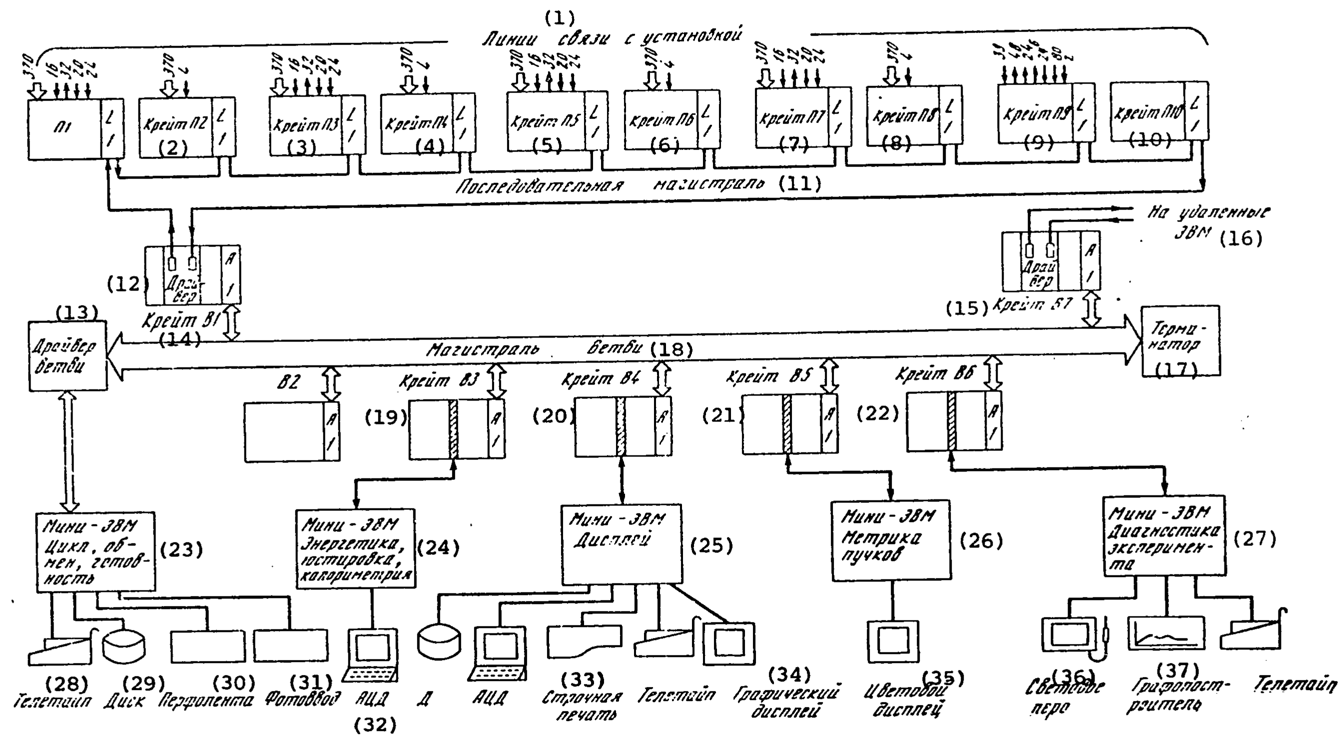

Figure 1. Block Diagram for Automation of Del'fin Installation in CAMAC Standard

[Key on following page]

[Key continued from preceding page]

1. Lines for communicating with installation
2. Crate P2
3. Crate P3
4. Crate P4
5. Crate P5
6. Crate P6
7. Crate P7
8. Crate P8
9. Crate P9
10. Crate P10
11. Sequential main line
12. Driver
13. Branch driver
14. Crate V1
15. Crate V7
16. To remote computers
17. Terminator
18. Branch main line
19. Crate V3
20. Crate V4
21. Crate V5
22. Crate V6
23. Minicomputers, cycle, traffic and readiness
24. Minicomputer, power, adjustment and calorimetry
25. Minicomputer, display
26. Minicomputer, bunch metrics
27. Minicomputer, experiment diagnosis
28. Teletype
29. Disc
30. Punch tape
31. Photo input
32. Alphanumeric display
33. Line printing
34. Graphical display
35. Color display
36. Light pen
37. Graph plotter

Selecting the type of minicomputer. Development of the subsystems shows that the considered monitoring and control problems can be solved by using minicomputers of any type. Different models of minicomputers may also be used in the system, but those of the same type are preferred. Despite this freedom, preference was given to the PDP-11-05 computer for the following reasons:

--the PDP-11 is used most widely in the CAMAC systems and there has been considerable progress here in language and software development;

--modules for communicating with the systems crate can be acquired for the PDP-11-05;

--production of the SM-3 minicomputer, program-compatible with the PDP-11-05, is planned by domestic industry;

--the Kinetic Systems Company has developed and supplies the CAMAC-complex with developed software based on the PDP-11-05;

--the Digital Equipment Company supplies the graphical display realized on the basis of the PDP-11-10;

--the PDP-11-05 has main line organization, which provides simpler communications with the CAMAC main line and consequently lower cost of interfaces;

--the family of PDP-11s provides a wide range of model and configuration selection in case of processor specialization or if it is necessary to increase their speed and capacities.

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COMPUTER RECORDING AND PROCESSING THE PHYSICAL INFORMATION OBTAINED AT THE TYAN'-SHAN' COMPLEX INSTALLATION FOR STUDY OF EXTENDED ATMOSPHERIC COSMIC RAY SHOWERS

Moscow SISTEMY AVTOMATIZATSII NAUCHNYKH ISSLEDOVANIY I IKH PROGRAMMNOYE OBESPECHENIYE. TRUDY FIZICHESKOGO INSTITUTA IMENI LEBEDEVA in Russian Vol 112, 1979 pp 49-51

[Article by V. S. Aseykin, V. K. Adamenko, O. G. Golovanov, A. P. Yeriskovskiy, Yu. G. Krutikov, M. F. Solov'yeva (Deceased), Yu. V. Stupin, B. V. Subbotin, Ye. I. Tukish and M. Ye. Shamaro from the collection "Sistemy avtomatizatsii nauchnykh issledovaniy i ikh programmnoye obespecheniye. Trudy fizicheskogo instituta imeni Lebedeva," Izdatel'stvo Nauka, 1,800 copies, 106 pages]

[Excerpt] Study of extended atmospheric cosmic ray showers (ShAL) is now impossible without simultaneous determination of the various characteristics of the shower. The Tyan'-Shan' complex installation for study of extended atmospheric showers [1] permits one to determine the number of charged particles in each shower, the energy of the nuclear-active and electron-photon components, the spatial distribution of muons, the energy of high-energy muons, the direction of arrival of the atmospheric shower and so on. Information about each extended atmospheric shower is obtained by means of a large number of various detectors located up to 200 meters from each other and which record one or another characteristics of a shower during its passage through the installation.

The system for gathering information about an extended atmospheric shower contains:

1) 1,000 channels for recording the pulse amplitude in IK-8 ionization chambers. The range of the recorded amplitudes is 100 μV-1 V;

2) 100 channels for recording the pulse amplitude from organic scintillation detectors 0.25-2.0 m^2 in area. The range of recorded pulse amplitudes corresponds to passage of 1 to 10,000 relativistic charged particles through the detector;

3) channels for recording data on the response of 1,500 gas-discharge counters of different area. Data on the operation of 1,000 counters are the number of triggered counters in each of 25 groups of 40 counters each. Information about the remaining 500 counters is individual: it is recorded, triggered or is not triggered for each of these counters;

4) channels for recording service information contain data about the date, number of the magnetic tape, the number and time of recording the event, the operating life of the installation, the type of control system including the recording system and so on.

Thus, information about an individual atmospheric shower contains data from 2,600 sensors. This information should be recorded in a form suitable for computer processing and for long-term storage in order to be able to return to analysis of the stored experimental data in the future.

The information about a single atmospheric shower contains approximately 10^4 bits. The installation records an average of 500 showers per day, i.e., $5 \cdot 10^6$ bits.

The large volume of information and the need to store it determined selectionof the method of information recording. The most suitable method of recording for our installation was recording the information on magnetic tape with subsequent input of it into computers directly from the magnetic tape.

The absence of available industrial devices to record digital information on magnetic tape and to enter the information from the magnetic tape into computers led to the necessity of developing these devices. They were developed by a group of associates at the Cosmic Ray Laboratory of FIAN [Physics Institute imeni P. N. Lebedev of the USSR Academy of Sciences] and have been operated since 1969 at the Tyan'-Shan' complex installation to study ShAL.

Block Diagram for REcording and Processing the Information Obtained at the Tyan'-Shan' Complex Installation to Study Extended Atmospheric Cosmic Ray Showers

When setting up a specific problem, not all cases of passage of cosmic radiation particles through showers must be recorded in cosmic rays, but only the cases which meet specific requirements. These requirements reduce to two main ones for our installation: the shower hadron energy recorded by the ionization chambers of the calorimeter exceeds a threshold value or the axis of a shower with more than 10^5 particles does not pass farther than 10 meters from the center of the installation. The first condition is found from the total impulse from the ionization chambers of specific rows of the calorimeter while the latter condition is found by the ratios of the numbers of particles passing through the scintillation detectors located at different distances from the center of the installation.

A check of the conditions is made by rapid analog circuits and the installation control pulse is shaped when one of the conditions is fulfilled (Figure 1). This pulse authorizes conversion of analog information from all the installation detectors to a code, storage of the codes in an intermediate memory and control of interrogation of this memory and recording of information on a narrow magnetic tape. After the memory has been interrogated and recording is completed, all the memroy cells are set to zero and the installation is unlocked.

The efficiency of each detector is determined when one reel of magnetic tape is recorded. To do this, information is entered from the magnetic tape by means of any of four tape recorders in a Nairi or Nairi-2 computer and sometimes into both simultaneously (Figure 2). The efficiency of each detector is determined by the integral or differential amplitude spectra of the detector on each reel of tape. The small internal storage of the Nairi and Nairi-2 does not permit one to find the spectra of all detectors during a single run of the magnetic tape. Therefore, information is entered from one tape recorder into both machines simultaneously and is processed by its own program in each machine.

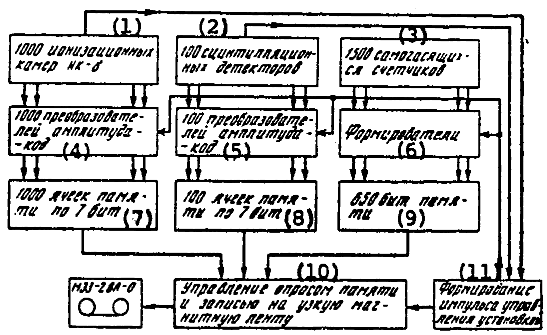

Figure 1. Block Diagram of Tyan'-Shan' Complex Installation for Study of Extended Atmospheric Cosmic Ray Showers

Key:

1. 1,000 NK-8 ionization chambers
2. 100 scintillation detectors
3. 1,500 self-quenching counters
4. 1,000 amplitude-code converters
5. 100 amplitude-code converters
6. shapers
7. 1,007-bit memory cells
8. 107-bit memory cells
9. 650 storage bits
10. control of memory interrogation and recording on narrow magnetic tape
11. shaping of installation control pulse

Nonoperable detectors or recording channels are repaired after the efficiency of the detectors is determined and preliminary and according to some programs final processing of the physical information is carried out on the Nairi and Nairi-2 computers. "Rubouts"--marks on the inefficiency of previously determined detectors--are entered in the program prior to the beginning of processing. Some processing programs are recorded in the permanent memory of the Nairi and Nairi-2 and the remaining programs are stored on narrow magnetic tape.

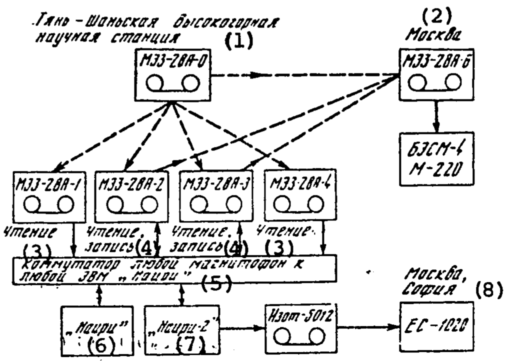

Figure 2. Block Diagram for Processing the Information Recorded on the MEZ-28A-0 Tape Recorder in the Tyan'-Shan' Complex Installation

Key:
1. Tyan'-Shan' high-altitude scientific station
2. Moscow
3. Read
4. Read and record
5. Switching of any tape recorder to any Nairi computer
6. Nairi
7. Nairi-2
8. Moscow and Sofiya

Almost all the magnetic tapes recorded on the installation at the Tyan'-Shan' high-altitude scientific station TShVNS and also the magnetic tapes recorded as a result of preliminary processing of physical information on the Nairi and Nairi-2 pass through final physical processing in Moscow on the BESM-4 or M-220 computer.* To do this, the MEZ-28A tape recorder compatible with the tape recorders at the TShVNS and a device for communicating with the BESM-4 and M-220 are used.

A device is being developed for output of information from the Nairi-2 to the IZOT-5012 magnetic tape store in YeS [Unified system] format for processing of this information at Moscow and Sofiya on machines of the YeS series.

---
*They are now processed on the PDP-11 computer.

Recording the Information on Narrow Magnetic Tape

Information about each atmospheric shower which meets previously determined conditions is recorded on magnetic tape in the developed device. The information is entered into the Nairi, Nairi-2, BESM-4 and M-220 computers from this tape by special input devices located alongside the machines.

The tape-feed mechanism of the MEZ-28A studio tape recorder, operating in the start-stop mode, is used both for recording and for playback of information. Information is recorded on magnetic tape of type 2 or 6 with diacetate base having a universal four-track magnetic head of type 62-MG-U4. This head is used during playback. The erase oscillator and the erase head of the MEZ-28A tape recorder are used to erase the recording.

[344-6521]

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CSO: 1863

COMMUNICATION OF COMPUTER BLOCKS BY MEANS OF OPTICAL FIBER LIGHT GUIDES HAVING LOW LOSSES

Moscow SISTEMY AVTOMATIZATSII NAUCHNYKH ISSLEDOVANIY I IKH PROGRAMMNOYE OBESPECHENIYE. TRUDY FIZICHESKOGO INSTITUTA IMENI LEBEDEVA in Russian Vol 112, 1979 pp 89-91

[Article by M. I. Belovolov, Ye. M. Dianov, V. I. Pelipenko, A. M. Prokhorov and I. N. Sisakyan from the collection "Sistemy avtomatizatsii nauchnykh issledovaniy i ikh programmnoye obespecheniye. Trudy fizicheskogo instituta imeni Lebedeva," Izdatel'stvo Nauka, 1,800 copies, 106 pages]

[Text] Low-loss fiber optic light guides (SVS) are a promising transmitting medium in optical communications systems [1].

There are now SVS in many countries with losses of only several decibels per kilometer in the near-infrared region of the spectrum. Optical fiber cables with low losses have also been developed and intensive investigations are being carried out on the use of SVS and of optical cables for information transmission (see, for example, [2]). Optical fiber communications systems have a number of advantages over ordinary wire systems, the main ones of which are nonsusceptibility to electronmagnetic interference, compactness and low weight, wide bandpass and so on.

The development of a system for optical fiber communications of computer blocks is reported in the given paper and the characteristics of the main components are presented.

SVS with step profile of the refractive index, developed by FIAN [Physics Institute imeni P. N. Lebedev of the USSR Academy of Sciences] and the Institute of Chemistry of the USSR Academy of Sciences were used as the transmitting medium [3,4]. The spectral losses in these light guides are presented in Figure 1 [5]. The fibers had a core diameter of 40 microns and numerical aperture of 0.16.

Domestic serially-produced light-emitting dioes (SID) of type AL107B were used as the light sources. The radiation wavelength of these SID was approximately 0.92 micron and does not correspond to the range of minimum losses of the SVS used. Sborka-1 or FD-10K photodiodes were the detectors of weak luminous fluxes.

The assemblies for joining the SID and photodetectors to the light guides were manufactured on the basis of standard coaxial metal connectors. The ends of the fibers, which are mirror chips, are located in the immediate vicinity of the SID and photodetector in the joining assembly. According to our estimates, the efficiency of admitting the luminous radiation into the optical fiber light guide was on the order of 0.1 percent, which corresponds to 8 μW of power introduced into the optical fiber line.

A simple device, easy to operate, in which a V-shaped groove was used as the component which establishes the fibers coaxially opposite to each other, was used to join the SVS to each other. The structure of the assembly for joining the fibers to each other is shown in Figure 2. A V-shaped groove 50-70 microns deep is applied to a rectangular plexiglas plate A measuring 2 X 10 X 50 mm. The middle part of the groove is covered with a small plate B measuring 2 X 5 X 8 mm, which is glued to plate A on one side of the groove. To place the ends of the fibers into this device, it is sufficient to slightly move the unglued end of plate B away from plate A, passing the edge of a razor blade between them. The ends of the joined fibers released from the polymer envelope are placed along the groove under plate B so that they are joined in the middle of plate B. The groove is drilled out to the diameter of the fiber with polymer coating at a distance of 2-3 mm from plate B. An immersion fluid is first poured under the plate. Plate B released from the stop presses the fibers in the groove.

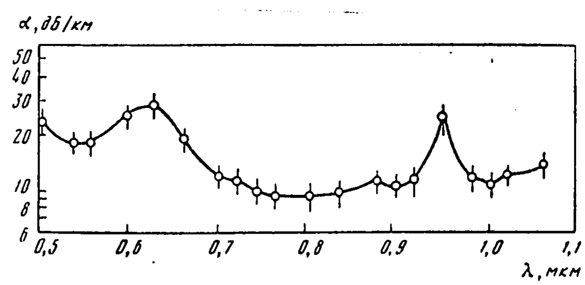

Figure 1. Spectral Losses in Light Guides

Moreover, the fibers are glued to plate A with a rapidly drying glue. The joint has good mechanical properties and is ready for use. If necessary the entire surface on which the joint is mounted can be filled with epoxide resin, which gives additional mechanical strength to the joined assembly and prevents drying of the immersion fluid. Glycerine was used as the fluid in the described design. Tests of the joining device showed that the losses during joining of the light guides are determined to a significant degree by the quality of preparation of the ends of the fibers and by the spread in the thickness of the fibers and do not exceed 0.5 dB in our case.

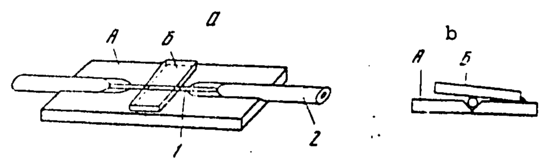

Figure 2. Assembly for Joining Fibers: 1--fiber without polymer coating; 2--fiber in polymer coating

Using the devices described above, we assembled a communications line based on low-loss optical fiber light guides consisting of four pieces with total length of approximately 350 meters, which was used to transmit information between computer displays and blocks. A block diagram of the developed optical fiber communications system is shown in Figure 3.

Information was transmitted between two displays of the Videoton-340 type (Hungary) or between the 1010B computer and the Videoton-340 display. The maximum transmission speed is equal to 1,000 symbols/s in the telegraph interface mode, which corresponds to 11,000 bits/s. The signal from the telegraph interface at the level of the TTL circuit modulates the current of the AL107B light-emitting diode through a preliminary amplifier. The SID can also be connected directly to the TTL circuit and its emissivity comprises 40 percent of nominal in this case.

The signal received from the photodiode is amplified by a serial amplifier of type 284UD1, assembled in a single integrated housing. The amplifier output is matched to the TTL circuit and enters the receiving part of the display interface N_2.

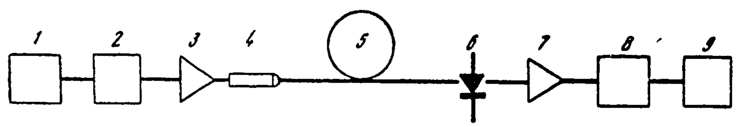

Figure 3. Block Diagram of Communications: 1--display memory No. 1 or computer memory; 2--telegraph interface; 3--amplifier; 4--AL107B light-emitting diode; 5--optical fiber; 6--Sborka-1 or FD-10K photodiode; 7--284UD1 amplifier; 8--telegraph interface; 9--display memory No. 2.

The assembled communications system is characterized by the presence of a threshold level of the optical signal required for reliable response of the recording system. Measurements of the increase of luminous flux output transmitted to the optical fiber line permit one to determine the losses of radiation over the entire length of the optical fiber line compared to the threshold value. Our measurements showed that the permissible attenuation in the optical fiber channel (without regard to losses for input of radiation into the light guide) is equal to approximately 19 dB. As already noted above, the output of the luminous radiant flux introduced into the optical fiber lightguide comprised 8 μW. Hence it follows that the recording device ensures reliable response of the communications system with optical signal output at the photodetector input of approximately 0.1 μW.

Thus, the use of serially produced SID (AL107B) and of photodetectors (FD-10K) and of developed low-loss optical fiber light guides permits transmission of information of the indicated type between computer blocks for a distance of approximately 1 km without using relays. The use of SID operating on a wave coincident with the minimum losses in optical fiber light guides (equal to or less than 10 dB/km at a wavelength of approximately 0.8 micron) permits this communications to be accomplished at a distance of approximately 2 km. A further increase of the length of the communications line can be achieved by using recently developed low-loss optical fiber light guides having numerical aperture of 0.33 [6] and also by using semiconductor lasers as the light sources.

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[344-6521]

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CSO: 1863

ABSTRACTS FROM THE JOURNAL 'SISTEMY AVTOMATIZATSII NAUCHNYKH ISSLEDOVANIY I IKH PROGRAMMNOYE OBESPECHENIYE'

Moscow SISTEMY AVTOMATIZATSII NAUCHNYKH ISSLEDOVANIY I IKH PROGRAMMNOYE OBESPECHENIYE. TRUDY FIZICHESKOGO INSTITUTA IMENI LEBEDEVA in Russian Vol 112, 1979 pp 104-106

UDC 681.142.2

A PROGRAM MONITORING SYSTEM FOR THE DNEPR-21 COMPUTER

[Abstract of article by Nafikov, A. A., Osoka, V. P., Slovokhotov, L. I., Shcherbunov, A. I. and Yurchenko, V. V.]

[Text] A general description of a machine-oriented programming monitoring system for the Dnepr-21 computer--the main functions, composition and organization of operation--is given. It is compared to the existing AKD programming system on the computer. Three figures.

UDC 681.142.2

SOFTWARE FOR EXPERIMENTS ON GAMMA-QUANTA SCATTERING

[Abstract of article by Baranov, P. S., Skorokhodov, A. P., Slovokhotov, L. I., Tatarinskaya, L. S., Shtarkov, L. N. and Yurchenko, V. V.]

[Text] A brief description of the program complex developed for modelling and on-line execution of experiments on elastic scattering of photons by protons is presented in the paper. One figure, one reference.

UDC 025.3

SPECIALIZED DIGITAL ELECTRONIC BLOCKS FOR NUCLEAR PHYSICS EXPERIMENTAL INSTALLATIONS

[Abstract of article by Volokitin, V. N., Yefimov, G. D., Yeliseyev, A. N., Zhuravlev, Ye. Ye., Kruglov, I. I., Saluyev, A. N. and Smirnov, P. A.]

[Text] Specialized electronic blocks for nuclear physics experimental installations having direct communications with a digital computer operating in real time are described. The described blocks have two-way program-control communications with a digital computer, carried out according to the requirements and recommendations of the European standard of CAMAC. Ten figures, two tables, 12 references.

UDC 681.322

THE MIR-1--M-220 APPARATUS TRANSLATOR AS AN EXPANSION OF THE MICROPROGRAM CONTROL OF THE MIR-1 COMPUTER

[Abstract of article by Pelipenko, V. I.]

[Text] An interpreting type translator has been developed for communication of small and large computers on the example of Mir and M-220 computers. The translator is realized by the structural-fixed method on the basis of microprogram control of a Mir-type computer. The developed communications system made it possible to debug the programs for BESM-4, M-220 and M-222 computers without utilizing their machine time, to control all the external devices of the M-220 computer from Mir computer language and to transmit information by cable from the Mir computer to the M-220. Eight references.

UDC 548.52.52

SYSTEM FOR AUTOMATION OF THE SAPFIR CRYSTALLIZATION INSTALLATION

[Abstract of article by Bagdasarov, Kh. S., Bardybakhin, A. I., Bulatov, Ye. D., Danileyko, Yu. K., Manenkov, A. A., Otlivanchik, Ye. A.,Sisakyan, I. N. and Prokhorov, A. M.]

[Text] The main requirements on system for automatic control of the operating modes of crystallization apparatus are considered. It is shown that systems constructed on the basis of digital equipment using mini- or microcomputers and also standard modules of the CAMAC type meet these requirements. The input data on the basis of which the configuration of the digital SAR [Automated control system] was compiled, the operating algorithm of this system and its software are described. The first results of the system operation are given in the paper. Three figures, three references. [344-6521]

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CSO: 1863

SUMMARIES OF SCIENTIFIC REPORTS OF THE ALL-UNION CONFERENCE ON COMPUTER SYSTEMS, NETWORKS AND TIME-SHARED CENTERS. CONFERENCE MATERIALS.

Novosibirsk TEZISY NAUCHNYKH SOOBSHCHENIY VSESOYUZNOY KONFERENTSII "VYCHISLITEL'NYYE SISTEMY, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA". MATERIALY KONFERENTSII. CHAST' 2 in Russian 1978 pp 3-7, 299 copies

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[351-8617]

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CSO: 1863

UDC 681.3.008

THE COMPUTER CENTER SYSTEM OF THE UKRAINIAN ACADEMY OF SCIENCES

Novosibirsk TEZISY NAUCHNYKH SOOBSHCHENIY VSESOYUZNOY KONFERENTSII "VYCHISLITEL'NYYE SISTEMY, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA". MATERIALY KONFERENTSII. CHAST' 2 in Russian 1978 pp 14-15

[Article by A. T. Bondarenko and A. A. Stogniy, Kiev]

[Text] The Institute of Cybernetics of the Ukrainian Academy of Sciences, in its plan of operations to establish a collective-use territorial computer center, has elaborated and put into operation the first phase of a computer center of the Ukrainian Academy of Sciences, uniting the computer centers of the Academy's Institute of Cybernetics, IPO, IM and IG. The BESM-6 is used as the central computer, and the MIR-2 is used as a terminal. The system also includes a MIR-2 situated at the Kiev oblast hospital, and the automated designer's work site of the MMS special design bureau of the Institute of Cybernetics. Combined operation of computers is effected by dedicated dual-lead lines of the urban telephone network interfaced across specially designed computer-computer hookups. In 1978 the system will include the computer centers of the Academy's IM, ITF and IED, which should be connected via switched channels across the industrially produced device APD-MA-TF.

The computer center system of the Ukrainian Academy of Sciences enables the user to work with three high level languages. But is it chiefly oriented toward use of the ANALITIK language subset as input language. This permits the application of hybrid analytical-digital methods of solution and enables the MIR-2 computer to be used for debugging problem-solving algorithms.

Experience gained in operating the first phase of the system has shown it to be highly effective and insensitive to noise. Methods of data protection used in the system have virtually eliminated the influence of noise in the data hookups. The efficiency of machine time utilization of the BESM-6 has risen significantly, because of preliminary debugging of jobs on the MIR-2 as well as the on-line user examination of printouts and job solution results, and the possibility of rapid insertions and deletions with the aid of the MIR-2 CRT display and light pen. Card punching is not necessary.

Operating modes of the system and output submodes are controlled by the user from the MIR-2 computer console. During system operation, the principles of user-system interaction are continuously improved. In the final version, the user is able to monitor the solution of his jobs at the processing center and, after the data has been transmitted to the central processor, use the MIR-2 intelligent terminal to solve or prepare other jobs.

The second phase of the system provides for the use of large models of the YeS computers in addition to the BESM-6, while the user will have computers of the SM series, user terminals and smaller models of the YeS computer series.

[351-8617]

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CSO: 1863

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ON THE ARCHITECTURE OF THE TIME-SHARED COMPUTING SYSTEM OF THE IRKUTSK SCIENCE CENTER

Novosibirsk TEZISY NAUCHNYKH SOOBSHCHENIY VSESOYUZNOY KONFERENTSII "VYCHISLITEL'NYYE SISTEMY, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA". MATERIALY KONFERENTSII. CHAST' 2 in Russian 1978 pp 20-23

[Article by A. A. Anistratenko, A. I. Yegorov, V. M. Matrosov, V. V. Mochalin and A. F. Ogloblin, Irkutsk]

[Text] Irkutsk currently has eight institutes of the Siberian Section of the USSR Academy of Sciences in operation (IGSiDV, IGKh, IZK, IOKh, Lin, SibIZMIR, SIFIBR, SEI), a division of regional economics (ORE) IE and OPP. The Irkutsk computer center of the Siberian Section of the USSR Academy of Sciences (IrVTs) has been established and is now functioning as the division of systems and cybernetic theory of the SEI of the Siberian Section of the USSR Academy of Sciences. They are keenly interested and require broader and more efficient utilization of mathematical and cybernetic methods (MKM) and computer hardware (VT) in their research efforts. For that reason, back in 1975, G. I. Marchuk published the first outline of the architecture of the computer system for collective-use for the Irkutsk Science Center (VSKP INTs), constructed on the basis of the YeS computers and the modular system of computer hardware (ASVT).

This report presents results obtained in recent years at the Irkutsk computer center on organization of VSKP INTs.

1. Analysis, trends, resources: choice of VSKP structure. The results of analysis of monitoring data of the institute of INTs now and for the next 2-3 years are cited, and they reveal the following trends at INTs: strengthening of problems solved using MKM and VT; a shift from solving mainly statistical problems (over 3500) to problems of optimization and prediction (by 1980 these will comprise more than 40 percent of the statistical problems); a growth in annual demand by INTs institutes of computer time (by 1980 it will comprise of 15,000 hours on a computer with a productivity of 500,000 operations per second and storage and transmission capacity of more than 700,000,000 symbols); concentration of VT hardware by increasing the computing capacities of existing institute computer centers (SEI—two BESM-6; SibIZMIR—M-4030 and others;

IrVTs--M-4030); the beginning of work to install terminals at the institutes; attempts made at improving the technology used to tackle scientific research jobs based on the use of applied programming packages.

The IrVTs organization must insure a unified methodological and technological approach to the solution of scientific-research problems for all INTs institutes using MKM and VT which afford the following possibilities: automation of data base formation in the subject field (PO), mathematical simulation of the problem (from the given class), the search for optimum and other solutions using numerical methods, analysis of properties of models and solutions; inclusion of the user in interaction across the user interface in a near-natural language in a given PO in the iterative process of solving his problems; maintenance of continuity of forms of VT used at INTs; improvement of organization of scientific work at INTS; efficient organization of information flow structures and their on-line reflection in problem-oriented data bases; development of elaborated information support and programming software of existing VTs.

Results of analysis are presented for different versions of selection of VSKP INTs structure and staging of its formation which were carried out on the basis of the circumstances present at INTs. Selection of a hierarchical structure for VSKP consists of a central highly productive computer complex (in first stage of central computer) and a terminal network which includes the terminal computer of institutes and remote data processing systems; the latter includes, in particular, user stations and other developed terminal complexes of the subdivisions. The advisability of forming the first phase of VSKP INTs in two stages was determined: first stage--1980; second stage--1982-1983.

2. Technical Proposals (TP). TP are cited which are required for elaboration of TZ for planning the first phase of VSKP INTs, involving the solution of the following problems at each stage: definition of the structure of VSKP INTs and technology for problem solving, choice of hardware for the central computer complex and terminal network, calculation of efficiency. These insure: possibility of working with any computer in the VSKP system from terminals at institutes; possibility of differentiated access to computer resources (tackling large jobs on the central computer, others on the M-4030); enhancing the reliability of access to systems resources; balancing out the load on individual computers.

The first stage is based on the use of the YeS-1050 or BESM-6 as a central computer. Comparative analysis was performed on the productivity, capacity of main and peripheral storages, possibilities of remote access, operating reliability, expenditures, program and hardware compatibility with computers now used and planned for the future at INTs institutes. Despite low operating reliability of the YeS-1050, preference was shown for configurations of the basic VTs VSKPS with the YeS-1050 computer with the OS-6.0 operating system and MPD-2 data transmission multiplexer (YeS-8402) provided that its reliability is insured at the highest possible level by reservation of several blocks, etetc.

The structure of VSKP in the first stage is illustrated in the figure.

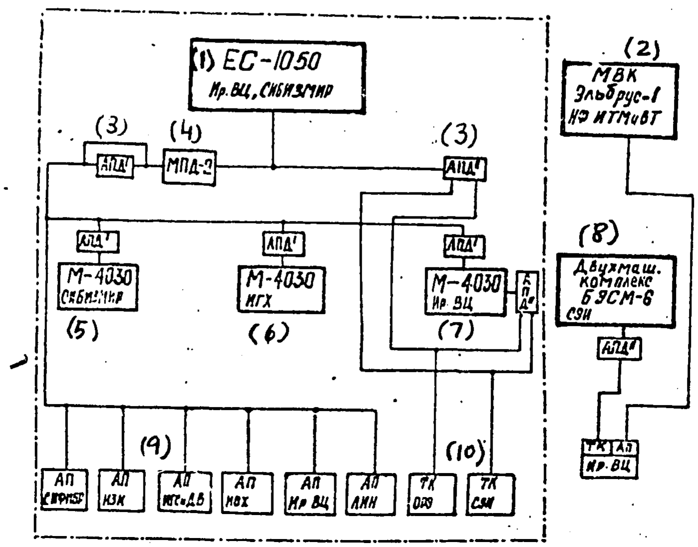

Figure 1. Structure of VSKP INTs.

Key:
1. YeS-1050, Ir. VTs, Sibizmir
2. MVK El'brus-1, NF ITMiVT
3. APD'
4. MPD-2
5. M-4030, Sibizmir
6. M-4030 (IGKh)
7. M-4030 (Ir. VTs)
8. Two-computer complex BESM-6 at SEI
9. AP of various institutes
10. TK

Designations: APD—data transmission equipment appearing in nomenclature of YeS computer remote processing hardware; APD" is the serial APD 'Akkord-1200'; AP are YeS computer user stations; TK is the terminal complex developed at IrVTs.

Three levels are specified in the system: I—central YeS-1050 computer; II—M-4030 computer of individual institutes with APD; III—AP of institutes and TK developed for IrVT, SEI and ORE. Based on the location of most INTs institutes at a distance of no more than two kilometers from the central computer and from the ATS of Akademgorodok, in the first stage three kinds of communications hookups are used: direct connections with cross commutation (basic form of communications), switched telephone and telegraph channels of general networks (reserve communications), and a dedicated communications line to remote users outside of Akademgorodok. The operation of all AP in group of single-station connections hooked up to the MPD-2 data transmission multiplexer is controlled by the remote processing subsystem of the central computer's YeS operating system. This subsystem realizes the basic and primary remote communication methods of access. The MPD-2 insures operation of all kinds of AP in a range of speeds from 50 to 4800 bits per second.

An APD will be connected to each multiplex channel (MK) of each M-4030 which fully satisfies the requirements of YeS computer interface. A complex of DOS (disc operating system) service programs is used to insure the APD for servicing standard MK devices. The required adapation is provided by interface modules without altering the standard control devices and DOS program. This possibility permits the computers of individaul institutes to carry out work for other users in the remote package processing mode in addition to their own. Establishment of connections is left to computer and AP operators.

The TK was developed on the basis of the APD 'Akkord-1200' with a modern set of peripherals: 'Videoton-340', medium speed dot-matrix printer (VT-342, DZM--180), high speed line printer (VT-343) and FS-1501.

The VSKP is supplemented by a two computer complex BESM-6 of SEI with TK at IrVTs; and AP from MVK "El'brus-1" of NF ITM and VT at IrVTs.

In the second stage the VSKP INTs should be constructed on the basis of a dual processor computer comlex 'El'brus-1' (prodcutivity 3,000,000 opeations per second, main memory capacity 1158 kbytes), located at IrVTs, with subsequent addition of a special BESM-6 processor (productivity 3,000,000 operations per second). A terminal network is planned which will include 10 terminal computers at INTs institutes and over 100 AP set up in their departments, laboratories and at the VSF Presidium of the Siberian Section of the USSR Academy of Sciences.

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ARCHITECTURE OF THE CENTRAL COMPUTING COMPLEX OF THE COMPUTING AND INFORMATION SYSTEM OF THE INSTITUTE OF NUCLEAR ENERGY IM. I. V. KURCHATOV

Novosibirsk TEZISY NAUCHNYKH SOOBSHCHENIY VSESOYUZNOY KONFERENTSII "VYCHISLITEL'NYYE SISTEMY, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA". MATERIALY KONFERENTSII. CHAST' 2 in Russian 1978 pp 24-26

[Article by V. S. Kozik, V. P. Mosolov, I. G. Pasynkov, M. Ye. Petrovicheva and G. L. Shilenko, Moscow]

[Excerpt] I. The central computer complex (TsVK) is the the largest data processing center (TsOD) of the computing and information system (IVS) of the IAE imeni I. V. Kurchatov, organized as a multilevel hierarchical network of computers interconnected via data exchange channels.

The IAE imeni I. V. Kurchatov is the largest center of scientific research in several areas of physics related to nuclear energy, and services of TsVK are utilized by several hundred coworkers of the institute.

Among the user needs for computer resources of TsVK, the following components predominate:

1. multivariant calculations on complex programs, mainly with maximum utilization of resource capabilities of TsVK;

2. editing and debugging of newly elaborated or modified programs;

3. storage and processing of large amounts of data obtained in the course of experimental research on physical apparatus (collection and rapid analysis of data is done using peripheral TsOD of IVS);

4. solution of problems related to automated planning of electronic devices developed at the institute.

Since users of TsVK are grouped into problem-oriented and territorially defined subdivisions with maximum distance from the TsVK of up to two kilometers, it was decided to set up on-line access to TsVK resources at such subdivisions in the form of programmable user stations (PAP) based on minicomputers and user stations (AP) based on displays and dot-matrix printers.

Work to set up TsVK as part of IVS was begun in 1972 and the first phase of TSVK in 1976 was introduced as follows: two TsP computers, a network of remote user stations (11 VT-340 displays), buffer processor using the HP-2100 computer (USA) which provided interaction of peripheral TsOD with the data base established on eight magnetic discs (MD) and eight magnetic tapes.

II. The study envisages a second phase TsVK consisting of the following basic subsystems:

1. Central processor (TsP) consisting of three computers connected by common magnetic discs.

2. Data base (BD) based on magnetic discs with capacities of 7.25, 29 and 58 Mbytes;

3. Terminal processor (TP) of the network of user stations (SAP) consisting of the M-7000 comptuer (SM-2);

4. Buffer processor (BP) of the data transmission network (SPD) of IVS based on the HP-2100 computer (SM-2).

It is worth noting that the all-purpose magnetic disc commutator (controller) (KMD) developed at the IAE imeni I. V. Kurchatov will play a major role in insuring interaction between the aforementioned subsystems of the TsVK; it has eight inputs for connection to the type BESM-6 and SM computers and 16 outputs for connection to two groups of eight MDs with capacities of 7.25, 29 or 58 Mbytes; it will be possible for further increase in the number of MD by means of a manifold connection (up to four KMDs). The KMD will also include a special message transmission unit between computer users of KMD. Because of the above opportunities provided by KMD, all TsVK process will have independent access to common magnetic disc memory.

Furthermore, any TsVK process, including any TsSP computer, may operate independently within the limits of its technical and programming media.

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ARCHITECTURE OF A DISTRIBUTED PROCESSING COMPLEX FOR AEROSPACE IMAGES

Novosibirsk TEZISY NAUCHNYKH SOOBSHCHENIY VSESOYUZNOY KONFERENTSII "VYCHISLITEL'NYYE SISTEMY, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA". MATERIALY KONFERENTSII. CHAST' 2 in Russian 1978 pp 42-46

[Article by A. S. Alekseyev, N. V. Kul'kov and V. P. Pyatkin, Novosibirsk]

[Text] Aerospace science of the late 1970's has been marked by an increase in the relative role of applied aerospace research, the prime aspect of which has become the application of remote investigation methods to study and inventory natural resources of the Earth. These methods are distinguished by the global nature of their view of the terrestrial surface, the rapidity of information delivery about any isolated region on the globe, and permit repeated inspection of desired territories with the necessary repetition; geostationary satellites (ISZ) can be used almost continuously for observation purposes.

Since the launching of the first Earth resources technology satellite (ERTS-1), two problems have become evident. First, the flow of information was so great that the ground-based complex did not have the technical plan for automated processing. Second, problems arose with delivery of the information to the user, because the processing systems were mathematically unprepared, inasmuch as there was no appropriate mathematical support for preliminary and thematic processing of aerospace information.

Study [1] proposed the concept of a regional center for automated aerospace image processing, examined the structure of the corresponding technical and programming media which were oriented toward performance of the following primary functions:

- reception of multizonal satellite data from a receiving station and buffering it in both analog and digital format;

- autonomous processing of images using special functional processors and all kinds of display media;

• digital processing of images on high output computers at the base computer complex.

The structure of all image processing media was selected to enable new technical components to be connected or old ones which did not meet standards of productivity or accuracy to be replaced, without altering the complex or existing data links as a whole.

The basic idea of functional organization of hardware of the processing system is the compatibility of special processors and image I/O devices with the basic computer complex in terms of peripheral memory at the level of magnetic discs and magnetic tape.

The wide diversity of users and the diversity of fields of application of remotely studied data enables one to assume that the future of aerospace information processing systems lies beyond distributed systems, beyond distributed computations, where several regional procesing centers are combined into a unified network, a unified system of automated processing of aerospace images.

The architecture of the image processing complex is hierarchical. The upper level of the hierarchy is formed by the basic computer complex whose base is a powerful computer system possessing high speed of several tens of millions of operations per second, main storage of several megabytes and enormous peripheral storage on magnetic disc storage (volume on the order of 10^6 megabytes) and magnetic tapes. In the existing image processing complex of the VTs of the Siberian Section of the USSR Academy of Sciences, the base computer complex consists of three BESM-6 computers which operate over a common field of peripheral memory on magnetic discs. With the base computer complex are linked the terminal computers which serve the specialized I/O aerospace image devices, user terminals, special processors (matrix processors, microprocessors, optoelectronic image processors, display processors and so forth), data preparation and compression devices [3-11].

We feel it is essential to have participation of the investigator of a certain problem using satellite information directly in the processing of the aerospace image (especially in the inital stage). This particularly relates to the stage of specification of the most informative fragments, processing and setting criteria for image processing on the computer and interaction during processing. A typical feature of the terminai complexes is their autonomy, i.e., the user is able to independently process images on complex subsystems in an interactive mode. In the existing image processing complex of the Siberian Section of the USSR Academy of Sciences, the M-6000 computer is used as a terminal, and the ISI-130 and Optronics are used as autonomous processors.

Mathematical support of the image procesing complex includes the following:

1) systems programs;
2) functional processing programs.

Systems programs insure operation of the entire system by connecting the user to the system I/O image operations, control of processing, retrieval and recording of errors, dynamic distribuiton of resources and dynamic loading of applied programs. Systems programs are also obliged to service interface requirements of the system, adaptation of peripheral devices connected to the computer complex. On the whole, the orientation is made toward a standard operating system of the basic computer complex and special processors, although not exclusively, so it becomes necessary to develop a specialized operating sytem oriented toward image processing. The latter can operate under the control of a standard operating system of the base computer complex.

The functional processing program systems is built on a modular principle and should be open, i.e., afford the opportunity for inclusion of new modules. Programming modules are configured in terms of functional features into applied program packages or programming processors. That is a sort of interface between the system and the user which provides the user with processing results in a format which is convenient for interpretation.

It is worth noting the extremely important aspect in the problem of storage of applied programming packages typical of distributed computations. There is no argument that the leading role in the establishment of specialized applied programming packages can be played by personnel in the natural sciences. In this regard, the circumstances at the Siberian Section of the USSR Academy of Sciences may be especially favorable, since most of the institutes have a natural science profile and a obvious attraction for the user of aerospace information.

Therefore, the organization of team access of experts in various natural science fields to centralized aerospace image collection and processing systems is extremely vital.

The structure of technical and programming media of a regional aerospace image processing center examined above can be recommended as the standard. The next level of development of the complex is the creation of a unified automated aerospace image processing system. The ideology behind such a network must be similar to that of the VTs KP elaborated at the computer center of the Siberian Section of the USSR Academy of Sciences [2].

The creation of a distributed aerospace image processing complex will undoubtedly demand the resolution of a whole range of problems on both the technical and mathematical plane. But evidently the major problem will be that of invariance of the system of programming support and the structure of hardware with respect to the newly elaborated technical devices and mathematical methods of image processing.

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[351-8617]

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PLANNING A SYSTEM OF REMOTE PROCESSING OF STATISTICAL INFORMATION

Novosibirsk TEZISY NAUCHNYKH SOOBSHCHENIY VSESOYUZNOY KONFERENTSII "VYCHISLITEL'NYYE SISTEMY, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA". MATERIALY KONFERENTSII. CHAST' 2 in Russian 1978 pp 47-50

[Article by S. P. Belyy, N. V. Kononov, S. N. Shul'gin and V. M. Yashin, Minsk]

[Text] Planning a system of remote statistical data processing (STOSI) is implemented in conformity with the "Consolidated plan for creation and implementation of the second phase of ASGS for 1976-1980". STOSI is aimed at establishing a data link between all computer centers (VTs) of the state statistics systems, insuring data exchange from solution of EDP problems and data from automated data bases operating at each ASGS level.

When a remote processing system is planned, two methods may be utilized: the method channels sharing and the method of commutation of messages. The method of channel sharing requires uniformity of the technology employed for transmission and of communications channels. This uniformity can ot currently be guaranteed. Thus STOSI will use the method of message switching where the message switching centers are control programs of remote processing at all of the coordinated computers in the neework. Each message circulating in the system will have identifying information about the point of origin and point of destination. The remote processing control program, by analyzing the network circuit and inherent position in the network, determines whether the incoming message is addressed to it or is a transiting message. If the message is addressed to the computer, the control program arranges access to data base resources or information banks obtained from EDP complex operations and insures transmission of the results to the requesting computer. If the message is transiting, the control program organizes transmission toward the point of destination.

In stage I of planning STOSI, a radial branching system of information exchange was adopted where individual VTs would handle the functions of message switching. Computers are linked via dedicated communications channels using a data transmission multiplexer (MPD). Each computer has local terminals, teletypes, user stations, etc. Each peripheral VTs has a single path consisting of dedicated channels connecting it to the State Computer Center of USSR TsSU. The possible use of shared communications channels for intermachine exchange will be considered. A fragment of the STOSI network is illustrated in Figure 1.

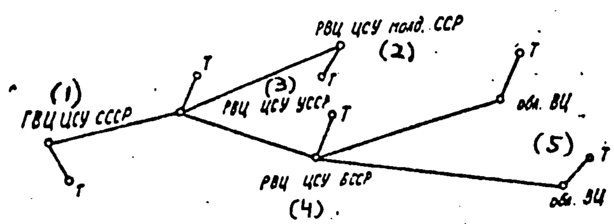

Figure 1. Fragment of STOSI network.

Key:
1. State computer center of USSR
2. Regional computer center, Moldavian central statistical adm.
3. Regional computer center, Ukrainian central statistical administration
4. Regional computer center of Belorussian central statistical administration
5. oblast computer center

The STOSI network must provide the following functional resources:

- implementation of dialog between remote processing administrators of all levels; terminal/computer/terminal and terminal/computer/computer/terminal versions may be specified here;

- implementation of access to ASGS data base resources both through the terminal directly linked with the computer as well as via intermachine links;

- implementation of data base transmission from solution of EDP complexes between network computers.

Realization of the above possibilities may be insured, in addition to hardware, by elaboration of programming support of communications between terminals and computers and intermachine connections. If communications program support for terminal/computer connections has BTAM or TSAM systems, it is a proven fact that organization of intermachine communication entails many technical problems, in spite of the lack of principal theoretical difficulties in this question, because of technical devices and communication channels.

The program basis of STOSI, as was shown above, is a control program for remote processing. The remote processing controller arranges reception and transmisison of messages along communications channels as a problems program of highest priority. The controller arranges message sequences for the terminals directly connected to a given computer, and message sequences for channels of intermachine communications. The centralized control process of transmission and processing of messages will take into account the system of message priorities, their volume and information nature. The controller must be given information on the bases used in STOSI obtained in a given computer when solving EDP complexes. In stage I, introduction of this information will be included in the function of the remote processing administrator which is connected to the remote controller by a special terminal. The remote processing controller arranges communication with the ASGS data base. Programming support for access to ASGS automated data bases is included in the composition of the controller as a series of subroutines.

An important problem in planning STOSI is the solution of questions of data protection against unsanctioned access. In the program support of ASGS automated data bases (the "ISKHOD" system elaborated by the scientific research institute of the USSR Central Statistics Administration), questions of data protection have been resolved. Data protection in bases obtained from solutions of EDP complexes is provided by the remote processing control program.

The remote processing control program must consider the material and time resources of the network used in data transmisison.

In planning STOSI, particular attention was given to the reliability of system operations. Problems can arise in insuring reliability of transmitted information and recovery of system effficiency in the event of malfunctions in the computers and communications channels. To insure reliability, detecting and correcting codes may be utilized. The validity of using correcting codes, or repeated transmissions in the event of error detection will be determined in the experimental stage. To recover system efficiency, the mechanism of monitoring points provided in remote processing systems is inadequate. Special recovery media in the remote processing control program will insure restoration of operations in the event of malfunctions of computers without data dropout.

The anticipated economic effect of incorporation of the planned system will amount to about 7,000,000 rubles per annum.

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COMPUTING AND INFORMATION NETWORK FOR THE AUTOMATED URBAN MANAGEMENT SYSTEM OF MOSCOW

Novosibirsk TEZISY NAUCHNYKH SOOBSHCHENIY VSESOYUZNOY KONFERENTSII "VYCHISLITEL'NYYE SISTEMY, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA". MATERIALY KONFERENTSII. CHAST' 2 in Russian 1978 pp 50-52

[Article by Yu. A. Chebotov, Moscow]

[Text] Improvement of automated management systems (ASU) and enhancement of their efficiency will soon be aimed toward expanding functions, levels of control, composition of subsystems and jobs, merging of automated control of production and automated control of technological processes, increase of loads of expensive computer equiment by using new forms of work organization.

A further development of organizational forms of application of computer technology is the creation of collective-use systems: computer centers of collective-user (VTsKP) and networks of computer centers.

One aspect of the national economic sector which has exerted influence on the creation of ASU of various levels (sector ASU, association ASU, etc.) consists in the predominance of small and medium enterprises and organizations situated at relatively short distances from each other. This feature permits the creation of computing and information networks (IVS) based on a collective-use computer center.

The principle of construction of a VTsKP-based IVS has been utilized in creating the ASU of the Chief Administration for Assembly and Special Construction Works (Glavmosmontazhspetsstroy) at Mosgorispolkom (ASU "Mosprom").

The computing and information network for ASU "Mosprom" represents information stations of the users connected by the radial principle of communications channels with the VTsKP; IVS users are the Chief Administration, associations, enterprises, construction and assembly trusts, specialized administrations and individual shops. The possiblity of exchange of information along communications channels between VTsKP and ASU of other sectors of urban management of the city of Moscow, Gosbank, Minfin and other ministries and agencies is also foreseen.

The IVS hardware complex consists of a VTsKP computer complex and user network hardware.

The first phase of the computer complex will include two YeS-1022 computers and one YeS-1020 computer in an expanded configuration; later on the computer capacity of the VTsKP will be enlarged by installation of an additional YeS-1022, and by a model with greater speed.

The MPD-2 and MPD-3 data transmission multiplexers, data transmission equipment (APD); user stations and communications channels are related to the technical hardware of the use netowrk.

Types and quantity of user stations installed at information stations depend on user characteristics: the AP-2 will be installed at branch plants of associations and at specialized administrations; the AP-2, AP-63 and YeS-7920 display at plants, in industrial associatons and at construction and assembly trusts; and the AP-2, AP-61, AP-63 and YeS-7920 at Chief Administration.

Dedicated telephone channels are planned for use as communications channels; they connect the VTsKP to each user.

In addition to user stations, certain VTsKP users will have a M-5010 type minicomputer.

At the computing and information network ASU "Mosprom" are planned various operating conditions: package processing, remote package processing; dialog, etc.

In view of the lack of experience in VTsKP operation, limitations on the delivery of hardware from the YeS computer catalog and other factors, step by step evolution of the ASU "Mosprom" IVS is planned.

In the first stage, the primary kind of communication between the VTsKP and the users will be electronic mail with automated transmission. Information stations will be equipped with data preparation devices and the source data for solving real-time jobs will enter the VTsKP on punched cards and tapes.

To solve non-real time jobs, both centralized and decentralized principles of data preparation will be used. Computer processing of information will be done in the package mode. Computer processing reults will be provided to the user in the form of computer printouts.

As the communications channels become ready, information stations acquire remote processing media, systems mathematical support becomes assimilated and so forth, other operating conditions will be assimilated: remote package processing, dialog, etc.

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EXPERIMENTAL NETWORK OF COMPUTER CENTERS

Novosibirsk TEZISY NAUCHNYKH SOOBSHCHENIY VSESOYUZNOY KONFERENTSII "VYCHISLITEL'NYYE SISTEMY, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA". MATERIALY KONFERENTSII. CHAST' 2 in Russian 1978 pp 57-61

[Article by Yu. A. Mikheyev, A. A. Stogniy and L. B. Efros]

[Text] The creation of the State Network of Computer Centers is a complicated national economy problem whose solution takes a long time and substantial resource expenditures. It is thus necessary to have thorough scientific and experimental justifications of construction possibilities of the entire system and its discrete components. Several basic scientific theoretical studies for creation of the GSVTs have now been completed. These studies have been reflected in the technical and economic justifications, preliminary and technical plans of GSVTs. Further development of these studies and the direct efficient and economic inception of their practical realization are impossible without a wide range of experimental research. This requires the appropriate experimental base. Known kinds of experimental bases used in the creation of complex systems, simulation stands, testing groups, prototypes and working models, etc. will be widely used in the planning of GSVTs. But analysis of the nature of NIR and OKR on creation and development of GSVTs shows that at full volume, functions of the experimental base can only be performed by a network of interacting centers.

An experimental network of collective-use computer centers (ES VTsKP) is a set of territorially-separate computer centers connected by a data transmission system that insures performance of experimental testing and refinement of theoretical research throughout GSVTs components with the aim of selecting optimum, economically justified solutions in terms of their practical realization. The basic goals of establishing ES VTsKP can be stated as follows:

1. ES VTsKP should be a sort of continously operating testing ground on which all scientific, design and technological solutions throughout the network undergo experimental testing prior to the start of industrial production and further utilization in GSVTs design.

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2. Establishment of ES VTsKP will permit a combination of efforts of diverse development staff working in network and discrete component design.

3. The clear demonstration of advantages of the network utilization of computer hardware as illustrated by solution of individual national economic assignments.

Only separate VTsKP have now been established and it seems impossible to immediately create an experimental network out of VTsKP. But this kind of network can be created gradually on the basis of the most developed VTs or organizations engaged in issues of network planning and directly experiencing needs for experimental research. The appropriate decisions of GKNT have now organized a network of computer centers which satisfy these requirements: the computer center of the Siberian Section of the USSR Academy of Sciences (Novosibirsk), of the IK Ukrainian Academy of Sciences (Kiev), the VNIIPOU (Moscow) and the NIIEVM at TIASUR (Tomsk). The number of computer centers in the experimental network may rise in the future.

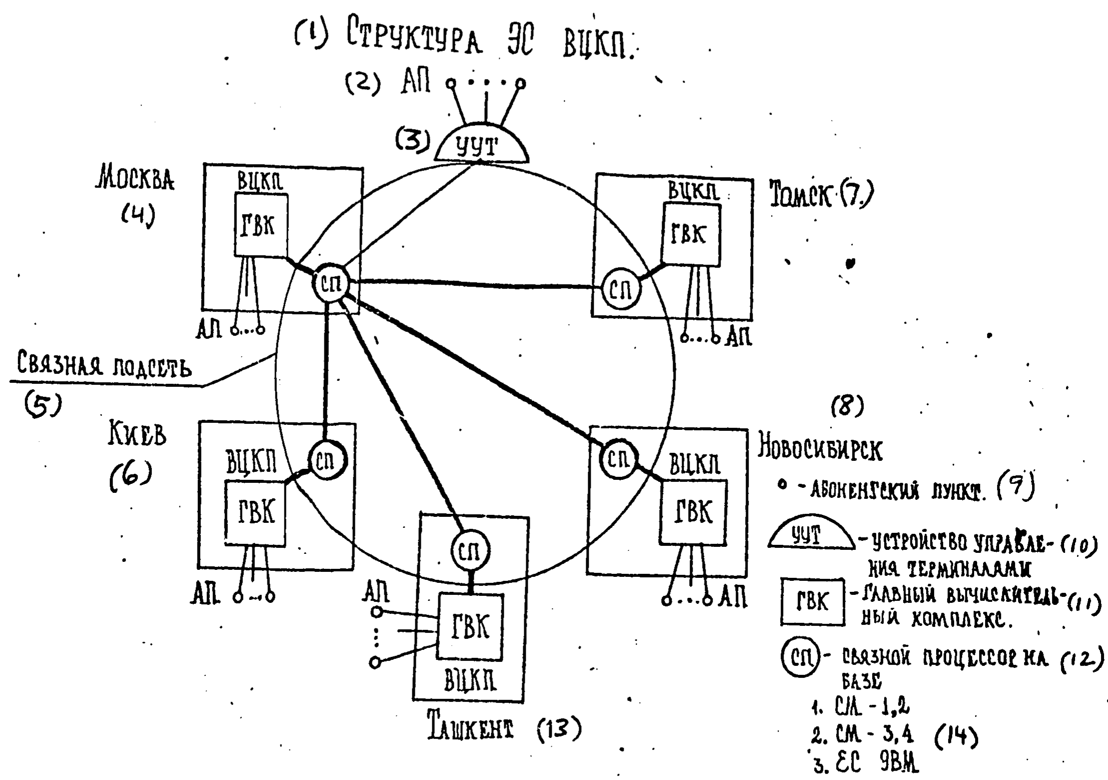
The experimental research carried out in the network must insure the justification of recommendations in both general systems questions of GSVTs construction including questions of administration of network operation as well as the selection of regional characteristics of its primary components: technical, informational, general and systems programming support, automated base of algorithms and programs and data exchange systems at various stages of development. These components are organically interrelated and the conduct of any kind of experiment within one demands the proper support by others. Thus questions of clear coordination of work, periods of development and delivery of hardware, programming support and so forth have primary significance, and all expeirmental research being done can be divided into two stages:

- pre-equipping of existing VTs and communication systems with the necessary technical and programming media;

- conduct of purely experimental research.

The structure of the experimental network of VTs is shown in Figure 1. To investigate the possibility of using various hardware in the network, it consists of two functionally different subsystems: a connecting subnetwork and a system of computer complexes. In the connective subnetwork will be investigated questions on the advisaiblity of using technical and programming media of the YeS and SM computer systems for various stages of construction and conditions of network operation; questions of refinement and standardization of protocols of the data exchange system. In the computer complexes will be carried out research on various operating conditions of VTs, use of different types of multiple machine complexes, and later elaboration of multiprocessor computer complexes, and study of programming support for informational interaction of users with the VTs utilizing the AP-70, AP-2, AP-63, MPD-2 and MPD-3.

In the first stages of creation of ES VTsKP, research will also be done on creation of automated information services for the FAP VTsKP sytem based on



Key:

1. structure of ES VTsKP
2. AP
3. UUT
4. Moscow (VTsKP/GVK)
5. Connecting subnetwork
6. Kiev (VTsKP/GVK)
7. Tomsk (VTsKP/GVK)
8. Novosibirsk
9. user station
10. terminal controller
11. main computer complex (GVK)
12. connecting processor at base
13. Tashkent (VTSKP/GVK)
14. SM 1,2; SM 3,4, YeS computer system

"KAMA", prototype testing of centralized control service operation, possibility of creating ROSS monitors and testing of statistical investigations of network operating characteristics, etc.

The enumerated studies, of course, do not exhaust the entire range of testing and theoretical work which will be done in the experimental network. As it is provided with promising technical and informational support, the range of experimental work will be expanded, embracing more and more the interconnected questions of development of GSVTs in later stages in our country.

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PRINCIPLES OF DESIGN OF A COLLECTIVE-USE COMPUTER CENTER (VTsKP)

Novosibirsk TEZISY NAUCHNYKH SOOBSHCHENIY VSESOYUZNOY KONFERENTSII "VYCHISLITEL'NYYE SISTEMY, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA". MATERIALY KONFERENTSII. CHAST' 2 in Russian 1978 pp 62-64

[Article by V. V. Vasil'kov and Ya. A. Khetagurov, Moscow]

[Text] The collective-use computer center of MIFI has been established in accordance with the USSR State Commission on Technology (GKNT) resolution as a technical base of a collective-user experimental VUZ computer system of an institution of higher learning . A distinctive feature of computer organization in an educational VTs is the wide range of jobs tackled (training, scientific tasks, ASU tasks, automated IPS, various SAPR jobs). The specific requirements from the training process, as well as requirements of other user categories give rise to the need for supplementing the package mode common to third-generation computers with a remote assignment input modality and, in some cases, a interactive dialog modality. In order to tackle the jobs formulated at MIFI, a complex of interconnected computers was set up from those available and to be received by the institute. The basic computer capacities in the VTsKP will be afforded by Unified Series computers (YeS 1060, two YeS 1033, Yes-1022); in addition to these, the complex will have about 20 minicomputers (YeS-1010, M-6000, M-400) and CRT-type terminals.

The following concepts have been employed in designing the VTsKP:

1. Interaction between complex computers arranged on the network principle. The network currently envisages one base computer complex (YeS 1060, YeS 1033) and a multitude of terminals containing minicomputers. Interprocess exchange will be done on the principle of message package commutation.

2. Remote communications equipment is not being utilized in designing the VtsKP because the maximum distance between the message package source and receiver will not exceed one kilometer. As a result, the network principle of organization of the complex was supplemented by the principle of functional specialization of the complex's components. Observance of this principle will chiefly affect the makeup of mathematical support of specific network

components. Thus, mathematical support of the base computer complex (BVK) is maximally relieved of tackling jobs of planning its work and these functions are concentrated in the network's control center (UU). In addition to functions of planning BVK work, the UU carries out commutation of message packages; an important function of the UU is control of shared-access ZUPD memories.

3. Control of operation of the local network is done by an operating system which is distributed throughout the computer components of the network. A distinctive feature of a distributed operating system (ROS) is that it functions without altering the functions comprising its local OS. The functions of ROS are coordination of operation of local OS in the event of malfunction of specific elements of equipment, as well as establishment of process interaction originating in discrete components of the network.

4. Process originators are the VTsKP users. A typical user of a computer center can not take into account the distinctive features of his computer center when programming his own job. Thus when planning the ROS, the needs of the unskilled user were taken into consideration. Basic attention was given to creating media enabling the user to work with ordinary language devices within a multi-machine complex. User programs written for operating on a specific computer must be able to work within a computer complex.

Media used to realize these principles were as follows:

1. ROS. Modular design of ROS consists in the fact that its programs are exchanged with those of local OS by "messages" which can be sent as either programs of the machine "itself" or as programs of "another" machine. Local OS can transmit messages, aside from these, about emergencies arising in the system. In particular, such a message may be one about the refusal of the local OS to receive any more messages.

2. Specific OS (localized in specific computers) are specialized to execute tasks assigned to the proper network junction.

3. Interaction of problem-oriented programs of ROS is insured in VTsKP owing to the selected principle of control (similar to manifold processing) as follows:

a) The entire user program is broken down into modules which produce data for utilization by other modules, on the one hand, and initialize data of other modules on the other hand.

b) Data movement is controlled by a special systems program ("manifold") which determines the computer and computer site which will put at the disposal of the corresponding module. This same program insures synchronization of execution of individual modules of user programs.

To account for work done in the VTsKP and monitor use of its resources, a work accounting system (SUR) was developed. SUR elements are distributed throughout individual computer installations and interact upon system operator requests.

VTsKP with these features should begin operating in 1980-1981. Hardware for configuring various types of computers and algorithms to be elements of a distributed operating system are now being developed and tested.

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ORGANIZATION OF WORK WITH REMOTE SUBSYSTEMS IN THE SEKOP NETWORK

Novosibirsk TEZISY NAUCHNYKH SOOBSHCHENIY VSESOYUZNOY KONFERENTSII "VYCHISLITEL'NYYE SISTEMY, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA". MATERIALY KONFERENTSII. CHAST' 2 in Russian 1978 pp 75-76

[Article by A. I. Ilyushin, N. Yu. Klepikov, Vs. S. Shtarkman, Moscow]

[Text] The following should be feasible in the SEKOP network [1]:

1. remote dialog;
2. remote triggering of assignments;
3. transmission of files between computers;
4. parallel solution of one problem on several computers.

The programming support of the SEKOP network is broken down into two large components. One is the network's electronic mail capability which enables processes ocurring in a network computer to be exchanged as messages. Another component, which is the focus of this report, is the mechanism of summoning remote programming subsystems (abbreviation UDV) and these subsystems per se.

A programming subsystem or cluster is a standard set of subroutines which carries out some list of interrelated activities. For example, it may be a file subsystem, data printout subsystem for remote users, assignment triggering subsystem, and so forth. Underlying the UDV is the requirement that the program operating on one computer can call forth a subroutine appearing in a subsystem located in another computer, just like an ordinary subroutine written in Fortran.

The UDV can carry out the following activities:

1. it "familiarizes" (ties in) the summoning program and the remote subsystem;

2. it summons subroutines in the remote subsystem;

3. it creates an "environment" for the summoned remote subsystem (in the form of other subsystems accessible to this remote subsystem).

The following problems had to be resolved in creating the UDV:

1. insuring synchronization of local and remote activities;

2. insuring protection against unauthorized summoning of specific activities;

3. the problem of processing "unofficial" situations arising when the remote partner does not respond for some reason;

4. surmounting incompatibility of programming systems in different computers.

Within UDV, the following subsystems are now in operation: DIMON dialog subsystem; a subsystem for transmitting data stored on tape and disc; a subsystem for digital printout; and a subsystem for displaying the status of remote problems.

The volume of UDV programs (not counting substantive subsystems) is roughly equal to 4000 sentences in Astra systems programming language (20,000 BESM-6 computer instructions).

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SEKOP EXPERIMENTAL COLLECTIVE-USE COMPUTER NETWORK: GOALS, BASIC CONCEPTS AND ARCHITECTURE

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[Article by V. I. Drozhzhinov, A. I. Ilyushin, A. N. Myamlin and V. S. Shtarkman, Moscow]

[Text] A computer network being developed at the Institute of Applied Matematics of the USSR Academy of Sciences is considered. The purpose of the network is to provide a user located near some network junction with access to information and computing resources existing at any and all junctions.

The following requirements underlie its elaboration:

- The network is an open system for step by step development. The appearance of new junctions should not impact on the functional portion of the network.

- The network is heterogeneous, i.e., it does not contain computers of different architecture as information processors (IP).

- Expansion of the kinds of services provided to the user should not cause realignment of the network, i.e., the network must consist of functionally expandable subsystems.

- Malfunction of one junction should not shut down the entire network.

- User operation with remote network resources should be functionally no more complicated than working with an autonomous computer.

- Mass produced hardware should be used in developing the network.

Among the most substantive decisions affecting network architecture are the following:

1. Choice of the decentralized method of data transmission control in the network. In centralized control, malfunction of one (central) link shuts down the entire network.

2. Selection of package multiplexing as the method of network data transmission (not channel or message multiplexing). Package multiplexing insures high throughput in transmission of long messages, a high communications channel duty factor and rapid transmission time for brief messages.

3. Separating hardware and programming media into interacting subsystems. Specification of the following basic levels in their hierarchy:

- user processes;
- functional subsystems and job mediators;
- transport subsystem;
- package multiplexer.

The transport subsystem and package multiplexer together form the network's electronic mail capability. This is a lower base level which insures message transmission between the facilities of all upper levels as well as its synchronization.

The user process is either a user job in the traditional sense, or a man at the terminal, i.e., a human plus some programming "representative" in computer memory. The user process is a finite object which obtains service in the network.

Various dialog systems (e.g., DIMON), local data base control systems, various translating and other general use programming systems are functional subsystems.

The job mediators are chiefly service processes which insure creation (summoning and initialization) of the necessary functional subsystems and their connection to the user processes requesting them. They can, however, "wipe out" functional subsystems if they are no longer necessary.

4. Definition of interaction protocols of network subsystems.

Prototype operation of electronic mail and several functional subsystems of the network are currently being tested; network characteristics are being investigated and its components are being developed and upgraded. BESM-6 are used as information processors, and M-6000 are used as network computers and terminals. Network processors are interconnected via telephone lines. Work on the network was begun in 1975.

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ASPECTS OF PROCESSOR PROGRAMMING SOFTWARE OF AN EXPERIMENTAL COMPUTER NETWORK WITH PACKAGE COMMUTATION

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[Article by Yu. S. Zhdanov, L. A. Kalinichenko and I. A. Shilikhina, Moscow]

[Text] Questions of selecting the architecture of hardware and programming devices of a junction processor of an experimental computer network with package commutation (multiplexing) elaborated on the basis of the mass produced SM computers are considered (SM 3, SM 4). The planned experimental computer network belongs to the class of heterogeneous networks; the following factors are taken into consideration in its design:

- elaboration and experimental testing of a multilevel system of network control protocols and the appropriate programming support;

- formation of a technical base for elaboration of distributed information system;

- creation of a hardware and programming medium for refining and experimental testing of new computer network components based on SM EVM.

The package commutation junction process performs these functions:

- transportation of messages from the user's computer center (AVTs) transmitter to the AVTs point of destination;

- conversion of messages (assembly-disassembly) at message reception/transmission junctions;

- control of flow and sequence of message transmission at interface between the AVTs and package commutation network;

- choice of package delivery route in package commutation network from transmission junction to destination junction;

• control of data transmission channels connecting package commutation junction to AVTs and other junctions in the package commutation network.

Programming suport of the package commutation network junction is modular in structure, insuring the necessary flexibility under conditions of unstable protocols, development of junction processor hardware components (especially modems) and improvement of control algorithms. For example, in the current version of package commutation junction programming support, there are three data transmission channel control protocols in the form of discrete programming modules:

• HDLC protocol [1] used to control data transmission along communication lines in the package commutation network;

• dialog protocol for control of data transmission through a series channel connecting the AVTs to the package commutation junction;

• data transmission control protocol for parallel channels to connect AVTs to the package commutation junction.

Protocols of the package commutation junction and algorithms of the primary components of programming support are examined in the report.

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SOME APPLICATIONS OF THE KAMA REMOTE DATA PROCESSING SYSTEM IN VTsKP

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[Article by F. I. Andon, A. A. Stogniy and V. V. Tyurin, Kiev]

[Text] The proposed systems programming support (OSPO) based on the Kama system of remote data control is designed to control the computing process in VTsKP constructed on the basis of Unified System (YeS) computers and oriented toward users elaborating, debugging and operating systems programming software to tackle scientific and technical jobs, automated planning and control systems.

OSPO insures package and interactive operating modes with program packages based on the YeS operating system (OS); it is a further development and includes the following components:

- Kama remote data control system;
- VTsKP supervisor (SVTs);
- remote program debugging system (STOP);
- interfaces for various systems for control of data bases (SUBD);
- interfaces for packaged programs;
- remote communications system with devices and machines (TSUM).

The structural scheme of OSPO is shown in Figure 1.

The Kama system is the nucleus of OSPO, expanding the possibilities of the YeS operating system by separating data from programs and insuring controlled access of local and remote users to data bases and applied program libraries.

The VTsKP supervisor, which is an expansion of the Kama system, arranges and controls the computing process at the VTsKP by synchronizing the operation of distinct OSPO components.

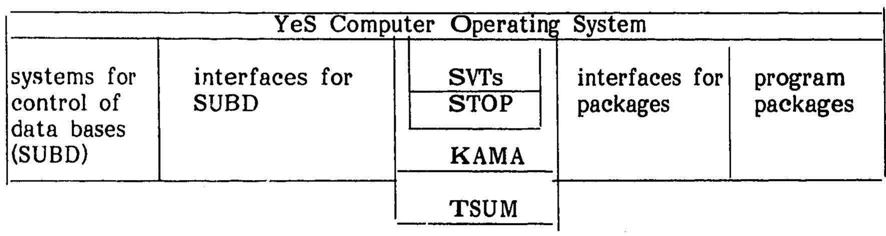

Figure 1

The STOP is a development of the YeS operating system and the Kama sytem is for debugging syntax and semantics of programs written in Assembler, PL/1, Fortran, Cobol and other languages under control of the Kama system and SVTs; it operates from the set of local and remote user stations and the computers, connection with which is insured by the Kama system and its TSUM expansion.

When debugging, the programmer is afforded the opportunity to interactively inspect and analyze the diagnosis obtained from translator (compiler) operation or execute programs with tracing and monitoring points from the terminal; he is also able to edit the program beging debugged, actuate its execution and print out results at another terminal (including punched cards, printers and magnetic carriers).

Under control of the SVTs and Kama system operate the interfaces for SUBD, e.g., the "OKA" SUBD which insures control of ASU and automated planning sytem data bases. An interface for SUBD insures access to the data base of programs operating under OSPO control in the Kama system or other interfaces.

Interfaces for program packages, e.g., the Kometa document data base, graphics packages etc. operate under control of SVTs and the Kama system as well, and via the TSUM, insure connection of remote users with the data package through input and output data sets.

A further development of SVTs and the Kama system is the TSUM, which realizes protocols of information exchange with YeS computers, SM computers, user stations and special devices such as production recorders, graphics devices and facility communications devices.

OSPO insures package and interactive modalities of operation of remote users with all packages and programs operating under control.

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SET' DATA BASE MANAGEMENT SYSTEM

Novosibirsk TEZISY NAUCHNYKH SOOBSHCHENIY VSESOYUZNOY KONFERENTSII "VYCHISLITEL'NYYE SISTEMY, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA". MATERIALY KONFERENTSII. CHAST' 2 in Russian 1978 pp 98-101

[Article by L. G. Tarasenko, Novosibirsk]

[Text] The SET' data base control system (SUBD) is discussed in the report; it was developed as part of the mathematical support of the MVK special processor "EL'BRUS-1" [1]. In the realization process, an experimental version of the system was obtained for the DIAPAK operating system for the BESM-6 computer which is of independent significance.

The SET' system is a collective-use system which insures access in both dialog and package modes to data bases situated in the systems archives and individual user archives. The SET' system may be used as a base in the design of specialized SUBD.

The RGBD CODASIL was adopted as the realization base for the SET' SUBD [2]. This system enables operation with data bases containing information of the network structure. The system is built on a modular principle and the following are its basic components: system nucleus and system library.

The system nucleus contains all the orthogonal possibilities which the SUBD must satisfy. The system nucleus insures partitioning of stages of the data description and handling of data of data bases; this enables program independence for data handling from the logic structure of the data base data. The data description apparatus realized in the nucleus serves to describe the logical structure of data and for assigning the address of data in peripheral memory. For a user working with part of the data base, a subcircuit data base data description apparatus has been realized. The SET' SUBD has enormous data base protection media against unauthorized access.

The system nucleus insures the possibility of parallel operation of several users with a single data base. In addition to intrasystems synchronization media which exist to insure the integrity of data base data when modified by users, there are media of user program synchronization which "close" part of the data base for a certain time period. The problem of insuring data integrity has been resolved by the presence of data base access synchronization media and by maintenance of a record of changes to and duplication of the altered portion of the data base. The system nucleus is an instrument which can be used to build a data base control system for various user categories.

The system library contains all the specific possibilities of specialized systems such as: operation with various data coding, retrieval methods and data storage, accounting methods and distribution of peripheral memory. The system library is easily enlarged. Among all the possibilities contained in the system library, it is possible in turn to specify the entire set of "basic possibilities", most frequently employed and most necessary in the library. This totality may, for example, include such possibilities as byte coding, octal coding, and retrieval in an ordered sequential set. During the development period, a total set of "basic possibilities" was discovered and included in the system library; consequently, a base SUBD was obtained.

Terminology used in the SET's system nucleus:

Multiplicity: the designated volume of peripheral memory.

Entry: the designated type of information contained in the data base. Entries in the data base correspond to the totality of entries located in some set put in conformity to a given entry in describing the circuit.

Field: the minimum designated type of information contained in an entry.

Aggregate: the designated type of information including the total set of fields.

Set: the designated type of connection between entries. The set has one host entry of the set and member entry of the set. To each circuit set in the data base corresponds the totality of examples of the given set. A set example is a chain of entries in which one entry of the host entry and one or more entries of the member entry of the set is present.

Circuit: the totality of sets, entries, multiplicities, fields, data aggregates in which the main set not containing a host entry is defined.

The retrieval key in the set: is a code located in the set's member entry in a fixed place for a given set.

The data circuit and subcircuit. The data description apparatus realized in the system is used to describe and alter the circuit and subcircuit of data of the data base. The "maximum" circuit of a data base is a network with an arbitrary number of junctions and connections. The junctions of the network are entries, the connections of data sets. The circuit and subcircuit of data are described by using the overall set of attributes of their elements (entries, sets, multiplicities, aggregates, fields). Values of the attributes are contained in the system library. A description of the circuit or subcircuit can be stored in the archive file to be used in handling. By using the data description apparatus, the user has the opportunity to alter the data circuit or subcircuit. When the data circuit is altered in a data base, information in the data base is reorganized in accordance with the new circuit.

On the outside, the data description apparatus is realized in the form of a package of YARMO-2 language macroexpansions. The system has a non-procedural language of data description in dialog and package versions enabling description and alteration of the data base data circuits and subcircuits with media independent of other programming languages.

Data handling. The handling apparatus enables interaction with the data base at the level of reading and writing of data element entries. At the start of operation with the data base, the user communicates to SUBD the address of the circuit and (if necessary) subcircuit of data. The circuit and subcircuit are matched by the system at the instant of operation of the user program, enabling maximum reduction of the time interval in which information reorganization is impossible in the data base.

The handling apparatus includes media for retrieval of entries (in terms of sets and multiplicities), reading detected entries of set examples, fields and aggregates of data, modification of entries, fields, aggregates of data in the data base, removal of entries from the data base. The presence of "simple protection" media and "word protection" limits access to entries (for reading, modification or removal), sets (for inclusion or exclusion), and data circuit (for use, alteration) and subcircuit.

On the outside the handling apparatus is realized in the form of:

- package of YARMO 2 language macroexpansions;

- standard array of the DUBNA monitoring system which permits handling of data from programs written in Algol, Fortran, Madlen, Bemsh and Alpha-6;

- nonprocedural handling language realized in dialog and package versions and independent of other programming languages.

To remain the integrity of data base data, the system keeps a record of information changes about all alterations of data base data, and a complete copy of all data in the base which can be obtained as a total or partial copy of the circuit multiplicities. In the event of malfunction, the system recovers information in the data base by using the copy and the record of alterations.

The system is written in YARMO 2 language. The first release of the system has been debugged and is undergoing prototype operation on the BESM-6.

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VARIABLE CROSS-REFERENCE SYSTEM FOR CONTROL COMPUTERS IN COLLECTIVE-USE CENTERS

Novosibirsk TEZISY NAUCHNYKH SOOBSHCHENIY VSESOYUZNOY KONFERENTSII "VYCHISLITEL'NYYE SISTEMY, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA". MATERIALY KONFERENTSII. CHAST' 2 in Russian 1978 pp 107-110

[Article by F. A. Kaganov and L. A. Serebrovskiy, Moscow]

[Text] Special control computers (STsVM) can are widely used to control facilities and processes in real time. A typical feature of these computers, in comparison to all-purpose machines, is that their system of instructions, structure and terminals have a problem orientation enabling production of the most economical solution of specific types of control jobs. With this goal, specialized control computers are being planned with minimum reserves of some or most of their parameters. Because of the absence of free resources in STsVM, elaboration of complexes of control programs for them (volumes in the tens and hundreds of thousand instructions) is done on a technological computer, for which is selected a large all-purpose computer. But if the control and technological computers are program-incompatible, the latter's standard media can not be used. In that case it is necessary to create a cross-refernece system enabling implementation of the technology of elaboration of programs of one computer (STsVM) on the other (technological). Therefore, it becomes possible to use collective-use centers to develop programs for any specialized computer.

Substantial problems are encountered, however, on the road toward practical application of cross-reference systems. Indeed, efficient utilization of computer technology to control facilities and processes in real time is only possible when there is an adequate diversity of specialized computers. Under those conditions it becomes necessary for each computer (which is program-incompatible with the technologcial one) to recreate or reprogram the existing cross-reference system: this leads to great productivity and time expenditures. A possible solution to this situation is the creation of cross-reference systems oriented to a class of control computers and conditions of their application and adaptable to both the distinctive features of a specific computer in this class as well as to specific conditions of its application.

Principles of parametrization and configuration have been proposed as basic principles of elaboration of adaptable cross-reference systems of this type. In accordance with the first principle, conditions of STsVM application and its architecture (system of instructions, program-accessible resources, etc.) are presented in the form of parameters. The principle of parametrization becomes dominant for planning programs insuring processing of compatible values of one and the same parameter. The second principle postulates the production of a multiplicity of configurations of a cross-reference system from some fixed set of program modules which is able to insure processing of all incompatible values of one and the same parameter. Furthermore, the possibility must be foreseen for connection to the system of specialized procedures which can be used to make changes in the program which exist only for the specific computer.

The architecture of cross-reference systems realized on the basis of the principles of parametrization and configuration has several typical features. It must provide for a unified organization of parameters which are used to describe the class of control computers and conditions of their application, as well as communication in information and control between the permanent (all-purpose) and configured parts of the system.

Before starting operation, the cross-reference system must be adapted to the specific operating conditions. This mode of system preparation is called "tuning". To implement tuning, the cross-reference system includes an automated tuining system. Its basic elements are as follows:

- language of formal description of computers and conditions of their application;

- archive for storage of the descriptive text of a specific computer and conditions of its application;

- data base for tuning which insures unified organization of parameters of the class of computers and conditions of application (structural unit of this base is chosen to be the information module in which are entered the actual values of the parameters and the features which describe them);

- a library of base programming modules with which handling in the system is enabled;

- a system of information about the course of tuning and the type of formal erorrs detected in the descriptive text of the computer and conditions of application;

- a model of the cross-reference system which is used as a semantic foundation to generate the configured portion of the system;

- a language processor which implements generation of the data base and the configured programming portion of the system for specific conditions of application; retrieval of syntactic errors in the descriptive text; omission of monitoring tests.

The enumerated principles and methods of development of a cross-reference system for a class of control computers, as well as a system of automated tuning were realized in an automated programming and debugging system, YaUZA-6 [1]. It is worth noting that 80 percent of its programs realizing unified technology of elaboration of control programs are invariable to the specific features of STsVM. The basic classes of parameters describing conditions of application of the system have been described in [2]. In 1976-1977, the YaUZA-6 system was tuned to 17 different STsVM which are typical members of three classes of control computers defined for this system.

The YaUZA-6 system has been circulated for the BESM-6 all-purpose computer. It can then be adjusted and utilized as a common mathematical support by users of specialized control computers.

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CONTROL OF TECHNOLOGICAL PROCESSES IN A VTsKP

Novosibirsk TEZISY NAUCHNYKH SOOBSHCHENIY VSESOYUZNOY KONFERENTSII "VYCHISLITEL'NYYE SISTEMY, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA". MATERIALY KONFERENTSII. CHAST' 2 in Russian 1978 pp 110-112

[Article by Yu. N. Labkovskiy, Tallin]

[Text] In connection with the appearance of large computer centers of collective-use servicing scores of diverse users with a wide range of jobs to be tackled in "question/answer", "dialog" and package modes, it is becoming extremely necessary to create efficient methods of planning and controlling technological processes of reception, processing and transmission of information.

Such methods make it possible to insure the timely and high-quality output of information to the user upon his request. The proposed system of control of technological processes is oriented toward the VTsKP having a three computer complex (two YeS-1033 and one YeS-1022 computers) which operates in the YeS operating system (OS) medium.

One means of planning and controlling technological process is a system of technological documentation and calendar planning standards.

Each user job has a "Technological job chart" which assigns the job previously elaborated technological line alternatives which can be selected in terms of the criterion of minimum time or cost.

A request for service ("the attached label") contains a job code by which the "Technological job chart" is loated.

The "technological job chart" contains the codes of all files needed to tackle the given job.

The "technological file charts" are retrieved according to file codes to establish all the information about the files.

Based on the "attached label", "Technological job chart" and "Technological file charts", an "attached routing sheet" is formulated which accompanies the user's information as it passes along the technological links indicated in the given sheet.

When the "attached routing sheet" reaches the next VTsKP subdivision, according to the code of the subdivision and job code is extracted the "Operating chart" in which all operations on the given job in the given subdivision are detailed.

Thus user information is accompanied as it moves through the technological links only by the "attached routing sheet"; the other technological documentation is a standards base and is kept by the corresponding services of VTsKP.

When user jobs pass through the computer, they are assigned relative priorities by the KROS control system.

The KROS system interprets accounting information on the JOB control card which outlines the proposed assignment execution time, the number of printout lines, the number of output punched cards, etc. [1]

The KROS assigns higher priorities to jobs requiring minimum resources. When KROS is generated, false accounting information in the instruction JOB can not occur. After processing the assignment, KROS prints out statistical information on actual utilization of resources by the given job.

If all technological and calendar planning standards are put into the data base and accounting information printed out by KROS and the systems monitoring program [2] is used to restore technological standards maintained in the data base, highly reliable technological matrices are obtained.

Such matrices can be used as an information base for compiler programs for processing descriptions.

To tackle the job of compiling an optimum description of processing, it is necessary to have a quality criterion of the compiled description.

In [3], the fee for job residence in the system is proposed as a criteria, and the best description in the system is obtained with a minimization of the total fee for residence of all requests in the system.

Such a job can be tackeld by methods of dynamic programming.

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ARCHITECTURE OF INFORMATION SOFTWARE OF A COLLECTIVE-USE AUTOMATED COMPUTER SYSTEM (SAVR KP) OF AN INSTITUTION OF HIGHER LEARNING

Novosibirsk TEZISY NAUCHNYKH SOOBSHCHENIY VSESOYUZNOY KONFERENTSII "VYCHISLITEL'NYYE SISTEMY, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA". MATERIALY KONFERENTSII. CHAST' 2 in Russian 1978 pp 113-115

[Article by I. A. Bashmakov and S. D. Kazaritskiy, Moscow]

[Text] The flow of jobs of a large vuz is distinguished by the great diversity of job types, their volumes, operational constraints on execution time, requirements on configuration of hardware and programming media etc. In the overall flow, packages of student jobs, the operational flow of institute management jobs (AIS/ASU VUZ), automated teaching jobs (ASO), large scientific and technical calculations, computer planning jobs (SAPR) can be specified. The basic time and volume characteristics of the job flow are briefly examined.

It has been proven advantageous to organize computer hardware of a large vuz by the principle of collective use, where the users are specific instructional, scientific and management subdivisions. Basic principles of planning SAPR KP of a vuz are considered.

A multicomputer hierarchical computer system forms the basis of a complex of SAPR KP hardware. The central computer complex includes a YeS-1060 computer and two YeS-1033 computers. The guiding principle of hardware design is the creation of an architectural hierarchy which guarantees a successive increase of resources.

The concept of a common organization of programming, information and linguistic support of SAVR KP is based on the hierarchical design of the above media and includes five architectural levels.

The zero level is the base for operation; it includes the computer operating system and packages of programs of general mathematical and general technical computations. The first level is formed by the data base and data base control media (SUBD); the second level includes problem-oriented programs. The third level are media and mechanisms for defining the sequence of execution of problem-oriented programs. The fourth level are control and dialog languages and their appropriate processors.

A necessary instrument for creating and operating programming support of VTs KP is a data base control system for creating and operating an intrasystems data base on a unified conceptual basis. The media of this SUBD should be put at the disposal of problem-oriented users to construct and interact with the applied data bases. Based on the mentioned use, SUBD should meet the following basic requirements:

1) permit operation with complex structural data;

2) provide media for nonprocedural handling of data as well as for interaction with data from applied programs written in traditional programming languages;

3) insure a high degree of procedural independence of data processing from changes in both logical and physical structures;

4) provide simple and convenient media for making changes in the logical structure of the data base;

5) provide methods of data organization which permit implementation of rapid access to any subset of data subset without regard to the degree of user knowledge of data organization details.

The enumerated requirements define the following architecture of SUBD VTs KP. The system must be based on a relational abstract model [1], which is gaining more and more sympathy from developers and users of SUBD. It is advisable that the system language be related to either the class of algebraic relationship languages or to the class of descriptive languages [2]. In order to insure the necessary response time, the system must utilize methods of access such as sector partitioning, which permits rapid multiple aspect access, in addition to standard methods of data organization. Realization of SUBD VTs KP should be done in accordance with the principle of modularity using methods of traditional modular and structural programming and the application of PL/1 and Assembler language (the latter is generally used for realizing comlex exchange operations).

A prototype of SUBD VTs KP can be the ADONIS system elaborated at the computer center of MEI, which is based on a relational abstract model of data. The system belongs to the class of systems with inherent algebraic relationship language and possible writing of applied programs in PL/1 and Assembler languages. The systems consists of 200 modules with an overall volume of about 20,000 instructions. The system has been used for about one and a half years to solve several informational and reference problems; in particular, the complex of programming support of ASU MEI is based on it. The use of the system permits a reduction in expenditures for realization of applied jobs by a factor of 5 or 6 and insures great flexibility in altered data structures and processing technology.

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SYSTEMS PROGRAMMING SOFTWARE OF THE VTsKP OF THE SIBERIAN SECTION OF THE USSR ACADEMY OF SCIENCES: DIRAK OPERATING SYSTEM FOR MINICOMPUTERS

Novosibirsk TEZISY NAUCHNYKH SOOBSHCHENIY VSESOYUZNOY KONFERENTSII "VYCHISLITEL'NYYE SISTEMY, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA". MATERIALY KONFERENTSII. CHAST' 2 in Russian 1978 pp 162-165

[Article by L. F. Laskin, S. P. Treskova and L. B. Efros]

[Text] The DIRAK operating system has been realized as a component of mathematical support of the Computer Center (the center) of Collective Use (VTsKP) developed at the VTs of the Siberian Section of the USSR Academy of Sciencesand is the operating system for minicomputers. DIRAK generally insures computer operations in time sharing modes, package and remote processing modalities. Minicomputers outfitted with DIRAK may be used as peripheral processing centers, because of the corresponding macrogeneration problem alignment of the DIRAK; a connected processor of a base computer complex; a communicating process of a data transmisison complex in a TSKP complex; and as an autonomous agency computer complex. The DIRAK sytem was elaborated for the M-7000 computer, but its planning and realization have proceeded under the assumption that it will be able to operate on the M-400 computer because of minimal restructuring required.

Two kinds of jobs can operate under control of the DIRAK system: all-purpose and packaged.

All-purpose jobs constitute a unified subject file in which the operating system does not distinguish any structural units. In the object file of such jobs, instructions, constants and working cells may be interchanged.

In packaged jobs, two zones are functionally differentiated: static (unchanging during execution) and dynamic (changing during execution). Package type jobs are capable of being repeatedly input.

When a job is inititated, the DIRAK operating system generates a process. The process is not the job itself, but a unitary execution of the job for a certain user in a certain time period. When the process is inititated, the job type is taken into account and the process of formed thereby.

One or more interactive processes being executed on a single computer and providing execution of one computer job is called a cluster.

Processes in the cluster have not relationship of subordination. An information (transmission and receipt of messages, work on common objects) and control (initiation, halting a process, synchronization of process operation, etc.) connection may be established between any processes in the cluster.

When cluster processes are executed, the operating system dedicates resources for this purpose (objects of operating system) which belong to the cluster, but not the discrete process.

The following are objects of the operating systems:

• peripheral I/O and data display devices. Exchange directives are defined on objects of this kind;

• working regions (regions of directly addressed memory which the operating system dedicates to the cluster only for its period of existence and over which zone exchange directives are defined);

• priority-expanded binary Deykstra semaphores in the critical interval for which P(S,) and V(S) operations are defined [1, 2];

• events for which directives "awaiting event", "declare event complete", "interrogate status of event" are defined;

• processes for which are defined directs of informational and administrative connection;

• information packages (memory fields dedicated to the cluster for its execution time and intended for storage and subsequent transmission of information to other computers of the network). Directives on information packages are defined for information entries in the package and transmisison of a package to another computer in the complex.

Systems objects are considered defined at the level of the cluster, but not at the process level. Within a cluster, the object appears after one (any one) of the processes has given the directive "form the object", having indicated the properties of the formed object and the possible non-zero mathematical name of this object. As a result of completion of the directive "form object", the operating system deletes the systems name of the formed object and returns it to the process.

For the object to be accessible to the process, the latter must give the instruction "open object", having indicated the mathematical or systems name of the opened object. In all subsequent instructions of operation with the objects, the process must utilize the systems name of the object.

The process loses the ability of working with the object after it has given the instruction "close object". The object vanishes from the cluster after one (any one) of the cluster processes has given the command "destroy object".

The process can use any object (where it would make sense) monopolistically, for which it must give the instruction "monopolize object". This directive halts all other processes attempting to utilize the monopolized object until arrival of the instruction "generalize object".

The DIRAK operating system is programmed in MASM macrolanguage [4] which possesses powerful macrogeneration media which insure, in particular, conventional macrogeneration controlled by attributes of the base language objects; this permits generation of a variant operating system from some all-purpose macroscheme with the minimum resource capacity and orientation to a specific class of problem-oriented programs or, in particular, to operation of computers in specific modes (as peripheral processing center, active time sharing, communicating process of data transmission network, etc.).

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SEKOP SYSTEMS PROGRAMMING SOFTWARE FOR DATA EXCHANGE FOR A COMPUTER NETWORK

Novosibirsk TEZISY NAUCHNYKH SOOBSHCHENIY VSESOYUZNOY KONFERENTSII "VYCHISLITEL'NYYE SISTEMY, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA". MATERIALY KONFERENTSII. CHAST' 2 in Russian 1978 pp 177-179

[Article by L. A. Grigor'yeva, V. I. Drozhzhinov, A. G. Zarubin and Yu. M. Kuznetsov, Moscow]

[Text] The SEKOP systems programming software for data exchange for a computer network [1, 2] contains transport stations (TS) and electronic mail clusters (KLP) of users (AB) in information processors (IP), as well as operating programs (OP) in network processors (SP). Electronic mail clusters, transport stations and operating programs form the network's electronic mail service [6]. Electronic mail insures data exchange between network users which are user processes and functional subsystems recorded at transport stations of those information processors where they occur [1, 2, 3].

From the viewpoint of users, electronic mail is a system of message (letter) commutation. From the viewpont of the transport stations, the multiplicity of operating programs represents a system of package commutation.

Data exchange control between users occurs in accordance with electronic mail protocols [3, 6]. The set of electronic mail protocols of SEKOP is shown in the form of a syntactic graph in Figure 1. Five of these protocols are basic, i.e., are independent of programming and hardware support of the network (TS-TS, KP-KP, (KP-KP), (TS-KP), /AB/TS), while the others are non-basic, because they are determined by the network's hardware, the programming medium of users, transport stations and operating programs, as well as by the programming medium of internal processes of AB, TS and OP.

Programs of TS and OP are organized in the form of totalities of internal parallel interactive processes whose execution is insured by functionally identical nuclei (monitors) [4]. With the use of a specially developed process monitor, this kind of organization becomes accessible for the user program [5].

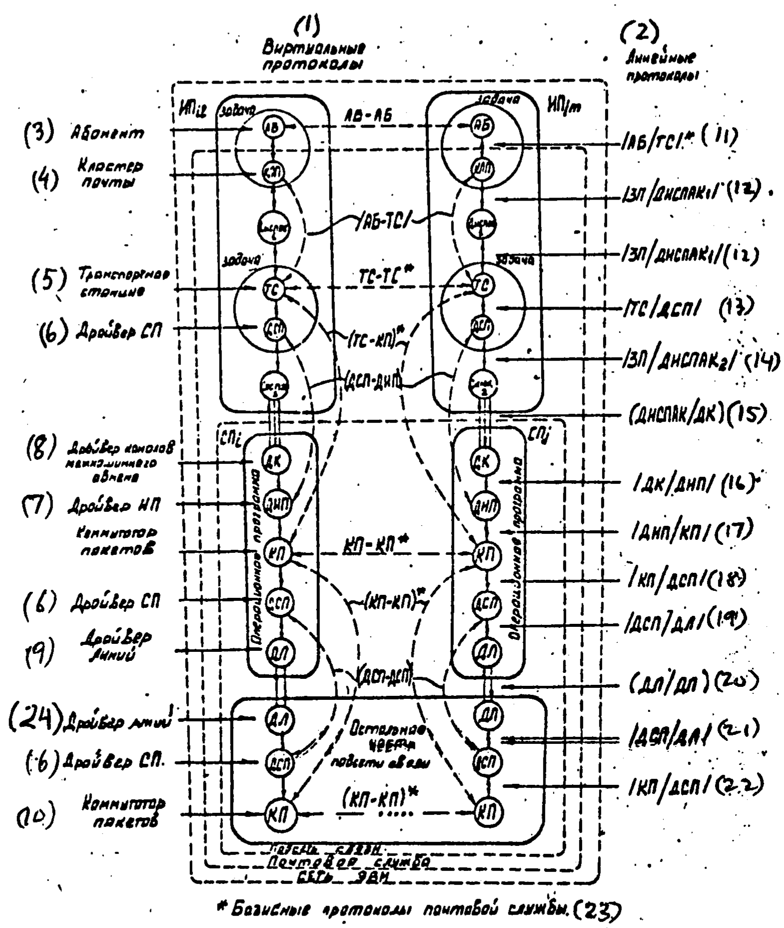

Figure 1. Syntactic Graph of Network.

Key:

1. virtual protocols
2. linear protocols
3. user
4. electronic mail cluster
5. transport station
6. SP driver
7. NP driver
8. non-computer exchange channel driver
9. line driver
10. package commutator
11. AB/TS
12. ZP/DISPAK$_1$
13. ZP/DISPAK$_1$
14. ZP/DISPAK$_2$
15. (DISPAK/DK)
16. DK/DNP
17. DNP/KP
18. KP/DSP
19. DSP/DL
20. DL/DL
21. DSP/DL
22. KP/DSL
23. basic protocols of electronic mail service
24. line driver

TS is executed as an independent user job under control of the BESM-6's DISPAK operating system; its volume constitutes 4,160 sentences in Astra language (after translation, 24,780 Bemsh autocode instructions). OP is executed on the M-6000 without using any standard OS, because these functions are realized by the OP nucleus. The volume of OP is 15,640 instructions of M-6000 mneumonic code.

The user (in most cases he is a systems programmer and elaborator of functional subsystems) is provided with a set of primitives permitting him to program data exchange in the network ("record user", "exclude user", "open port", "close port", "send message", "supply buffer for reception of messages", etc.)[5]. Primitives are macroinstructions in BEMSH autocode and are realized in the form of subroutines in Astra language, together forming an electronic mail cluster which enters, together with the monitor, into the user program. The electronic mail cluster subroutines insure interaction of the user with the transport station and essentially utilize the message exchange apparatus between DISPAK operating system jobs. The volume of the subroutine of electronic mail clusters is 990 sentences in Astra language (after translation, 5130 instructions in BEMSH autocode).

SEKOP electronic mail has been in prototype operation since December, 1977. Work is currently going on to enlarge its throughput in terms of the results of test operations.

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ORGANIZATION AND OPERATION OF COMPUTING FACILITIES

Moscow ORGANIZATSIYA I EKSPLUATATSIYA VYCHISLITEL'NYKH USTANOVOK in Russian 1980 signed to press 4 Jan 80 pp 2, 12-17, 108-111, 166-168, 181-188, 258-260, 276-279

[Annotation, table of contents and excerpts from book by Grigoriy Semenovich Zastenker, Lev Samoylovich Fel'dman and Svetlana Nikolayevna Pompeyeva, Izdatel'stvo Statistika, 13,000 copies, 279 pages]

[Text] In this textbook are described organizational forms for the computer processing of economic information and the content of production processes for the processing of data at VTs's [computing centers], MSS's [machine calculating stations] and MSB's [machine calculating bureaus]; questions are discussed, relating to the design-stage planning of computing facilities and to planning their production and business operations; estimates are given of the effectiveness of the mechanization of computing and accounting operations.

This book can be used by mechanized accounting personnel.

Chapter Two

Organizational Structure and Staff of Computing Facilities

The organizational structure of a VU [computing facility] depends on its production structure and on the standard structures and norms for the number of managerial and engineering and technical personnel and other VU-VTs, MSS and MSB specialists, as well as on the established list of duties of these personnel.*

The production structure of a VU is usually structured on the functional (technological) principle, whereby production subdivisions (departments,

*Official designations are provided in special tables (Nos 5 and 10) of a decree by the CPSU Central Committee, Council of Ministers and VTsSPS [All-Union Central Trade Union Council] adopted on 24 Dec 76.

bureaus, groups and sections) are created according to the principle of technological homogeneity and each subdivision performs only specific interrelated operations of the technological process of the mechanized processing of data, e.g., the preparation of machine data media and checking them, the compiling of cumulative data for computers, the evaluation and summation of the data of primary documents, sorting and tabulation and the like. Such a structure for a VU facilitates management of the production process, makes possible the best utilization of the work time of operators, both in each subdivision and for the VU as a whole, and also makes it possible to run computing equipment most efficiently, in particular, to have a minimum number of standby machines.

At large VU's the production structure can be structured according to the functional-category principle, which provides for a combination of the technological principle of structuring a VU with the category principle of structuring individual subdivisions and groups. The characteristic feature of the category principle is the specialization of subdivisions with regard to the processing of similar primary documents and the compilation of a specific list of reporting data. In connection with this, in a production subdivision is performed the entire cycle of technological operations for the mechanized processing of data, e.g., the writing of budgets, engineering and technical calculations, the recording of credits and pension payments, the writing out of invoices and statements and the like.

The structure and staffs of VU's--VTs's (IVTs's [computing and data processing centers]) and MSS's (IVS's [computing and data processing stations])--are established and approved by the managers of enterprises and organizations who have been given the right to approve staffs as applied to standard structures and norms for the number of managerial and engineering and technical personnel and specialists and employees developed by ministries and departments in agreement with trade union committees.

2.1. Typical Structure of a Computing Center

The organizational structure of a VTs (IVTs) operating on an independent balance sheet includes functional and production departments. The functional departments include the following: the management of the center (the director of the VTs, his deputies and the chief engineer), the accounting department, the economic planning department, the materials and equipment supply and operations maintenance department and the personnel department. With a number of individual workers at a VTs of less than five people, functional departments are not created and the specialists and employees are included in management and are subordinate directly to the VTs's management. The size of the staff of functional departments depends on the VTs's group with regard to the wages of management and engineering and technical personnel.

Production departments include the electronic computer operation and keyboard computer and punchcard computer operation departments, the department for the preparation and issuance of statistical data (at VTs's having the functions of gathering and processing statistical reporting data), the programming department, the development planning department for PVM's [punchcard computers] and KVM's [keyboard computers], the department for the organization of production and NOT [the scientific organization of labor] and the operations printing department. Depending on the nature and volume of work at a computing center, other production subdivisions can also be created, e.g., a department for the reception and transmission of data through communications channels. Production departments are created with a number of individual personnel of not less than 10; in large production departments having not less than 20 workers production bureaus are formed consisting of not less than five people.

The computer department is divided into the following production bureaus: algorithm development and programming (these bureaus can be specialized for solving economic, statistical or engineering and technical problems), a computer equipment servicing bureau, and a computer operation bureau. When a computer center operates in two or three shifts these bureaus can be converted into independent departments. The size of the staff of the computer department and its bureaus depends on the type of computers and the work shift system. As an example, in table 1 are given the typical structure and staff makeup of the production subdivisions of a YeS-1022 computer department.

Table 1.

With a single-shift work routine		With a two- and three-shift work routine		
Subdivision	Number of staff	Subdivision	Number of staff when working	
			In two shifts	In three shifts
Computer department				
Department manager	1			
I. Bureau for algorithm development and programming of economic and engineering and technical problems		I. Department for algorithm development and programming of economic and engineering and technical problems		
Bureau manager	1	Department manager	1	1
Senior programming engineer	3	Senior programming engineer	4	5
Programming engineer	3	Programming engineer	4	5

[Continued on following page]

		Senior technician	1	1
Total	7	Total	10	12
II. Bureau for algorithm development and programming of statistical problems		II. Department for algorithm development and programming of statistical problems		
Bureau manager	1	Department manager	1	1
Senior programming engineer	1	Senior programming engineer	4	4
Programming engineer	3	Programming engineer	4	5
		Senior technician	1	1
Total	5	Total	10	11
III. Computer equipment servicing bureau		III. Computer equipment servicing department		
Bureau manager	1	Department manager	1	1
Shift chief	1	Shift chief	2	3
Senior electronic engineer	1	Senior electronic engineer	2	3
Electronic engineer	2	Electronic engineer	3	4
Senior technician	1	Senior technician	2	2
Total	6	Total	10	13
IV. Computer operation bureau		IV. Computer operation department		
Bureau manager	1	Department manager	1	1
Senior programming engineer	1	Senior programming engineer	1	2
Programming engineer	1	Programming engineer	2	2
Computer operator (technician)	6	Computer operator	10	11
Total	9	Total	14	16
Grand total	28	Grand total	44	52

With the additional furnishing of a VTs with new computers the staff of these departments is increased, whereby with a three-shift computer operations routine the position of deputy department manager is added. Thus, for a second YeS-1022 computer the number of staff is increased in the following manner:

Table 2.

Subdivision	Number of staff when computers are operating		
	In one shift	In two shifts	In three shifts
I. Department for algorithmization and programming of economic and engineering and technical problems	5	7	9
II. Department for algorithmization and programming of statistical problems	3	5	8
III. Equipment servicing department	5	8	10
IV. Computer operating department	6	11	14
Total	19	31	41

The PVM and KVM department includes the following bureaus: the PVM operation bureau, the KVM operation bureau, and the PVM and KVM equipment servicing bureau. At large VTs's these bureaus can be converted into departments, whereby the PVM and KVM operating bureaus are united into a single production department. The PVM and KVM operation bureaus (departments) include, in addition to engineering and technical personnel, computer operators, and the equipment maintenance bureau (department) includes workers (mechanics).

The structure of departments for the preparation and issuance of statistical data is established by the superior organization in keeping with the approved structures for these subdivisions, and the number of senior economists and economists is determined in accordance with the standards for the duties performed by them.

Operations printing departments are divided into three groups depending on the amount of work. In departments of the first group are provided the positions of department manager, senior foreman and foreman; in departments of the second group, department manager and foreman; and of the third group, department manager.

The structure of a VTs (IVTs) forming part of an enterprise or organization is distinguished only by the fact that in it are absent such functional subdivisions as the economic planning department, the accounting department, the materials and equipment supply and operations maintenance department and the personnel department. The functions of these departments are performed by the respective subdivisions of the enterprise's or organization's management apparatus.

2.2. Typical Structure of a Mechanized Accounting Station (MSS)

Mechanized accounting and computing and data processing stations are divided into four groups in terms of structure and rules for the number of managerial and engineering and technical personnel and employees. MSS's and IVS's are placed in an individual wage group as a function of the annual work volume, in keeping with the indicators presented in table 8.

Table 8.

Wage group	Annual work volume, million rubles
I	Over 150
II	Over 75 to 150
III	Over 40 to 75
IV	From 20 to 40

Stations of group I and II have a section structure, and of groups III and IV a sectionless structure. At stations of group I three sections are created: a PVM section, a KVM section and a computer equipment servicing section; at stations of group II the first two sections are united into a single PVM and KVM section and the computer equipment servicing section is added with a two-shift work routine or with the existence of several branches.

In table 3 are presented as an example standard structures and norms for the number of managerial and engineering and technical personnel and other MSS (IVS) specialists in the USSR TsSU [Central Statistical Administration] system.

Table 3.

Positions	Standards for number of managerial and engineering and technical personnel and other MSS (IVS) specialists			
	Group I	Group II	Group III	Group IV
I. Administration				
Director	1	1	1	1
Chief engineer	1	1	-	-
Deputy director for statistics	1	1	1	1

[Continued on following page]

Senior engineer-economist for planning and norm setting	1	1	1	-
Chief accountant (senior accountant with authority of chief accountant)	1	1	1	1
Accountant	1	1	-	-
Cashier	1	-	-	-
Senior personnel inspector	1	1	-	-
Personnel inspector	-	-	1	-
Equipment manager (with duties of stockroom manager)	1	1	1	1
Secretary-typist	1	-	-	-
II. PVM section				
Section chief	1	-	-	-
Shift chief or senior engineer (for single shift)	1	-	-	-
Engineer (for single shift)	1	-	-	-
Senior technician (for single shift)	1	-	-	-
Technician (for single shift)	1	-	-	-
III. KVM section				
Section chief	1	-	-	-
Shift chief or senior engineer (for single shift)	1	-	-	-
Senior technician	1	-	-	-
Technician	1	-	-	-
IV. PVM and KVM section				
Section chief	-	1	-	-
Shift chief or senior engineer (for single shift)	-	1	1	1
Engineer (for single shift)	-	1	1	-
Senior technician (for single shift)	-	1	-	-
Technician	-	-	1	-
V. Computer equipment maintenance section				
Section chief	1	-	-	-

[Continued on following page]

Senior engineer	-	1	-	-
Engineer	-	-	1	-

At an MSS (IVS) below group IV, i.e., with a total work volume of 20,000 rubles per year and lower, only the positions of station chief and accountant are added. The position of deputy station director for statistics exists only at VU's performing the functions of preparing and issuing statistical reporting data, e.g., at IVS's of state statistical agencies.

For the purpose of planning operations and creating technological processes for mechanized processing at MSS's (IVS's) senior engineer and engineer positions can be added: for group I up to three people; for groups II and III up to two people; and for group IV, one person. In addition, for the purpose of checking and issuing tabular accounting forms, the position of economist can be added for each four PVM combinations.

At large self-supporting MSS's (IVS's) of group I, with the permission of the superior organization departments can be created, both production (planning, etc.) and functional (economic planning, materials and equipment supply, etc.), and their personnel should number not less than five people. At self-supporting MSS's (IVS's) of groups I and II can also be organized departments and bureaus for the preparation and issuance of statistical data; their structure and number of personnel are determined by the superior organization which has been given the right to approve the staff assignments of these stations.

Branches of MSS's (IVS's) have a sectionless structure. The number of engineering and technical personnel of branches is established similarly to the established number of engineering and technical personnel of IVS's and MSS's of the corresponding groups--according to the volume of work done--with the exception of the positions indicated in the "Administration" section. The positions of senior accountant, accountant, cashier and senior personnel inspector (inspector) are not included on the staff of stations financially accountable to enterprises and organizations.

6.3.3. Creation and Operation of Complexes for the Electronic Processing of Statistical Information

In the USSR TsSU system has been created and put into operation the first phase of the Automated System for State Statistics (ASGS). The ASGS represents a system for gathering and processing reporting and statistical information necessary for planning and controlling the national economy, making possible the extensive application of mathematical economic methods, electronic and other computing equipment, as well as office systems equipment and communications facilities at state statistical agencies.

The ASGS is one of the main functional components of the Statewide Automated System for Gathering and Processing Data for Accounting, Planning and Controlling the National Economy (OGAS).

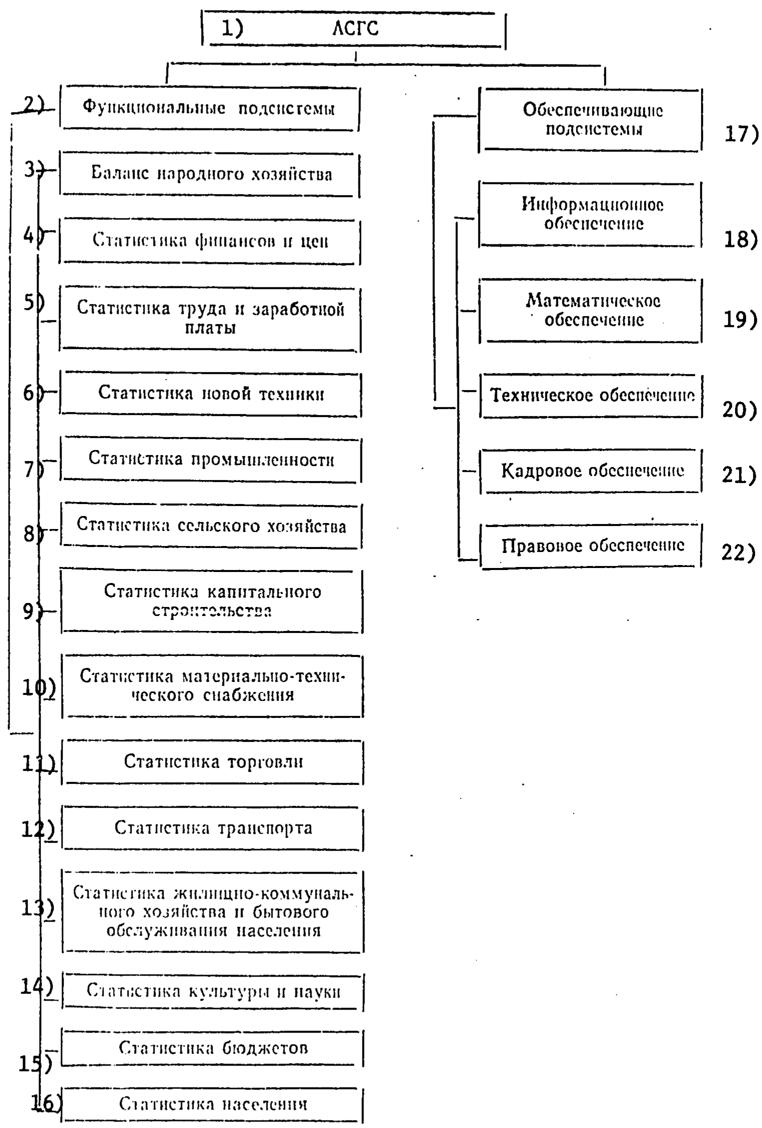

Figure 3. Functional and Support Subsystems of First Phase of ASGS

[Key on following page]

Key:

1. ASGS
2. Functional subsystems
3. National economic balance
4. Financial and price statistics
5. Labor and wage statistics
6. New equipment statistics
7. Industry statistics
8. Agriculture statistics
9. Capital construction statistics
10. Materials and equipment supply statistics
11. Trade statistics
12. Transportation statistics
13. Statistics on housing and public utilities and personal services
14. Statistics on culture and science
15. Budget statistics
16. Population statistics
17. Support subsystems
18. Data support
19. Software
20. Hardware
21. Personnel support
22. Legal support

The interbranch and multilevel (Union, republic, oblast and rayon levels) structure of the ASGS corresponds totally to the organizational structure of state statistics agencies built on the administrative-territorial principle, which makes it possible to furnish with statistical data all branch and territorial agencies for controlling the country's national economy. The first phase of the ASGS consists of functional and support subsystems (fig 3).

By a functional subsystem of the ASGS is meant a combination of statistical work united by a common object of statistical research and expressed by a system of interrelated indicators characterizing the status and development of this object. In the first phase of the ASGS have been developed and put into operation 14 functional subsystems.

Support subsystems of the ASGS are designed for the normal operation of both individual functional subsystems and technological processes and of the entire system as a whole.

Support subsystems of the first phase of the ASGS include the following:

Data support--classifiers and systems of designations unified for the USSR TsSU system, statistical reporting documentation and a system of statistical indicators.

Software--standard software of "Minsk-22" and "Minsk-32" computers, unified software of systems complexes for the electronic processing of statistical data, as well as the software of local complexes for the electronic processing of statistical data.

Hardware--the equipment complex.

Personnel support for the ASGS.

Legal support--the combination of legal standards establishing and fixing the procedure for the organization of the ASGS, its goals, objectives and the legal status of all components of the ASGS.

The functional subsystems of the first phase of the ASGS number 46 system and 106 local complexes for the electronic processing of statistical data (KEOSI's).

A KEOSI represents the unification of a number of statistical operations related by a uniform economic and statistical content, unified methods of processing data and a unified software and production and hardware base.

For example, the first phase of the ASGS includes for the functional subsystem "Budget Statistics" a single system complex for the electronic processing of statistical data--"Routine Processing of Data of a Survey of the Population's Finances." This complex was developed by the scientific research institute of the USSR TsSU and the Uzbek SSR RVTs [Republic Computing Center]. It covers about 100 percent of statistical data on family budgets. Because of the introduction of this complex, for the first time in the practice of developing budgets a characterization of the population has been gained in relation to mean-head combined income. Prior to the transition to electronic processing, a calculation of the combined income of families was not made because of the labor intensiveness.

Included in the structure of the functional subsystem "Materials and Equipment Supply Statistics" are five KEOSI's characterizing the state of the materials and equipment supply of industries of the national economy:

Reports on surpluses, delivery and consumption of fuel (form No 4-sn).

Reports on surpluses, delivery and consumption of raw material and materials in production and operating activities (form No 1-sn).

Reports on surpluses, delivery and consumption of materials in capital construction (form No 2-sn).

Reports on joint deliveries of cast iron, steel and non-ferrous metal castings, forgings, stampings and articles made of plastic (form No 5-ps).

Lists of noninstalled equipment (forms No NO-1 and NO-2).

Information of these KEOSI's makes up about 40 percent of all statistical data.

The introduction of these KEOSI's has made the following possible: to reduce the time for processing reports on form No 1-sn by 25 days and on form No 5-ps by 10 days; to produce in addition a territorial cross section for three complexes; to shorten the time for checking incoming and outgoing data.

Included in the structure of the functional subsystem "Industry Statistics" are 19 system KEOSI's.

Included in the structure of the functional subsystem "Agriculture Statistics" are two system KEOSI's whose performance has made it possible to gain statistical data characterizing the status, development and efficiency of agriculture, etc.

A KEOSI is based on integration of the gathering and processing of statistical data at all levels of the system, which makes it possible to reduce to a minimum the amount of data to be entered by eliminating redundant relative indicators in primary documents.

The creation of a KEOSI takes place in the following stages: Formulation of the problem and unification of forms and tables; creation of the engineering assignment; the development of software; and the introduction of the KEOSI at a computing center of the USSR TsSU system.

8.8. Requirements for the Location of a Computing Facility

In the computer room are provided double floors for the purpose of using the space between them as a continuous ventilation duct or for accommodating continuous air ducts or for laying power cables, switching system wires and grounding lines. The height of this space equals 200 to 600 mm. The upper side of the floor is covered with linoleum or parquet. The unit load on the floor must not exceed 450 to 470 kg/m^2.

It is recommended that the ceilings of computer rooms be of the suspended design. The sectional suspended ceilings used are easily taken apart if necessary. The space formed between the overhead floor and the suspended ceiling is used as a ventilation duct and for accommodating air ducts, power cables, the fire extinguishing system and lighting equipment. The construction and sound absorbing materials of the suspended ceiling must not release dust. The distance between the main and suspended ceiling equals 500 to 800 mm.

The walls in computer rooms are covered with sound absorbing panels. The noise level in production areas (measured with a special noise meter) must not exceed 65 dB.

For the purpose of reducing the level of production noise (in addition to the acoustic insulation of walls and ceilings and the use of suspended ceilings) it is necessary to install computers, machines and other equipment creating noise and vibration on special foundations. Here it is necessary to use shock absorbers made of special elastic materials. For example, under table-top computers it is necessary to place soft mats made of synthetic materials, or felt pads covered with oil cloth or wrapped in a cellophane film, and under the legs of tables on which computers are placed, pads made of soft rubber 6 to 8 mm thick. A reduction in noise level is achieved also by the proper adjustment and timely lubrication of the mechanical parts of machinery, motors and fans and by checking the mountings of moving parts and protective panels on individual assemblies of computers, machines and other VU [computing facility] equipment.

In computer rooms, for the purpose of protecting from dust, are employed windows with hermetically sealed glass. For the purpose of protecting from the heat of solar radiation, between window openings are installed moving blinds.

In all production areas there must be adequate natural light. Work places and equipment are situated so that the light will fall on the left side. It has been observed that with natural lighting the labor productivity of operators is considerably better than with artificial. However, since natural lighting has a number of disadvantages (it varies depending on the time of year and day and is nonuniformly distributed in individual sections of large rooms), in production areas artificial lighting is often employed, which must meet the following key requirements: be adequate in terms of the level of illumination of the area and of the evenness of illumination, make possible the proper selection of light sources, protect the human eye from direct beams of light and reflected highlights, and make possible an efficient distribution of light in the room.

A standards document on artificial lighting has established appropriate health standards for illumination, for the determination of which is employed a special instrument--the luxmeter. For example, the following illumination norms are provided for a combined illumination system (ceiling, walls and work place of operators): when fluorescent lights are employed, 750 lx, and incandescent bulbs, 600 lx.

Air conditioning units must provide a supply of air with the required temperature, humidity, purity and flowrate for the purpose of creating normal conditions for the operation of computers and for operating personnel. The optimal temperature in the computer room should be in the range of $20 \pm 2°$ C. The instrument for continuous recording of the temperature of the ambient air is a thermograph. It is recommended that the humidity of the air in the room be maintained within the range of 55 ± 5 percent. Hygrographs are used for the purpose of determining continuous changes in relative humidity of the air. The atmospheric pressure must be at a level of 760 ± 30 mm Hg.

The creation of a stable artificial climate is called for also in areas where large amounts of punched tape, magnetic tape and magnetic disks and punched cards are stored, e.g., in the norms and permanent card file department. In this area the temperature and relative humidity of the air must also be held constant.

For the purpose of reducing the concentration of dust in computer rooms, operating personnel should work in smocks made of nylon, Lavsan, etc., and in lightweight spare footwear. The dust concentration in the computer room must not exceed 0.5 mg/mm^3 and the gas concentration, 2 ml/m^3. Smoking is prohibited, since particles of ash settling on the surface of magnetic tape cause malfunctions in the operation of a computer.

9.2. Organization of Wages

Increasing the personal interest of workers in the results of their work is a highly important principle of the organization of wages under conditions of advanced socialism. For the purpose of implementing this principle for several years a great amount of work has been done with regard to regulating wages in industry and in other sectors of the national economy: There has been an increase in the minimum wage of workers and employees with a simultaneous increase in official pay rates and pay scales for middle-scale categories of workers, there has been an increase in the share of wage rates in the total earnings of workers, and measures have been taken for the regulation of norm setting for labor, the introduction of unified interindustrial and industrial output norms and the like.

In December 1976 new stipulations were added for the wages of VTs and station personnel, calling for a raise to 70 rubles per month for the minimum wage for workers and employees and for an increase in official salaries for managerial and engineering and technical personnel and other specialists, employees and junior service personnel and computer operators and in the hourly wage rates for equipment servicing and repair workers.

9.2.1. Wages for Managerial and Engineering and Technical Personnel

The official salaries of managerial and engineering and technical personnel of VTs's (IVTs's) which are self-supporting have been established for three groups based on the functions and volume and complexity of work performed by a VTs. A VTs (IVTs) is placed in one or another wage group according to the following indicators (table 7):

Table 7.

Wage group	Annual work volume, million rubles
I	Over 1.0
II	Over 0.4 to 1.0
III	From 0.1 to 0.4

In determining the work volume of a VTs (IVTs) the following correction factors are employed: for the total work volume--for VTs's accomplishing the introduction and improvement of an automated control system, as well as for VTsKP's [collective-use computing centers] and multiple-user computing centers providing for the processing of data for automated control and planning systems--1.3; for the amount of operations work which must constantly be done within strictly definite time periods set by a superior organization or which must guarantee the efficient management of production operations--1.2; and for the amount of work relating to the introduction of optimization problems--1.3; etc. In the work volume of republic and oblast VTs's (IVTs's) performing the functions of controlling computing work in an ASSR [autonomous Soviet socialist republic], kray or oblast, e.g., the USSR TsSU system, in determining the wage group for managerial and engineering and technical personnel is included 30 percent of the work volume of independent rayon VTs's (IVTs's) and MSS's (IVS's).

Wages for managerial and engineering and technical personnel of IVS's and MSS's are structured according to four groups based on the extent and complexity of the work. IVS's and MSS's are put into one of four wage groups according to the indicators in table 8 [cf. sec 2.2 above].

IVS's and MSS's included in the structure of enterprises, organizations and institutions are placed in one managerial and engineering and technical personnel wage group lower than that provided for VU's which are self-supporting with a corresponding work volume.

Wage groups for managerial and engineering and technical personnel of VTs's (IVTs's), IVS's and MSS's are established no more often than once a year on the basis of annual plan figures.

The monthly official salary for an MSB chief is set independently of the volume and nature of the MSB's work. Set similarly are the official salaries of employees and junior service personnel of computing facilities.

The official salaries presented in tables 9 and 10, respectively, have been set for managerial and engineering and technical personnel and other specialists of VTs's (IVTs's) which are self-supporting and of IVS's and MSS's.

Table 9.

Position	Monthly official salary for VTs group, in rubles		
	I	II	III
Director (chief)	240-260	220-240	190-210
Deputy director (chief), chief engineer	210-230	200-220	180-200
Production department manager	200-220	180-220	175-185
Managers: bureau (group) in a production department or economic planning department;			

[Continued on following page]

chief accountant of a republic (kray or oblast) computing (computing and data processing) center to which is subordinate a network of computing centers and computing and data processing and mechanized accounting stations	180-200	175-190	170-180
Economic planning department manager	165-175	155-165	-
Chief accountant (senior accountant with authority of chief accountant)	165-175	155-165	145-155
Managers of the materials and equipment supply and personnel departments and department No 1	155-165	145-155	-
Operations department manager	110-120	-	-
Chiefs: computer and shift	170-180	170-180	170-180
Senior personnel: programming engineer, mathematician, electronic engineer	165-175	165-175	165-175
Senior personnel: engineers in other fields of specialization, economist, mathematician, programming engineer, electrical engineer	140-165	140-165	140-165
Engineers in other fields of specialization, economist, legal adviser of republic (kray or oblast) computing (computing and data processing) center	115-150	115-150	115-150
Senior technicians in all fields of specialization	100-125	100-125	100-125
Technicians in all fields of specialization	90-115	90-115	90-115

Notes:

1. The official salaries for deputy department chiefs of VTs's (IVTs's) have been set 10 to 20 percent lower than the official salaries of corresponding managers.

2. The official salaries for managers and engineering and technical personnel of VTs's (IVTs's) of enterprises and organizations in industry, transportation and communications have been set at the scales provided

for personnel of automated production control system departments and of computing and data processing centers of the respective sectors, and at enterprises, institutions and organizations of non-production sectors of the national economy, provided for personnel of light industry enterprises.

3. The wages of personnel of VTs's (IVTs's) created as part of scientific research institutions and design, technological, planning and research organizations are set in keeping with the stipulations presented above in the table. Here the official salary of a VTs (IVTs) director is set at the salary level of the deputy director of a VTs which is self-supporting, and the official salary of the production department manager, at the wage level of a bureau (group) manager.

4. The official salaries of management personnel of collective-use computing centers and of main computing centers of USSR ministries and departments and all-Union industrial associations whose work volume is twofold and greater than the work volume set for VTs's of group I have been increased by 10 to 15 percent.

Table 10.

Position	Monthly official salaries for IVS and MSS groups, rubles			
	I	II	III	IV
Chief (director)	185-220	175-185	165-175	155-165
Deputy chief (director), chief engineer	165-175	155-165	145-155	130-155
Department managers: production; economic planning at a republic (ASSR), kray or oblast station planning the operations of a network of urban and rayon stations and centers	155-165	145-155	-	-
Chief accountant of a republic (ASSR), kray or oblast station managing the total balance sheet for a network of urban and rayon stations	155-165	145-155	-	-

[Continued on following page]

Section chiefs: keyboard computer, punch-card computer, calculating machine and equipment servicing	155-165	145-155	-	-
Economic planning department manager	145-155	145-155	-	-
Chief accountant (senior with authority of chief accountant)	145-155	145-155	135-145	125-135
Department managers: materials and equipment supply, personnel and No 1	135-145	-	-	-
Shift chief; senior personnel: engineers in all fields of specialization, economist	130-155	130-155	130-155	130-155
Engineers in all fields of specialization, economist	105-145	105-145	105-145	105-145
Senior technicians in all specializations	100-125	100-125	100-125	100-125
Technicians in all specializations	90-115	90-115	90-115	90-115

Notes:

1. The official salaries for the director of an IVS or MSS with a work volume lower than the volume provided for stations of group IV, as well as of an MSB director, have been set at 130 to 155 rubles per month.

2. The official salaries of branch managers have been set at the salary level provided for directors of IVS's and MSS's with the corresponding work volume.

For purposes of strengthening the material interest of VTs (IVTs), IVS and MSS personnel in improving the efficiency of utilizing computer technology, speeding the development and introduction of automated control systems, improving labor productivity, and reducing the cost of computing work and data services, a standard rule has been approved which provides for rewarding these workers for the fulfillment within the time periods set of the quarterly plan and work list and for not exceeding and lowering the planned cost of operations. For fulfillment of the plan within the time period set and for not exceeding the planned cost of operations has been provided a bonus to the extent of 30 percent of the monthly official salary, and for each percentage point of cost reduction, of

10 percent of the official salary. Bonuses are awarded upon the condition of high quality of the work performed.

When the established norm is exceeded for the mean 24-h-period workload of equipment, the size of the bonus to managers and engineering and technical personnel and employees of VTs's (IVTs's) for the fulfillment of quotas is set for individual indicators by taking into account the extent to which this norm is exceeded, but to equal not more than 60 percent of the monthly official salary.

The total of bonuses paid to a single worker for all indicators must not exceed on a monthly basis the monthly official salary, or 1.2 times the official salary for the results of work for a quarter.

The list of positions of engineering and technical personnel and employees of VU's who are rewarded according to this standard rule is approved by the manager of the organization by agreement with the trade union committee. Other engineering and technical personnel and employees of VU's can be rewarded for the timely and high-quality fulfillment of quotas set by them upon fulfillment of the indicators and bonus conditions used for managerial and engineering and technical personnel and employees of the organization's administrative apparatus or of corresponding structural subdivisions to an extent of 0.8 times the bonus paid according to the standard rule (as a percentage of official salaries).

According to the standard rule, taking into account specific objectives and working conditions, ministries and departments by agreement with the respective trade union agencies can approve industry recommendations for rewarding VU personnel. On the basis of the standard rule and industry recommendations, managers of computing centers and stations develop and approve, by agreement with trade union committees, rules for rewarding the personnel of organizations.

The rewarding of managerial and engineering and technical personnel and employees of non-self-supporting VTs's (IVTs's), IVS's and MSS's financially accountable to enterprises (organizations) is carried out according to the stipulations provided for personnel of these enterprises (organizations).

9.2.2. Wages for Workers (Mechanics) Repairing and Servicing Equipment

Wages for workers (mechanics) repairing and servicing VU [computing facility] equipment are structured according to a time rate plus bonus or piece rate system on the basis of the following hourly wage rates (table 11):

Table 11.

	Categories (wage rate in kopecks)					
	I	II	III	IV	V	VI
For piece rate workers	43.3	47.1	51.2	56.6	63.7	74.2
For time rate plus bonus workers	40.4	44.0	47.9	53.0	59.6	69.3

For purposes of strengthening material interest, improving the efficiency of the operation of computers and improving qualitative work indicators of VU's, time rate plus bonus workers involved in work relating to the repair and servicing of equipment of VU's which are self-supporting or financially accountable to ministries, departments, institutions and construction organizations can receive bonuses. Bonuses are paid for the high-quality performance of work on time or ahead of time to the extent of 25 percent of the wage rate and upon the condition of a guarantee of continuous operation of the equipment and completion of the schedule set for its repair for the section (subdivision) serviced. These bonuses are computed in terms of monthly work results for actual time worked.

Workers (mechanics) repairing and servicing equipment of VU's financially accountable to enterprises (organizations) are given bonuses according to the stipulations established for repair and tool shop (workshop) workers of these enterprises (organizations).

9.2.3. Wages of Operators

Two main forms of wages exist for VU operators: piece rate, whereby the total earnings of an operator are in direct relationship to the amount of work done and the level of his skills, and time rate plus bonus, whereby wages are determined by the work time of an operator and his skills.

The predominating form of wages for operators is the individual piece rate wage, since in this case are solved to the maximum extent problems relating to increasing labor productivity, stimulating the more efficient utilization of computers, improving the organization of labor and increasing the professional level of operators. The piece rate wage system for VU operators has been introduced by agreement with trade union organizations and is being carried out on the basis of interindustrial unified and local output norms. Piece rate calculations are determined on the basis of minimum rates established for operators, and when payment is in keeping with interindustrial unified output norms or more progressive labor cost norms, with a 10 percent increase in these rates.

The following monthly rates have been established for wages for VTs (IVTs), IVS, MSS and MSB operators: operators of category I--90 to 100 rubles, operators of category II--80 to 85 rubles and computer operators--100 to 125 rubles. Here operators of category I are paid wages for performance of the following operations: punching and verifying punching with verifiers, tabulation of all kinds, working on billing and accounting machines, adding summary figures with the folding and collating of tables, work relating to verifying addition and computations, computations relating to engineering and design calculations, working with mathematical handbooks (tables), and verifying tabulated forms for a primary check and issuance; operators of category II--sorting (grouping), addition, computations, and preparation of documents for mechanized processing; computer operators--initiating the data processing process from a computer control console according to operating instructions, entering data into the computer from data media and directly from data transmission equipment and reading it out of the computer, preparing data media by using data preparation equipment (UPDK's [devices for data preparation on punched cards] and UPDL's [devices for data preparation on punched tape]) and other similar operations.

The basis of organization of the piecework system of wages is the rate, which represents the total wages paid for the performance of work in specific units of measurement, e.g., for 1000 operations, 100 rows or a graph row, 1000 card runs and the like. The size of the rate is determined by the equation:

$$R = SK/N ,$$

where R is the rate, S is the hourly rate of the operator, K is the number of units for which the rate is established, and N is the output-per-hour norm.

In keeping with the socialist principle of payment for quantity and quality, it is advisable to construct a piece rate wage system for operators in such a manner that it will take into account not only quantitative indicators (output), but also qualitative. In practice are employed several variants of encouragement for high work quality and for limiting rejects in keeping with labor legislation. One of these variants consists in the fact that the rate is established in relation to the percentage of errors committed by an operator: If the percentage of errors equals the established limit (set in relation to the nature of the technological operation), wages are paid according to an average rate, and if it exceeds the established limit, wages are paid at reduced rates, and if it is below the established limit, at increased rates.

The most skilled operators of computers and adding machines do their work without errors, i.e., the flawless output of work with the first presentation. As a result there is no need for a repeated (check) calculation. For the purpose of encouraging error-free work on keyboard computing and adding machines and for dispensing with repeated calculations in connection with this, increased piece rates have been established for computation and addition operations performed without repeated calculation; this compensates the additional expenditures of time of operators for a logical check of operations performed. This kind of organization of work on computing and adding machines substantially improves the labor productivity of operators, shortens the expenditure of time for the arithmetic processing of documents and reduces operating costs on account of a reduction in consumption of the wage fund (upon condition of an increase in wages of operators).

The time rate plus bonus wage system for operators should be employed only in those operations of the production process which are not subject to or are insufficiently subject to norm setting, e.g., in the operations of collecting documents and data media, tending to card files and tape files, operations at the computer console and the like.

Operators of electronic, punchcard and keyboard computers can receive bonuses for the fulfillment of standardized quotas for volume of work upon the condition of the observance of established requirements for quality and work deadlines, to the extent of 20 percent of the wage rate, and for each percentage point of overfulfillment of these quotas, to the extent of one percent of the wage rate.

15.4. Aspects of Calculations for Jobs Done by Computing Centers

Computing centers furnished with computers, in calculations with customers for work performed, are guided by price list No U-01 (decree of the USSR State Committee on Prices in 1978).

Its effect extends to all computing centers regardless of their departmental subordination, as well as to other organizations having general-purpose computers.

In the prices list's prices are taken into account expenditures associated with the maintenance of personnel for servicing computers and using standard software, with the amortization of equipment and costs for materials, electric power and the leasing of space, and administrative management costs.

If computing centers are supplied with imported models of computers, then they use rates established for domestic machines which are similar in terms of utilization parameters. The following rates have been established for one machine hour of operation of a computer (in rubles):

"Minsk-22," "Ural-14"	30
M-222, "Minsk-32," BESM-4, "Ural-16"	35
M-6000 (combination No 3)	35
YeS-1020	70
YeS-1022, YeS-1030, M-4030	85
YeS-1033	90
YeS-1040	110
BESM-6	100

In addition, rates have been approved (by a 1976 order of the USSR TsSU) for one machine hour of operation of the following computers for the USSR TsSU computing system (in rubles):

M-5000	35
"Ural-11"	30
GE-115	30
"Nairi-K"	9
"Tsellatron-S8205"	9

The price list's rates take into account the utilization of the entire computer combination. If necessary, when the solution of a problem requires the employment of additional equipment for the main combination of computer hardware, the cost of one machine hour of operation of this equipment (T_{dop}) is determined by the equation

$$T_{dop} = T_{osn} \cdot \Sigma S_{dop} / S_{osn} ,$$

where T_{osn} is the cost of one machine hour of the main computer combination, S_{dop} is the cost of additional equipment, and S_{osn} is the cost of the main computer combination.

Provided in the price list are surcharges (discounts) as a percentage of the basic rate for the performance of additional services. For example, a VTs receives a surcharge equal to 15 percent of the rate for one machine hour of utilization of a computer (T_{osn}), when opening, for example, to customers free access to software and data transmission control equipment. Charges are also provided for maintaining and servicing a customer's software and data (five percent), for the expansion of standard software (five percent), for making calculations within 24 h from the moment of presentation of raw data (two percent), etc. For making calculations and producing results at night a discount is provided for (15 percent). Thus, the total cost of one machine hour (T_{poln}) of the computer used and additional equipment, taking into account the additional services offered, is calculated according to the equation

$$T_{poln} = T_{osn} + T_{dop} + T_{osn} \cdot \Sigma N/100 ,$$

where N is the surcharge or discount as a percentage of the basic rate for the individual kind of additional service.

Let us consider as an example the determination of the total cost of one machine hour of operation of a YeS-1022 computer.

Raw data: the cost of the basic combination of the YeS-1022 computer equals 380,000 rubles (S_{osn}); the rate for one machine hour of operation of the YeS-1022 computer is 85 rubles (T_{osn}); the cost of the additional equipment required for performing calculations, for the main YeS-1022 combination, equals: magnetic tape storage--4200 rubles (S_{dop}), punchcard input unit--10,000 rubles (S_{dop}).

Additional services offered to the customer include: expansion of the standard software--five percent; the performance of calculations within 24 h from the moment of the presentation of raw data--two percent.

Remarks: 1. The cost of the basic YeS-1022 computer combination as well as of the additional equipment for it (the magnetic tape storage and punchcard input unit) is indicated on the basis of price list No 17-08, "Wholesale Prices for Computer Equipment."

2. The rate for one machine hour of operation of the YeS-1022 computer and the surcharges on the basic rate for the performance of additional services have been set according to price list U-01 for computing center services.

On the basis of these data a calculation is made of the cost of one machine hour of operation of the additional equipment used:

$$T_{dop} = [85\cdot(4200 + 10{,}000)]/380{,}000 = 3.18 \text{ rubles} .$$

The total cost of one machine hour, taking into account the additional services offered, equals:

$$T_{poln} = 85 + 3.18 + [85\cdot(5 + 2)]/100 = 94.13 \text{ rubles} .$$

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[342-8831]

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ABSTRACTS FROM 'AGGREGATION, CONTROL AND DIAGNOSIS OF COMPUTER SYSTEMS'

Kiev AGREGATIROVANIYE, KONTROL' I DIAGNOSTIKA VYCHISLITEL'NYKH SISTEM in Russian 1978, 400 copies, "Naukova dumka," pp. 188-196

UDC 681.31:323

ON THE ISSUE OF CREATING SURVIVABLE STRUCTURES

[Abstract of article by Dodonov, A. G., and Pelekhov, S. P.]

[Text] Gives an analysis of existing architectures of parallel computers from the point of view of their survivability. Proposes a new methodology from the point of view of the construction of parallel computer structures with higher indices of survivability.

UDC 681.3.001.57

ON THE EFFECTIVENESS OF THE MEMORY ORGANIZATION OF MULTIPROCESSOR COMPUTER SYSTEMS

[Abstract of article by Kramskoy, V. V., Nebukin, A. I. and Shnurko, N. G.]

[Text] Examines a mathematical model of a matrix multiprocessor computer system, whose general purpose processors contain their own memories. Cites performance results of such systems, obtained through modeling. The advantages of the use of self-contained memories in general purpose processors are demonstrated.

UDC 681.32:62.50

AN INTERACTIVE SYSTEM OF AUTOMATED DESIGN (ISAP)

[Abstract of article by Zabar, S. S.]

[Text] The basic principles of the construction of an interactive system of automated design in radioelectronics are considered; the basic functions of the system are defined; the characteristics of the object being designed are examined; technical means are selected. The functional possibilities of the system are analyzed, levels of information storage and the design library are described, a description of means for users to communicate with the computer in the system and the practical results of the work are given.

UDC 681.142.4

ON THE EVALUATION OF THE EFFECTIVENESS OF CERTAIN STRUCTURES OF MULTIPROCESSOR SYSTEMS

[Abstract of article by Glukhoy, Z. Sh., Kramskoy, V. V. and Shnurko, N. G.]

[Text] Considers three structures of multiprocessor systems, consisting of modules of processors, memories and switches--matrix, trunk line and matrix-trunk-line. Investigates the performance and efficiency of these structures as a function of the number of modules of processors and memories, and also of the ratios of the modules' speeds. Gives recommendations for the use of each of the structures.

UDC 681.3

THE INTERFACE OF A SYSTEM FOR COLLECTING AND PROCESSING MEASUREMENT DATA

[Abstract of an article by Logvina, N. I., Oleynik, A. V. and Khoroshko, V.A.]

[Text] Considers the organization of the interface of a multichannel system for collecting and processing measurement data which provides for communication between peripherals and the digital computer, and vice versa. Describes compound communication which includes programmed as well as non-programmed synchronous and asynchronous communication.

UDC 681.3.06:51

DETERMINATION OF THE OPTIMAL SIZE OF A SLICE IN MULTIPROCESSOR SYSTEMS WITH TIME SLICING

[Abstract of article by Brodetskiy, G. L. and Lemishevskiy, G. A.]

[Text] This article considers the task of determining the optimal size of a slice of time in the work of a processor to be devoted to each of the programs which are simultaneously executed by a computer, as a function of the number of programs and the loss of processor time in program maintenance, input-output and switching the computer to a new job when the slice changes.

UDC 681.142

ON THE USE OF FEATURES WHICH ADDITIVELY DISTINGUISH NUMBERS IN THE CONTROL OF DIGITAL DEVICES

[Abstract of article by Gulyayev, V. A. and Dodonov, A. G.]

[Text] Considers a method of processing information using control points, arranged inside large integrated circuits with the aim of cutting down on the number of external contacts used. The method is based on the use of features which additively distinguish numbers and is implemented by means of digital delay circuits.

UDC 681.3.06

ON THE CALCULATION OF THE CHARACTERISTICS OF LOGICAL ALGORITHMS FOR IDENTIFICATION OF RESTART POINTS IN SYSTEMS WITH RECOVERY CAPABILITY

[Abstract of article by Koloskov, V. A., Denisova, G. P. and Tipikin, A. P.]

[Text] Considers issues involving the arrangement of restart points in logical control algorithms. It is shown that, by taking account of the structure of the source algorithm and the relationship between input and output signals, it is possible to identify segments of the algorithm, the repetition of which does not alter the state of the controlled object.

UDC 681.142

ON THE CHARACTERISTICS OF THE TECHNICAL DIAGNOSIS OF AIRBORNE SYSTEMS OF COMPLEX DEVICES DURING FACTORY TESTS

[Abstract of article by Chubenko, B. S.]

[Text] Presents a method of technical diagnosis based on taking account of supplementary specific features of a system having a modular structure. These features depend on the amount of labor required to produce the modules of the system composing the device. Starting from the logical relationship among the processes of production and diagnosis, this article develops an idea for quantitative evaluation of the correlations between them.

UDC 681.84

THE ORGANIZATION OF EFFECTIVE CONTROL OF AN ATsVK (analog-digital computer complex)

[Abstract of article by Gorbachenko, V. I., Zagitov, V. M., Kozlov, E. S., Miroshkin, V. A., Sergeyev, N. P., and Trupkin, V. I.]

[Text] Investigates the reliability of an analog-digital computer complex (ATsVK), derives the relationship between the indices of the efficiency of the operation of the complex, the probability of obtaining a solution and the reliability of the ATsVK elements. Describes the "Saturn-2" system of control and presents the principles of construction of the operative tests of the mass elements of the network analog computer complex.

UDC 681.325.1.001.4

HARDWARE CONTROL OF AUTOMATA WITH MEMORY IN THE DESIGN PROCESS

[Abstract of article by Kon, Ye. L. and Matushkin, N. N.]

[Text] Considers a methodology for the synthesis of the minimized complex "controlled object--device for hardware control" using an apparatus of Boolean derivatives. Proposes a practical procedure for applying the Boolean derivative apparatus. The possibilities for using the synthesis methodology are illustrated for a stage in design as well as for the case where the structure of the controlled object is given.

UDC 681.326.7

THE CONTROL OF AUTOMATA WITH MEMORY OF GIVEN STRUCTURES USING BOOLEAN DERIVATIVES

[Abstract of article by Kon, Ye. L.]

[Text] Considers a methodology for control of synchronous and asynchronous automata, of given structures, based on the use of an apparatus of temporal Boolean derivatives. Also investigates the characteristics of a setup of the automaton in a certain state when the branch being tested participates in the setup of the experiment.

UDC 681.325.6.001.4

THE USE OF SOFTWARE AND HARDWARE MEANS FOR CONTROL AND DIAGNOSIS TESTS

[Abstract of article by Soldatenko, L. M.]

[Text] Considers a sequence for the analysis of the electrical circuits of a digital device, the construction of initial tests of setups (sequences) on a general purpose computer and the generation of test sequences in the process of implementing control checks indirectly on the control-diagnostic device.

UDC 681.325.6.001.4

TOWARD THE ANALYSIS OF CONTROLLABILITY OF A SEQUENTIAL STRUCTURE

[Abstract of article by Soldatenko, L. M.]

[Text] Considers the possibility of determining disjunctive control points and the use of means to transform sequential structures into tree structures. Presents a sequence for implementing control experiments on the transformed structures.

UDC 681.326

A DEVICE FOR THE AUTOMATED CONTROL OF THE PARAMETERS AND WORKING ORDER OF TRANSISTORS IN ELECTRONIC CIRCUITS

[Abstract of an article by Likhttsinder, B. Ya. and Zadorozhnyy, V. K.]

[Text] This article deals with a method for increasing the speed of control of transistors in a printed circuit. A solution to this problem is proposed which involves connecting a multidimensional measurement device to the transistor being checked. Control takes place through the effect on the measurement device of a bipolar pulse of voltage, giving evidence of the adequacy of a single test operation which makes it possible to identify ten possible states of the transistor. The circuit additionally makes it possible to measure the coefficient of current transmission of the transistor in circuit with a general emitter or collector.

UDC 681.310.621.317

PRINCIPLES OF THE CONSTRUCTION AND MAIN CHARACTERISTICS OF A SYSTEM OF INDUSTRIAL CONTROL OF PRINTED NODES OF REA (Radioelectronic devices)

[Abstract of an article by Bayda, N. P., Likhttsinder, B. Ya. and Shpilevoy, V. T.]

[Text] Presents the principles of construction of an automated system of element by element tolerance control of analog and analog-digital printed nodes of REA (Radioelectronic devices), a structural diagram is given and the technical characteristics of the system of control, which has been developed, are considered.

UDC 681.327.2

AN EVALUATION OF THE PROPERTIES OF MAN (OPERATOR) INTERACTION WITH A DISPLAY

[Abstract of article by Gubinskiy, A. I., Kozak, A. A. and Rotshteyn, A. P.]

[Text] Considers analytic models for the calculation of temporal and reliability characteristic curves of the properties of the activity of a human operator during interaction with a display while inputting information from a keyboard to a computer. Gives the initial data essential for the calculation and a graph of the results of the calculation.

UDC 681.32

THE CONSTRUCTION OF CONTROL TESTS FOR COMBINATIVE CIRCUITS USING Z-OPERATIONS

[Abstract of article by Bayda, N. P. and Semerenko, V. P.]

[Text] Considers the synthesis of control tests for combinative circuits, based on the use of one of the methods for orthogonalization of the implications of Boolean functions, making it possible to substantially simplify the analytic transformations of these functions.

UDC 681.3.019.3+681.3.0257

AN ANALYSIS OF THE ADEQUACY OF MODELS IN A PROBLEM OF MODELLING FAULTS

[Abstract of article by Golub, V. B., Svyatskiy, A. B. and Shmid, A. V.]

[Text] Proposes a methodology for comparative analysis of models of discrete logical nets. Binary ordinal relationships correspond to the sets of reactions of the models, the substantive meaning of which is related to the completeness and trustworthiness of the prediction of the reactions of the modelled object.

UDC 621.391.154

THE EFFECTIVENESS OF THE USE OF CODES, WHICH CORRECT AN INDIVIDUAL ERROR BURST, FOR PROTECTION OF AN OPTICAL-MECHANICAL MEMORY FROM ERRORS

[Abstract of article by Babanin, A. G., Boldyrev, V. N. and Tipikin, A. P.]

[Text] Considers issues in the evaluation of the effectiveness of the use of codes in communications links and memories with errors which fall into groups. Gives graphs of functions, obtained on a computer which make it possible to speed up the process of determining an effective code. Analytic expressions for the calculation of effectiveness were obtained.

UDC 681.142.6.019.3

ON THE ISSUE OF CONTROL OF ELECTRONIC DEVICES AS THEY ARE PRODUCED

[Abstract of article by Chichikanov, I. V.]

[Text] Deals with an approach, related to the decomposition of the net of an industrial process into elementary modules, which makes it possible to solve the problem of increasing the quality and reliability of electronic devices. They are produced by means of a rational arrangement of control working areas along the line where they are assembled.

UDC 531.383

OPTIMAL DAMPING OF ERRORS OF A TWO ROTOR GYROCOMPASS OF A PENDULUM TYPE IN THE PRESENCE OF INFORMATION ON THE LATITUDE OF AN OBJECT

[Abstract of an article by Grimalyuk, V. F. and Onishchenko, S. M.]

[Text] Proposes a regulator, optimal in respect to the quadratic criterion of quality, for the damping of errors in series produced pendulum gyrocompasses of the "Kurs" type, with the inclusion of supplementary information on the geographic latitude of an object and the influence of relative speed of the ship taken from the log. To estimate the state vector, the Kalman methods of optimal filtration were used.

UDC 681.3

THE USE OF THE VIDICON FOR DIGITIZATION OF WRITTEN CHARACTERS

[Abstract of article by Danilyuk, Yu. S. and Il'nitskiy]

[Text] Considers the possibility of the use of a transmitting CRT of the "vidicon" type for the creation of a device to digitize two dimensional outlines of images. Makes provision for regulation of resolution within broad limits due to the operation of the vidicon in a nonstandard mode with digital scanning of the line and frame.

UDC 681.327

A STUDY OF THE CHARACTERISTICS OF EXCHANGE MEMORY IN TWO-OPERATION BUFFERS

[Abstract of article by Kozhemyako, V. P.]

[Text] Derives the formula for determination of the advantage of a two operation buffer device with given probabilities of information loss. Chains of two-operation buffers are studied.

UDC 681.058

ANALYSIS OF THE ACCURACY OF DIGITAL SCANNING COMPUTING DEVICES (TsRVU)

[Abstract of article by Monashkin, Yu. M.]

[Text] Considers the analytical description of errors arising in digital scanning computing devices. Proposes analytical expressions for errors in digital generator scans, depending on the nature of solutions to the initial difference equations, the accuracy of the performance of the computations and the error of approximation.

UDC 65.012.122

ON ONE METHOD OF ELIMINATING NON-CONJUGATION OF POWERS UNDER CONDITIONS OF MULTICRITERIALITY

[Abstract of article by Kuz'min, I. V. and Churilov, V. I.]

[Text] Describes a method for eliminating non-conjugation of powers in the solution of multicriterial problems on the optimal formation of the yearly production plan of an enterprise. An algorithm for solution using a statistical search method is given and described.

UDC 681.3.019.35+681.3.02.57

A SOFTWARE-HARDWARE COMPLEX FOR AUTOMATED SET-UP OF THE BLOCKS OF COMPUTER SYSTEMS

[Abstract of article by Golub, V. B., Smirnov, A. V. and Shmid, A. V.]

[Text] Considers a range of fundamental problems arising during the construction of a complex for the software-hardware set-up of blocks of computer systems. Cites dialogue forms and problems in control of the software-hardware model.

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ABSTRACTS FROM THE JOURNAL 'WORKS OF THE CENTRAL ORDER OF THE RED LABOR BANNER SCIENTIFIC RESEARCH INSTITUTE OF THE NAVY. AUTOMATED CONTROL SYSTEMS'

Leningrad TRUDY TSNIIMFA. AVTOMATIZIROVANNYYE SISTEMY UPRAVLENIYA in Russian No 249, 1979 pp 69-70

UDC 629.12.004.67

BASIC PREMISES OF FLEET REPAIR PLANNING AND CONTROL

[Abstract of article by S. N. Dranitsyn]

[Text] The basic premises of fleet repair planning and control are examined.

UDC 629.12-52.004

PROBLEMS IN THE OPERATION OF AUTOMATED VESSELS

[Abstract of article by S. N. Dranitsyn]

[Text] The unique features in modern development of the navy and the phases of development of automated vessels are shown.

UDC 629.12.03.681.3

SYSTEMS FOR MONITORING THE TECHNICAL CONDITION OF THE PROPULSION COMPLEX OF A VESSEL WITH A SHORE-BASED COMPUTER

[Abstract of article by N. G. Andreyev]

[Text] The fundamental principles of setting up a system for monitoring changes in the technical condition and the qualities of technical operation of a vessel's hull-propeller-engine propulsion complex on the basis of a vessel's reports processed by a shore-based computer are presented.

UDC 629.12.004.67+656.612.3/5

REGULATION OF THE REPAIR, RETIREMENT, AND REPLENISHMENT OF THE FLEET

[Abstract of article by A. N. Bondarenko]

[Text] The information needed for regulation of the repair, retirement, and replenishment of the fleet is presented. The procedure for making decisions to adjust the plans is described with a data bank entitled "Continuous Plan for Repair of a Shipping Company's Fleet" as an example.

UDC 621.431.74:621.436-772.2

THE ACCOUNTING OF SPARE PARTS FOR A SHIP DIESEL ENGINE, AND DETERMINATION OF SPARE PART REQUIREMENTS

[Abstract of article by S. B. Aksel'rod and A. N. Bondarenko]

[Text] A simplified approach to solving the complex of problems associated with propulsion accounting and with the planning of the spare parts requirements for a main ship engine at the ship, shipping company, and the GKhO [not further identified] levels is presented. The unique features of planning the needs and the principles behind the organization of the record-keeping system are shown. A spare parts classification system is developed.

Four figures, five tables.

UDC 656.611.2:65.011.56

ORGANIZATION OF FEEDBACK IN AUTOMATED PROCESSING OF DOCUMENTS IN THE TEF AUTOMATED CONTROL SYSTEM

[Abstract of article by A. N. Bondarenko and G. M. Shchuchinskiy]

[Text] A method is presented for organizing automated document handling associated with introduction, into shipping companies, of current planning and regulation making use of feedback between an information and computer center and the controlling subdivision.

Four figures, two bibliographic references.

UDC 656.614.3.071

AN ALGORITHM FOR DETERMINING THE TONNAGE USE PLAN

[Abstract of article by A. P. Batenko and Ya. Ya. Eglit]

[Text] The algorithm for determining the optimum tonnage use plan is presented.

One figure, three tables, three bibliographic references.

UDC 681.518.2:[629.12.004.-192]

SECTOR AUTOMATED SYSTEM PROVIDING INFORMATION ON THE DEPENDABILITY OF VESSELS AND SHIPBOARD EQUIPMENT, BASED ON THE UNIFIED COMPUTER SYSTEM

[Abstract of article by A. L. Kastal'skiy, V. V. Maslov, S. F. Mel'kanovich, and V. V. Pisklyukov]

[Text] The principles behind operation of a sector system for collecting and processing data on the dependability of shipboard technical resources are examined. The goals and tasks of the system are defined, and the levels at which information is utilized are singled out. The system foresees regular provision of objective, complete, and reliable data on the dependability of shipboard technical resources to interested consumers without having to introduce additional reporting forms of the permanent ship reporting system.

Two figures, two tables.

[345-11004]

11004
CSO: 1863

TEXTBOOK ON ANALOG COMPUTERS

Moscow ELEKTRONNYYE ANALOGOVYYE VYCHISLITEL'NYYE MASHINY (Analog Computers) in Russian 1979 pp 2-4, 7-8, 230-231

[Annotation, Table of Contents, Foreword, and excerpt of Introduction from book by I. L. Prager, Izdatel'stvo "Mashinostroyeniye", 26,000 copies, 231 pages]

[Text] Annotation

This textbook is intended to accompany the approved program for the course "Analog Computers" in instrument making tekhnikums. The book presents the layout and principles of construction of analog computers, and it examines problems associated with analog computer programming. In comparison with its first edition, the bulk of the book's material is oriented in this edition to second and third generation analog computer technology.

The book is intended as a textbook for technical students.

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Foreword

The program for the instrument making tekhnikum subject "Electronic Analog Computers" ("Continuous-Action Computers") foresees familiarizing the students with the principles of operation of modern analog computers, as well as with the fundamental principles of modeling physical processes and expressing these processes by the appropriate differential equations.

This textbook is based on a lecture course given by the author over a period of a number of years at the Moscow Instrument Making Tekhnikum. The book also makes extensive use of materials published in the domestic literature of analog computers. In his presentation, the author considered the fact that students beginning their study of a course on analog computers have had a certain amount of preparation in the elementary principles of higher mathematics, electrical engineering, and electronics.

The course program has changed since the time of the textbook's first edition (1971). The years since then were marked by significant development of the resources of analog computer technology. All of this has necessitated significant revision of the book.

Chapters I, II, and IV have been abbreviated. Materials on the modeling of differential equations in partial derivatives were introduced into Chapter I, and problems pertaining to establishing the transfer coefficients and operating conditions of solving amplifiers were added to Chapter III.

The book has been supplemented by new topics: "Power Supply Systems for Analog Computers," "The AVK-2 Analog Computer Complex," "Third Generation Analog Computer Technology," and "Third Generation Analog Computer Technology Software."

The author did not intend to examine analog devices of all types, instead concentrating his attention on the most significant principles of their design and use.

Self-testing questions, which are essentially a brief outline of the material, have been introduced into the book. Students should answer these questions not just after they finish reading a given section, but significantly more often, in order to reinforce previous material.

The production of third generation analog and analog-digital computers recently started. However, although the greatest productivity could be achieved with the use of such analog computer technology, second generation analog computers will still be servicing researchers for a long time to come.

The second edition accounts for the remarks and wishes of a number of tekhnikums, and errata discovered in the first edition have been corrected.

Introduction

Development of semiconductor technology led to creation of semiconductor instruments having significant advantages over tube-type instruments in terms of dependability, overall size, consumed power, and power wasted on warming-up. As a result second generation analog computers made with semiconductors started to be manufactured concurrently with the first generation tube-type analog computers. We have now assimilated industrial production of second generation analog computers such as the MN-10M, MN-18, AVK-2, and others.

Now that semiconductor integrated circuits have appeared as the foundation of integrated technology, work has started on third generation analog computers. We have already developed the AVK-3 analog computer complex and the GVS-100 analog-digital hybrid computer system; series production of these units is to begin very soon.

Our Soviet scientists have made a significant contribution to the development of analog computer technology. Thus EMU analog computers were developed under the guidance of Academician V. A. Trapeznikov and B. Ya. Kogan, while IPT, MPT, and MN computers were created under the guidance of V. B. Ushakov, I. M. Vitenberg, A. A. Fel'dbaum, and G. M. Petrov. G. Ye. Pukhov, B. A. Borkovskiy, and others deserve great credit for developing and building new types of analog models--quasi-analog. The Soviet scientists I. I. Eterman, M. A. Bykhovskiy, and N. G. Bryuevich made a significant contribution to the theory of analog computer error.

[345-11004]

11004
CSO: 1863

UDC 681.2.088+681.325

"ELEKTRONIKA 100I" INTERFACE SYSTEM

Novosibirsk ALGORITMY OBRABOTKI I SREDSTVA AVTOMATIZATSII TEPLOFIZICHESKOGO EKSPERIMENTA in Russian 1978 pp 4-5, 68-71

[Annotation, foreword, and one article from a collection of articles edited by USSR Academy of Sciences corresponding member S. S. Kutateladze]

[Text] The collection presents algorithms of recurrent restoration of the periodic signal and its integral characteristics at the measurement system input under conditions of high-level measurement noise, algorithms of choice of the experimental data smoothing parameter when using cubic splines, both given known noise characteristics and in the absence of a priori information about the measurement noise, and formulas of statistical characteristics of the selected average fixed random process given conditions of varied types of irregular quantization.

Brief information is provided on several hardware applications for a computer-based system of automating thermophysical experiments, which includes data acquisition and conversion devices and data input to the computer.

Foreword

Basic tasks for automating thermophysical experiments were formulated in articles by S. S. Kutateladze and Ya. Ya. Tomsons "Nekotoryye voprosy avtomatizatsii teplofizicheskogo eksperimenta" [Some Problems in Automating Thermophysical Experiments] in the collection entitled "Algoritmy obrabotki teplofizicheskogo eksperimenta" [Processing Algorithms of Thermophysical Experiments], Novosibirsk, 1975, and "Avtomatizatsiya obrabotki eksperimenta pri issledovanii turbulentnykh potokov" [Processing Automation of Experiments When Studying Turbulent Flows] published in the works of the II All-Union Meeting "Experimental Methods and Equipment for Studying Turbulence," Novosibirsk, 1977. These works also present results obtained on this problem by the Insititue of Thermophysics.

This collection presents results recently obtained in the Department of Automation and Computer Technology on mathematical and hardware support of computer-based automation of thermophysical experiements with predominate use, at a low level, of CAMAC [European Nuclear Electronic Standards] standard hardware.

S. S. Kutateladze

UDC 681.142:681.325:681.327.4

S. P. Blinov, Yu. E. Mencher, E. L. Mekhanevich

Interface System for the "Elektronika 100I" with External Stations

Use of a control computer to acquire and process information in an experimental laboratory, where equipment is dozens and hundreds of meters apart and the speed at which information is received from measurement devices can greatly vary, places the following, rather typical, demands on the system linking the computer to the external stations: Tie-in of the largest possible number of external stations to the computer, attainment of the computer's maximum exchange rate, and the capability to work with remote stations in the presence of interference. Questions of system operating reliability and simplicity in linking up with external stations are of great significance.

The "Elektronika 100I" minicomputer [1] has broad capabilities for information input/output:

--the external station call instruction format allows direct address to 50 external stations (not including the standard stations), thereby making issuance of seven basic commands to each station possible;

--availability of a data discontinuity channel allows exchange of masses of information at up to 600,000 words per second.

These capabilities have some drawbacks:

--the "Elektronika 100I" interface calls for tie-in of devices with negative signal levels, complicating the matching of devices containing TTL- and DTL-series [transistor-transistor logic and diode-transistor logic] integrated circuits;

--the interface contains too many signals (49 for programmed exchange, 35 for the discontinuity mode);

--the station to interface tie-in uses the external trunk organization principle, which involves the necessity to use multiple-contact connectors and compound cables.

Thus, the external position communication system is huge and unreliable due to the large number of contacts and low resistence of connecting cables to interference. This conclusion is supported by experience acquired working with a "Raduga" complex, which industry produces for the "Elektronika 100I" computer.

Use of a modern design with built-in trunks greatly improves matters. The number of signals can be decreased by combining the "Data Address," "Data," and "Input Busses" since signals from these busses randomly enter the processor registers. Signal gating to the joint bus is accomplished by keying pulses from the computer "Address Received," "Discontinuity 1," and "VVI" [Input-Output Information], respectively. Moreover, the "Discontinuity 1" pulse is formed in accordance with the time pattern depicted in Figure 1. The total number of signals is reduced to 60, making it possible to use a standard CAMAC system crate [kreit] with trunk separation as the combination interface design (KROSS--crate combined interface system).

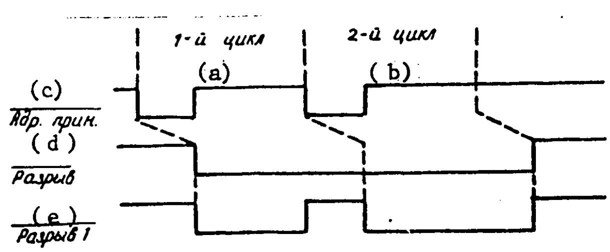

Fig. 1

KEY:

(a) First Cycle
(b) Second Cycle
(c) "Address Received"
(d) "Discontinuity"
(e) "Discontinuity 1"

The crate is connected to the computer via a combination cable up to 5 meters long via the interface module (MOSK--crate-computer interface module), in which are found the adapting components for the communications cable and the trunk, plus the "Discontinuity 1" signal forming circuit. The MOSK is installed where the crate-controller goes, i.e., occupies places with numbers 24 and 25 (see the communications structural diagram, Figure 2). The logic and the "Elektronika 100I" computer interface time pattern are retained fully in the KROSS. The signals in the trunk correspond to TTL logic levels.

For positions using the single-cycle data discontinuity mode, the current address register and word counter are built as a separate unit (BRASS--Address Register and Word Counter Unit), which serves any position connected to the trunk. The BRASS is controlled, where the program is concerned, like one of the external positions.

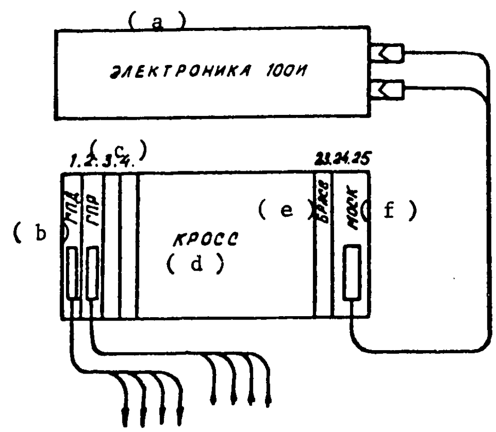

Fig. 2

KEY:

(a) "Elektronika 100I"
(b) GPD (Group Transmitter)
(c) GPR (Group Receiver)
(d) KROSS
(e) BRASS
(f) MOSK

Special modules are used to communicate with the remote positions: group transmitters (GPD) and group receivers (GPR). Each module occupies one position in the KROSS and, in the discontinuity mode, can serve up to four communication lines. Transmission of information is achieved through a sequential bipolar code [2]. The code chain consists of 1, 2, or 3 bytes supplemented by check bits. Two operating modes are possible--with or without confirmation of receipt of each code train. Transmission speed reaches 125 kilobytes per second when transmitting 3-byte code trains without confirmation. Communication line length when using TPP, TPV, and similar telephone cable can be up to 500 meters. Code train format and the exchange mode are controlled by commands from the computer.

In essence, the units described are the first level of communications system branching with external positions. It is advisable at the second level to use separate crates with hardware meeting the CAMAC standard. The crates are placed near the experimental devices and connected to the communications system via the corresponding communications monitors and adaptors. It should be noted that a multicrate system with branches organized in the CAMAC standard or using a CAMAC sequential system [3] not only requires larger expenditures of hardware, but also materially reduces computer input/output capability.

The following conclusions result: The system meets the aforementioned requirements, the fact that the crate had a built-in feed source and prototype boards with printed-circuit connectors significantly reduces development time and hardware manufacture, and experience in operating CAMAC standard units allows one to hope that the communications system will be highly reliable and resistant to interference.

In conclusion, the authors want to take this opportunity to express their appreciation to candidate of technical sciences Ya. Ya. Tomsons for useful discussions and attention to detail, to candidates of technical sciences V. P. Shul'ts and N. S. Danilov for practical assistance in system realization, and to A. V. Fedosov for excellent equipment installation.

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7869
CSO: 1863

ABSTRACTS FROM INSTITUTE OF THERMOPHYSICS BOOK

Novosibirsk ALGORITMY OBRABOTKI I SREDSTVA AVTOMATIZATSII TEPLOFIZICHESKOGO EKSPERIMENTA in Russian 1978 pp 113-118

UDC 621.391

MODIFIED KALMAN FILTER FOR EVALUATING AN UNKNOWN CONSTANT VECTOR

[Abstract of article by Ya. Ya. Tomsons, A. A. Poltavets and V. A. Gavrilov]

[Text] Examines a modification of a Kalman filter for evaluating an unknown constant vector. Various applications of this algorithm are discussed and its computational efficiency is demonstrated. Also, it presents a hardware variation for memory process sampling in the buffer memory and input of data into a minicomputer. Six illustrations, 10 references.

UDC 519.2:681.2.088

ON EVALUATION OF THE MATHEMATICAL EXPECTATION OF A FIXED RANDOM PROCESS GIVEN UNEQUAL QUANTIZATION

[Abstract of article by V. A. Gaponov and Ya. Ya. Tomsons]

[Text] Examines the properties of a mean arithmetic evaluation of the mathematical expectation of a fixed random sequence resulting from stochastic quantization of a moving random process.

The two best-known models of stochastic quantization--periodic quantization with scintillation and adaptive random quantization--are examined in detail. Seven references.

UDC 517.518.8

CRITERION AND ALGORITHMS OF PARAMETER SELECTION WHEN SMOOTHING WITH SPLINE FUNCTIONS

[Abstract of article by Yu. Ye. Voskoboynikov]

[Text] Suggests a criterion which permits answering the question concerning optimality of plotted approximation for the problem of approximating the experimental information of a certain functional dependency. In a case where the approximation is accomplished by cubic splines, two algorithms of parameter selection are suggested plotted on the basis of the criterion of optimality and of the statistical principle of closure. A comparison of and discussion of these two algorithms are presented. The attachment contains a description of a subprogram compiled in FORTRAN-1Y algorithm language and which accomplishes the plotting of the smoothing cubic spline and computation of the first and second derivatives. One illustration, two tables and nine references.

UDC 517.518.8

SELECTION OF THE SMOOTHING SPLINE PARAMETER GIVEN UNKNOWN STATISTICAL CHARACTERISTICS OF INITIAL DATA ERROR

[Abstract of article by Yu. Ye. Voskoboynikov]

[Text] Constructs an algorithm for selection of the smoothing parameter given an unknown correlation error matrix in the initial data. A comparison is made of the smoothing errors given parameter selection using this algorithm or an algorithm using information relative to the correlation matrix. Presented are results of smoothing a histogram and differentiation of the temperature profile in a turbulent flow. Provided in the attachment is a description of a subprogram which is written in FORTRAN-1Y and which accomplishes a plotting of the smoothing spline, as well as computation of its first and second derivatives, given an unknown correlation error matrix in the initial data. Two illustrations, one table and eight references.

UDC 681.3.06:518.5

RECURRING ESTIMATION OF AVERAGED CHARACTERISTICS OF TURBULENT GAS-LIQUID FLOWS

[Abstract of article by A. A. Poltavets and O. B. Shuvalova]

[Text] Provides a brief description of the input program and initial data processing using an M-6000 minicomputer when studying turbulent gas-liquid flows. One illustration.

UDC 681.3.06

PROGRAM-MONITOR FOR AUTOMATION OF SCIENTIFIC EXPERIMENTS

[Abstract of article by B. N. Borzenko and L. A. Samylina]

[Text] Describes a program which controls a system of automatic acquisition and processing of the results of an experiment, which permits changing the control language and processing programs set. Three illustrations and three references.

UDC 681.142.4:681.325

SEMIADAPTER OF A RADIAL DATA ACQUISITION SYSTEM

[Abstract of article by B. N. Borzenko and V. M. Gorbachev]

[Text] Presents the structure of an interface device for a radial data acquisition system with an intermachine adapter connected to an M-4030 computer and describes problems of mathematical support exchange. Three illustrations and three references.

UDC 532.574.082.54.1088.5

LDIS [Laser Doppler Velocimeter] INTERFACE WITH M-4030 COMPUTER

[Abstract of article by Ye. V. Kozhukhova and V. I. Titkov]

[Text] Describes a system inputting to an M-4030 computer data obtained during experimental research into turbulent flows using an LDIS [Laser Doppler Velocimeter]. It examines the basic operating modes and presents a block diagram and basic technical characteristics of the input system. One illustration and six references.

UDC 680.325

OFF-LINE DATA ACQUISITION SYSTEM FOR AERODYNAMIC RESEARCH

[Abstract of article by V. P. Shul'ts, K. M. Kirillov, V. P. Kudrenko, and A. M. Khodayev]

[Text] Describes a data acquisition system for research into the physical processes in a low-turbulence aerodynamic tube, which acquires and registers measurements information based on preassigned "hard" programs. The system interfaces with an M-6000 ASVT [modular system of computer technology], which permits the required information processing. Three illustrations, one table and two references.

UDC 681.142:681.325:681.327.4

INTERFACE FOR CAMAC DIGITAL MEASURING DEVICES

[Abstract of article by Ye. S Voronel', V. A. Gavrilov, Yu. E. Mencher and E. L. Nekhanevich]

[Text] Describes two interface modules permitting several digital meters used in an experimental information acquisition system to be connected to CAMAC trunks. Module structural diagrams are presented and the functions the modules perform based on trunk commands are listed. Two illustrations and two references.

UDC 681.327.11:088.8

ULTRASONIC SEMIAUTOMATIC GRAPHIC INFORMATION CODER

[Abstract of article by E. K. Skvortsov and V. V. Yakushin]

[Text] Presents technical data, describes the block diagram of an ultrasonic semiautomatic device for encoding graphic information and notes its advantages over known analog devices, in particular the availability of a new system for monitoring device operation. Two illustrations and six references.

UDC 621.378.3

SIGN-SENSITIVE LASER ANEMOMETER

[Abstract of article by N. S. Danilov and V. I. Titkov]

[Text] Provides a brief description of an optical circuit for a sign-sensitive laser anemometer, examines the formation of signals at the electronic circuit input, and provides an optical circuit and vector diagram of the output signals. Two illustrations and two references.

UDC 532.13:54.3.1

STUDY OF THE VISCOSITY OF OXIDE MELTS USING AN AUTOMATIC VIBRATING VISCOSIMETER

[Abstract of article by A. F. Mundus-Tabakayev]

[Text] Examines questions of automating research into the viscosity of oxide melts and processing measurements.

Dissociated vanadium-bearing oxide melts were the research target.

Demonstrates that, when processing measurements, one must bring to light deviations and differences in viscosity temperature relationships in logarithmetic coordinates. The deviations mark the various stages of the processes of comminution and association of the particles in the melt.

The activation energy values obtained experimentally are apparent activation energies of the viscuous current. One illustration and 12 references.

UDC 53.087.9:531.787

SEMICONDUCTOR SENSORS TO MEASURE MINOR PRESSURE DROPS

[Abstract of article by V. P. Shul'ts and E. A. Samoletov]

[Text] Briefly describes pressure sensors which use silicone resister elements at ranges of 100 to 100,000 pascals. Two illustrations and one table.

UDC 681.325

COMPUTER INPUT DEVICE FOR GAS PHASE TIME INTERVALS IN TWO-PHASE FLOWS

[Abstract of article by V. V. Kryachkov and A. A. Franchuk]

[Text] Describes devices for measuring gas content and velocity of the gas phase in two-phase flows. The device's operating principle is based upon measurement and input into a computer of the time intervals between pulses obtained from electrodiffused converters. The device has been made in designs and based upon the CAMAC standard ideology. One illustration and two references.

7869
CSO: 1863

UDC 681.51:007.5

A SYSTEM FOR CONTROLLING LARGE CAPACITY MEMORY

Vladivostok SISTEMA UPRAVLENIYA PAMYAT'YU BOL'SHOY YEMKOSTI, Preprint, Institute of Automation and Control Processes, 1979, 18 pages

ORLOV, S. I., UVAROVA, T. G. and FAL'KO, S. V., Far Eastern Scientific Center, USSR Academy of Sciences

[From REFERATIVNYY ZHURNAL. TEKHNICHESKAYA KIBERNETIKA in Russian No 4, Apr 80 Abstract No 4.81.274K by S. G. Romanova]

[Text] It is noted that one of the most important trends in the area of artificial intelligence is development of the principles of design and study of systems which utilize large volumes of knowledge to solve problems and are based on the theory of representation of knowledge. Realization and experimental study of problems in this type of system requires means for the control of large capacity memories. A study is made of a memory control system oriented toward the solution of problems using the theory of representation of knowledge. It is indicated that the extent of the system of knowledge is supported by a programmed virtual memory system. The capabilities are described for utilizing software-realized virtual memory systems. Characteristics are presented for methods of control of both peripheral and main memory, available to the system. A description is presented of methods of access to virtual memory: direct, associative and library methods. Methods are described for working with virtual memory, realized within the framework of the OS YES operating system. The specifics of realization of methods of access and quantitative characteristics of virtual memory are described. References 9.

[350-6508]

6508
CSO: 1863

UDC 681.51:50

METHOD OF STUDYING OPERATIONS AND THE THEORY OF RELIABILITY IN THE ANALYSIS OF SYSTEMS

Kiev METODY ISSLEDOVANIYA OPERATSIY I TEORII NADEZHNOSTI V ANALIZE SISTEM, 1979, 103 pages

KANIOVSKIY, Yu. M., Institute of Cybernetics, Ukrainian Academy of Sciences

[From REFERATIVNYY ZHURNAL. TEKHNICHESKAYA KIBERNETIKA in Russian No 4, Apr 80 Abstract No 4.81.5K by V. A. Garmash]

[Text] This collection contains the following works: A Formalized Model of Statistical Modeling of Complex Systems, The Optimal Duration of Problems to be Solved by Computer with Incomplete Information on Initial Data, Use of Analytic-Statistical Methods for the Study of One Highly Reliable Redundant System, Conditions of Effective Application of the Process of Storage of Intermediate Information in an Unreliable Memory Unit, A Lower Estimate for the Probability that a Semimarkhov Process will Remain in a Subset of States. Works are published on the following themes: convergence of random processes, generated by a procedure of statistical approximation for random processes, one discrete circuit with a periodic priority, construction of a multilevel piecewise-continuous approximation, a numerical method of solution of the problem of control of reserves under conditions of limited information on the distribution function of random demand. Modifications are described for the method of successive planning, control of the operation of a continuous production line by means of modeling, statistical estimation of a parameter in processes of pure growth, eliptical equations and control of a boundary, planning of collection and processing of observations in the solution of the problem of planning of statistical hypotheses, dynamics of the problem of planning of demand in cases of random demand.

[350-6508]

6508
CSO: 1863

BOOK ON AUTOMATING ENTERPRISE CONTROL

Kiev AVTOMATIZIROVANNYYE SISTEMY UPRAVLENIYA PREDPRIYATIYAMI (Automated Enterprise-Control Systems) in Russian 1978 signed to press 20 Dec 78 pp 92-93

[Table of contents from collection edited by V. I. Skurikhin and V. A. Koshevaya, Institute Kibernetiki, 600 copies, 93 pages]

[Text]

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[343-8963]

8963
CSO: 1863

DEVELOPING SYSTEMS OF DATA PROCESSING PROGRAMMING

Moscow KONSTRUIROVANIYE SISTEM PROGRAMMIROVANIYA OBRABOTKI DANNYKH (The Development of Programming Systems for Data Processing) in Russian 1979 signed to press 20 Nov 79 pp 267-270

[Table of contents and annotation from book by S. N. Berestovaya, O. L. Perevozchikova, V. M. Romanov and Ye. L. Yushchenko (ed.), Statistika, 15,000 copies, 269 pages]

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This monograph is devoted to a consideration of the basic problems involved in designing automated systems for processing statistical economic data; it sheds light on questions connected with selection of the structure of data-processing systems and describes methods and technological procedures involved in their development. Presented in systematic form for the first time in the monographic literature is the method of designing parametric systems orientcd toward classes of I/O languages advanced by the Kiev school of programming.

[The book is intended] for system programmers developing and operating data-processing systems, as well as for students and graduate students in VUZ's in these fields.

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CSO: 1863

HYBRID COMPUTERS

Kiev GIBRIDNYYE VYCHISLITEL'NYYE MASHINY I KOMPLEKSY (Hybrid Computers and Computer Complexes) in Russian No 2, 1979 signed to press 21 May 1979 p 104

[Table of contents from collection edited by Z. A. Maydan, Ukrainian Academy of Sciences Sector of Electronics and Modeling of the Institute of Electrodynamics. Naukovadumka, 1000 copies, 105 pages]

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[366-9285]

9285
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UDC 681.327:621.397

STRUCTURE OF MEMORY CIRCUIT FORMATION IN THE ASU TP ON THE INTERNAL STORAGE SCREEN FOR THE OPERATOR'S CONSOLE

Kiev SISTEMY I SREDSTVA UPRAVLENIYA AVTOMATIZIROVANNYM PROIZVODSTVOM in Russian signed to press 26 Sep 79 pp 12-17

[Article by Zh. L. Bortsova and A. M. Shandurskiy, Kiev Institute of Automation imeni 25th CPSU Congress of the Ministry of Instrument Building, Automation Equipment and Control Systems of the USSR, Izdatel'stvo Naukova Dumka, 800 copies, 168 pages]

[Text] Significant attention is now being devoted to computer-operator communications systems in complex automated control systems. Existing communications equipment is inefficient, cumbersome and expensive. The low efficiency of these devices is the result of a mismatch of engineering and biological systems (man-computer) in the speed and amount of transmitted and perceived information and also due to the imperfection of methods of displaying it. One of the most rational methods of displaying information to the system operator on the course of the production process is memory circuit formation in the ASU [Automated control system] equipment or individual parts of it on the video display screen. The information displayed on the internal storage screen for operator monitoring is recorded in the regenerative storage device from the computer, control console or automatic punch tape reading and input device. Modified disc stores with K parallel operating reproduction channels can be used as the regenerative store to store statistical information about the memory circuit components of the production process reproduced on the UO screen. The necessity for several parallel information reproduction channels is explained both by the operating specifics of the character generator of the display device, one of the characteristics of which is entry to the symbol generator input of a parallel n-digit code ($n = \log_2 N$, where N is the number of symbols used), read from different information tracks of the discs, and by the necessity of displaying on the screen simultaneously with the code through the direct access channel information symbols which reflect the graphical relationahips of the memory circuit facilities in the complex to their color characteristics.

A special format of organizing information storage on discs, corresponding to the type of scanning of the television device and the rotational speed

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of the disc carrier, which takes into account the operating characteristics of the symbol generator and which is expressed in the following, is required for synchronized transmission of a parallel code to the character generator and subsequent output of symbolic and graphical information to the screen. The memory circuit of the line section of machine tools with ChPU [Numerical program control] is an image consisting of tables for recording alpha-numeric information and the production equipment circuits of the section. The vertical lines of the graphical display contours of the production equipment are color boundaries formed due to different tint of the image of objects in the machine tool line section and also the boundary between the color of the internal field of the image and the screen background.

The tables consist of lines; the length of the horizontal and the distance between vertical lines are determined by the limited capabilities of frequency matching of the scanning devices of the television scan to the record-playback devices of the regenerative MD [Magnetic disc] memory, i.e., the vertical lines of graphical information cannot be brought closer to each other than the frequency capabilities of the record-playback channel components permit, which should provide reliable detection of each of a number of recorded code pulses of symbolical graphical information on the working channel of the device. The discreteness of the described memory circuit of the line section is equal to α (cm), i.e., the vertical lines of the tables, and also the parallel vertical components of the graphical images of the production equipment are located at a distance multiple of α from each other and have a length also a multiple of α, thus, $L = m\alpha$ ($m = 1, 2, 3, \ldots$) (Figure 1). This explains the fact that the symbols of alphanumeric information may also be arranged only in specific, previously known locations of the screen: in the table cells or at distances multiple of the dimensions of the table cell upon sampling. It is impossible to change the arrangement of symbols with respect to each other within a sampling step. In many cases rigid tying of the memory circuit components to the location of the screen is convenient, for example, when displaying static and dynamic information on the screen which do not change their coordinates. This reduces the volume of the apparatus used and the volume of information files transmitted from the computer.

It is obvious from Figure 1 that the maximum number of coordinates used to display the required volume of information on the screen is limited by the number of intersection points of the vertical and horizontal lines drawn at the distance of the sampling spacing from each other.

Static information includes graphical images of production equipment components and tables (Figure 1, positions 1 and 3). Dynamic information is alphanumeric symbols (Figure 1, position 2) entered in the memory circuit tables and the color components of the production equipment components which reflect the dynamics of variation of the production situation in the machine tool line section.

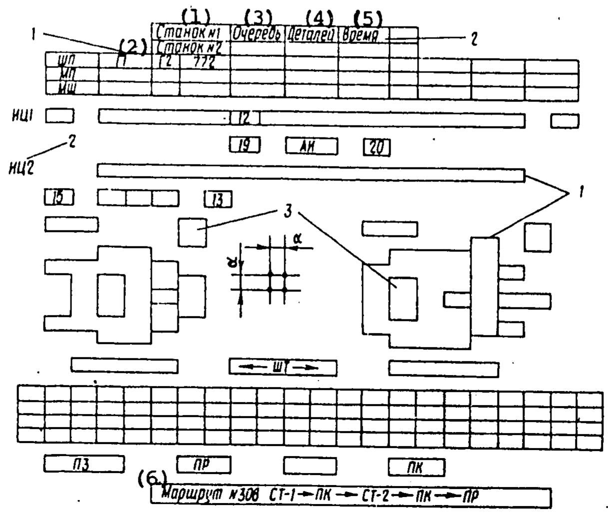

Figure 1. Memory Circuit of the Production Process of a Machine Tool Line Section. Displayed Objects of the Graphical, Alphanumeric and Color Information Memory Circuit.

Key:

1. Machine tool No. 1
2. Machine tool No. 2
3. Priority
4. Parts
5. Time
6. Route

The number of components for expansion of graphical information of the memory circuit at the reproduced frequency of code F is equal to

where f is the frame scanning frequency. F can be regarded as the television scan control frequency. The number of symbols which may appear simultaneously on the screen, for example, a dimension favorable for visual perception, also depends on control frequency F. Control frequency F can be increased by using several code reproduction channels from different tracks of the same information cylinder. In this case scanning is controlled by all parallel operating channels of the device. The characteristic feature of this control is that the code pulses of different channels are reproduced with a time shift within the period $T = 1/F$. The discreteness and number of elements of graphical information increases in proportion to the number of K parallel operating channels, i.e., $Z = k \cdot F/f$. The codes of the color information characteristic should be reproduced with a time shift in the same manner.

The following organization of disc information storage is required to ensure arrangement of the memory circuit components on the UO screen according to Figure 1 (Figure 2). The information tracks of each information cylinder are allocated for recording the synchronous frequency which provides synchronized recording and reproduction of information, and also the symbol codes, graphical information and color contrast.

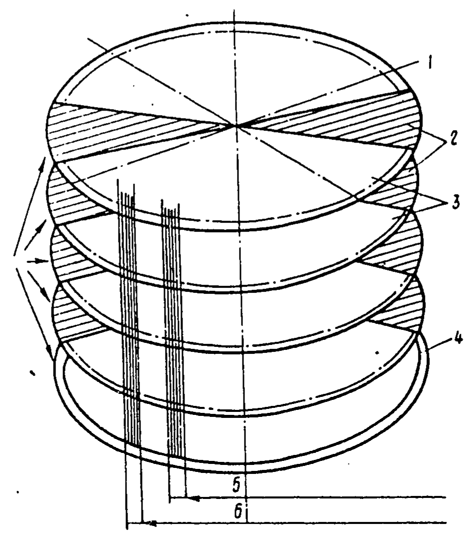

Figure 2. Diagram of Information Storage on Magnetic Disc: 1--disc pack; 2--free zone; 3--alpha-numeric information codes; 4--synchronization track; 5 and 6--parallel reproduced symbol codes which form the text lines of alphanumeric information of the memory circuit.

The information contained in two half-frames of the television scan is recorded on each MD cylinder. The M tracks of the cylinder are allocated for parallel codes of alpha-numeric information recorded in the form of code pulse packs, the number of which is equal to the number of text lines (the lines containing symbolic information) with frequency equal to the frequency of reception of the character generator in the BZU [Buffer storage]. The code packs carry information about the content of the corresponding digits of alphanumeric information and the corresponding digits of codes of different symbols are recorded on each track. The digit capacity of the code is determined by the formula $n = \log_2 N$. The number of packs on the tracks is equal to the number of symbol lines on the screen. The reproduction channels are switched to direct access channels upon completion of transmission of each code pack to the BZU of the character generator and the graphical information code is entered directly to control the television scanning device. The graphical information codes are recorded on the same tracks of the cylinder in the spaces between code packs of alphanumeric symbols. The code reproduction time from these sections corresponds to the decoding time and output of information included in the code packs onto the screen. The channel switching signals and the color contrast codes are recorded on different tracks of the cylinder.

It is sufficient to have a single recording channel and a system of switching devices controlled from the console, computer or FSU to range this organization of information storage. The volume of the information files transmitted from the computer is limited by the dynamic information displayed on the memory circuit. It can be reduced, having separated several tens of the most typical situations of the status of the production equipment and having recorded them on the free cylinders of the magnetic disc in the form of a memory circuit of "standard" states of the production process. Thus, dynamic information is transformed to static information for long-term use, thus ensuring a higher utilization factor of the regenerative memory of the storage device.

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ABSTRACTS FROM THE COLLECTION 'SISTEMY I SREDSTVA UPRAVLENIYA AVTOMATIZIROVANNYM PROIZVODSTVOM'

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UDC 658.012.011.56:681.3.06

THE MAIN PRINCIPLES OF CONSTRUCTING METASYSTEMS FOR AUTOMATED DESIGN OF ASU SOFTWARE IN MACHINE BUILDING

[Abstract of article by Muzychuk, V. T., Dutchak, I. D. and Tashchuk, D. A.]

[Text] Existing metasystems used to develop applied program packs are analyzed and classified. The main requirements on the metasystem for automated software design of ASU in machine building are formulated. The structure of the indicated metasystem is proposed. 1 figure, 40 references.

UDC 681.327:621.397

THE STRUCTURE OF MEMORY CIRCUIT FORMATION OF AN ASU TP ON A UO SCREEN FOR AN OPERATOR'S CONSOLE

[Abstract of article by Bortsova, Zh. L. and Shandurskiy, A. M.]

[Text] The principles of organizing the storage and time matching of message files transmitted from the computer for conversion and display on the UO screen, on the basis of which determination of the format and addressing of machine files of messages is possible with regard to the direction toward a decrease of them, are outlined in detail in the paper. 2 figures.

UDC 621.9.06-529:658.012.011.56:681.3

COMPUTER CONTROL OF PARTS LOADING ON A MACHINE TOOL LINE

[Abstract of article by Overko, V. A. and Pasynok, A. M.]

[Text] Problems of organization and input of parts as one of the problems of an ASU TP [Automated control system of production processes] of a rearranged line consisting of several internal tasks, and also the data required to enter the parts are considered in the article. The different methods of determining the moment of entering the parts are analyzed and the criteria are given by which the values of the moment of entry should be selected. The algorithm of one of the input problems is presented--determination of the next part entered, expressed in operator form.

UDC 621.9.06-529

AUTOMATION OF OPERATIONAL FORMATION OF THE INFORMATION USED TO MACHINE THE PARTS OF SEPARATING DIES ON MACHINE TOOLS WITH ChPU

[Abstract of article by Fomenko, V. I., Bursov, G. G. and Mostipan, N. B.]

[Text] The functioning of an operational information formatting block contained in the subsystem "Manufacture," which is a constituent part of the Avtoshtamp-IP complex system for automated design and manufacture of separating dies in instrument building, is described. 2 tables, 4 references.

UDC 621.9.06-529

DYNAMIC DESCRIPTION OF THE PROCESS OF FUNCTIONING OF AN OBJECT IN SYNTHESIS OF THE BLOCK DIAGRAM OF AN AUTOMATIC LINE

[Abstract of article by Lozovskiy, L. N.]

[Text] The model of automatic line functioning to determine productivity with regard to reliability and the mutual effect of functioning of all production units contained in the line. The model is used in synthesis of the block diagrams of automatic lines. 1 figure, 3 references.

UDC 681.327.681.3.06-52

AUTOMATION OF INPUT-OUTPUT PROGRAMMING

[Abstract of article by Taran, Ye. A.]

[Text] A method of describing external devices in the form of a hierarchical structure is considered. It is proposed that the means of description be included in a specialized high-level language to solve the problem of automation of input-output programming.

UDC 621.914.37

INTERPOLATION OF DISCRETELY GIVEN SURFACES FOR SYSTEMS FOR AUTOMATION OF COMPLEX SHAPE MODELING

[Abstract of article by Linkin, G. A. and Kachurovskiy, A. I.]

[Text] A new approach is proposed for interpolation of discretely given surfaces for systems for automation of control program preparation in complex shape molding on production equipment with numerical program control. The principles of interpolation by the method of interpolating circles using spline functions are described and the required theorems are proved. 3 figures.

UDC 621.7.001.2-52:621.9.06-529

THE PROBLEM OF AUTOMATED DESIGN OF THE TRAJECTORY OF MOTION OF A TOOL IN MACHINING ARTICLES ON MACHINE TOOLS WITH NUMERICAL PROGRAM CONTROL

[Abstract of article by Zagorova, A. V. and Linkin, G. A.]

[Text] Two problems related to automation of production preparation are considered: design of the complex route of manufacture of an article on a machine tool with ChPU when the tool does not completely machine the entire article, and design of the optimum sequence of interoperational and tool changes with respect to productivity. The authors managed to reduce the first problem to construction of graphs having specific properties and to sequential breakdown of them to find the elementary working changes. The changes found in this manner are distinguished by the fact that they fully satisfy or do not satisfy the external production conditions for manufacture of the entire article. Having used this approach and then operating by the available set of elementary passes, the authors show that time optimization of machining by known methods permits a more significant advantage in this case. The paper is of interest to specialists involved in problems of constructing highly organized systems for program and production design automation. 3 figures, 4 references.

UDC 519.2:681.327

CONSTRUCTION OF EMPIRICAL DISTRIBUTIONS USING THE POTENTIAL FUNCTIONS METHOD

[Abstract of article by Ponomarenko, V. A.]

[Text] A method of constructing empirical distributions devoid of uncertainty, related to selection of the interval, is proposed. The method is based on the idea of the potential functions method and provides the use of a computer with display. 2 figures, 2 references.

UDC 621.9.06-529:681.3.06-52

ANALYSIS OF SYSTEMS FOR AUTOMATED PREPARATION OF CONTROL PROGRAMS FOR MACHINE TOOLS WITH NUMERICAL PROGRAM CONTROL

[Abstract of article by Bursov, G. G. and Levchuk, N. M.]

[Text] The quality index for program automation systems (SAP), which reflects the dynamics of development of these systems from simple to complex, is proposed. The main classification features are established as a result of analyzing the quality index and the classification of the SAP circuit is worked out. Most domestic and foreign SAP are characterized from the viewpoint of the proposed quality index, on the basis of which conclusions are made about the prospects for further development of the SAP. 1 figure, 1 table, 4 references.

UDC 621.391:658.012.011.56:681.3

ANALYSIS OF A MODEL FOR COMMUNICATION OF THE DISPATCHER INFORMATION DISPLAY DEVICE OF AN AUTOMATED CONTROL SYSTEM WITH A COMPUTER

[Abstract of article by Kupchik, V. P.]

[Text] The model for communication of a display device with a computer is considered, selection of the given model is justified and the time required to service the messages arriving from the computer during transmission of code messages is determined on the basis of mathematical analysis. The optimum number of messages arriving per unit time can also be calculated by the proposed formulas and communications with minimum loading of the computer are organized. 3 figures, 1 table, 2 references.

UDC 681.3.06:518.5:658.512

THE STRUCTURE OF A SIMULATION MODEL OF THE GENERAL PROBLEM OF CALENDAR PLANNING

[Abstract of article by Borovik, V. N. and Ponomarenko, T. B.]

[Text] The structure of a simulation model of the general problem of calendar planning is considered. It is proposed that known algorithmic languages be used to realize the model. 3 references.

UDC 658.012.2"403"

ALGORITHM FOR PLANNING THE MANUFACTURE OF PARTS AND REPLACING TOOLS FOR AUTOMATED MACHINE TOOL COMPLEXES

[Abstract of article by Yanik, A. F., Bochkov, V. S. and Panchul, Yu. A.]

[Text] A calendar planning algorithm for manufacture of parts and replacement of tool settings for automated machine tool complexes is considered. The production restrictions on the stability of the tools and their number are taken into account. The calendar planning algorithm is constructed on the basis of simulation modelling on a computer and is written in COBOL language for entry on third-generation computers. 1 figure, 4 references.

UDC 621.9.06-529

DETERMINATION OF SOME PARAMETERS OF THE BLOCK DIAGRAM OF A COMPUTER-CONTROLLED AUTOMATIC LINE

[Abstract of article by Lozovskiy, L. N.]

[Text] An approach to determining the maximum capabilities of an automatic line, predetermined by its structure, is considered to determine the reserves and to increase the effectiveness of controlling machine tool systems. The results of analyzing the versions of organizing multinomenclature flows of machined parts are presented. 3 references.

UDC 621.837:658.012.011.56:681.3.06

AUTOMATED DESIGN OF MACHINING SURFACES BOUNDED BY CONTOUR ON MACHINE TOOLS WITH NUMERICAL PROGRAM CONTROL

[Abstract of article by Zagorova, A. V. and Linkin, G. A.]

[Text] A "star-shaped" algorithm is described for constructing the trajectory motion of a tool in machining surfaces bounded by a wide range of contours on milling machines with numerical program control. A method of designating the optimum feed on tool passes is presented. The algorithm can be used when designing systems for program and production equipment automation and is recommended for design of tool trajectories for sampling "depressions" of complex shape for articles manufactured in small lots on machine tools with numerical program control. 4 figures, 3 references.

UDC 621.9.06-529

STRUCTURE ORGANIZATION OF INFORMATION EXCHANGE IN A TWO-MACHINE COMPLEX WITH NUMERICAL PROGRAM CONTROL OF THE METAL-CUTTING MACHINE SECTION

[Abstract of article by Artemov, Yu. I., Ponomarenko, T. B., Kondenskiy, G. S. and Beregovoy, A. I.]

[Text] A system for group control of machine tools with numerical program control, constructed on the basis of a two-machine computer complex, is considered. The control system is represented in the form of a closed queueing network. The method and example of calculating the parameters of the system with given probability of machine tool idle times are given.

UDC 681.327.12

AUTOMATIC INPUT AND MONITORING OF INFORMATION RECORDING FROM PUNCH TAPE TO DYNAMIC MEMORIES

[Abstract of article by Dolinskaya, N. A. and Khromova, N. A.]

[Text] A block diagram of a device for automatic input of information read from a punch tape to dynamic memories, its capabilities related to the arrangement of the information of the punch tape and the possibility of determining the reliability of the recorded information and of correcting detected recording errors are considered. 1 figure.

UDC 621.313-526

THE SERVO DRIVE OF A START-STOP DIGITAL MAGNETIC RECORDING APPARATUS BASED ON A LOW-INERTIA DC MOTOR

[Abstract of article by Artemov, Yu. I., Dynnik, V. I. and Lysenko, A. N.]

[Text] The servo drives of a single roller tape feed mechanism with tachometer bridge are described and its deficiencies are determined. A system for automatic regulation with latitude modulated control and measurement of the counter-EMF during pauses is proposed for increasing the accuracy. The results of testing this system with an actuating motor are presented. 4 figures, 3 references.

UDC 621.397.6:681.84.083.84

MAGNETIC RECORDING SYSTEMS FOR DIGITAL CASSETTE TAPE RECORDERS

[Abstract of article by Lysenko, A. N. and Poritskiy, O. V.]

[Text] Digital magnetic record-playback methods used in cassette tape recorders are reviewed. The requirements on the magnetic heads and tapes, methods of recording with relative phase modulation and using a two-position signal OShIM [expansion unknown], signal correction by predistortions during recording, the quasi-optimum method of demodulating a phase-difference signal and the method of symbol discrimination by intra-time step comparison of the elements of 2-OShIM of the signal, the block diagrams of record-playback channels and the results of reliability testing are described. 3 figures, 5 references.

UDC 681.84.083.84

USING LINEAR VISCOELASTIC THEORY WITH RESPECT TO MAGNETIC TAPE INFORMATION CARRIERS

[Abstract of article by Perlov, Ye. F.]

[Text] The value of the viscosity of a magnetic tape base is determined analytically and confirmed experimentally, for which the physicomathematical model of a viscoelastic body is selected by means of which the value of viscosity is found analytically. The experimental installation on which the experimental check of the viscosity of magnetic tapes was made is described. 3 figures, 5 references.

UDC 681.84.083.84

PERIODIC SEQUENCE GENERATOR FOR TESTING DIGITAL MAGNETIC RECORDING APPARATUS

[Abstract of article by Lysenko, A. N. and Kovalenko, A. A.]

[Text] The specifics, difficulties and block diagrams for testing reliability monitoring of record-playback in a single channel are considered. Data are presented on the probable analysis and mathematical processing of the test results. A code sequence generator, including a pseudo-code constructed on a modern component base, is described. 3 figures, 5 references.

UDC 681.327.636:539.551

USING THE LONGITUDINAL OSCILLATIONS OF MAGNETIC TAPE WITH REGARD TO ITS VISCOUS PROPERTIES

[Abstract of article by Perlov, Ye. F. and Taranukha, A. I.]

[Text] The effect of the viscoelasticity of magnetic tape on its longitudinal oscillations in real mechanical systems (lever storage devices and tape motion channel) is considered. It is shown analytically and confirmed experimentally that the viscoelasticity of magnetic tape significantly reduces the time of attenuating the oscillatory process. 4 figures, 4 references.

UDC 621.391.2

SOME PROBLEMS OF CONSTRUCTING AN AUTOMATIC REGULATING SYSTEM FOR DRIVING THE COILS OF START-STOP DIGITAL MAGNETIC RECORDING APPARATUS

[Abstract of article by Artemov, Yu. I. and Lysenko, A. N.]

[Text] Comparative investigation of systems for automatic regulation of the coil drives of vacuum and small lever tape feed mechanisms is carred out. The conditions are determined at which the time of processing the angle of rotation of the coil is independent of the speed of motion of the magnetic tape fed or selected by the main drive. 3 figures, 2 references.

[367-6521]

6521
CSO: 1863

NEW COLLECTION OF ARTICLES ON NUMERICAL METHODS IN MECHANICS

Novosibirsk CHISLENNYYE METODY MEKHANIKI SPLOSHNOY SREDY in Russian
Vol 10, No 4, 1979 pp 2-3

[Annotation and table of contents of book "Chislennyye Metody Mekhaniki Sploshnoy Sredy" (Numerical Techniques of Continuous Medium Mechanics), Novosibirsk, Vychislitel'nyy Tsentr SO AN SSSR, 1979]

[Excerpts] Annotation

This topical anthology publishes original articles in the following subject areas: (1) numerical methods of solving problems of continuous medium mechanics; (2) research on mathematical models of continuous medium mechanics; (3) studies of the correct formulation of problems arising in continuous medium mechanics; (4) exact (analytic) solutions to problems of continuous medium mechanics; (5) technology for programming large problems of continuous medium mechanics.

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11,176
CSO: 1863

UDC 681.327

MULTIVALENT COMPUTING AND INFORMATION TECHNOLOGY

Kiev MNOGOZNACHNAYA INFORMATSIONNO-VYCHISLITEL'NAYA TEKHNIKA in Russian 1979 pp 2, 77

[Annotation and table of contents of collection edited by M. A. Rakov, doctor of technical sciences, professor, 500 copies]

[Text] Questions of construction, theory and practical application of computing and information hardware operating in a multivalent structural alphabet are considered.

The collection is intended for scientific and technical engineering workers, instructors and students in senior courses, specializing in information measurement and computer systems.

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[360-8617]

8617
CSO: 1863

ABSTRACTS FROM THE COLLECTION 'IDENTIFICATION AND PARAMETRIC CORRECTION OF CONTROL SYSTEMS'

Vladivostok IDENTIFIKATSIYA I PARAMETRICHESKAYA KORREKTSIYA SISTEM UPRAVLENIYA in Russian 1979 pp 181-187

UDC 681.5

THEORETICAL PRINCIPLES OF PARAMETRIC CORRECTION OF COMPLEX SYSTEMS

[Abstract of article by Edor, V. V.]

[Text] A survey is given of algorithms for parametric correction of complex systems. Algorithms are presented for the designation of tolerances, the construction of "price" functions and the calculation of optimum nominal values of parameters and classes of precision of units. The parametric correction of systems is carried out to increase the effectiveness of their functioning.

UDC 62-192

PARAMETRIC CORRECTION IN TASKS OF RELIABILITY CONTROL

[Abstract of article by Abramov, O. V.]

[Text] The problem of control of parametric reliability of technical facilities is discussed. It is shown that the solution of most problems in reliability control with respect to gradual failures is reduced to finding the optimum correction of parameters of components of the object. General formulations of the problem of parametric correction in the planning and operating stages are presented.

UDC 621.37.019.3.001.2

DESIGNATION OF TOLERANCES FOR RADIOELECTRONIC EQUIPMENT PARAMETERS AND CONTROL SYSTEMS BY THE CRITERION OF COST

[Abstract of article by Antushev, G. S.]

[Text] The author investigated the question of the meaning of the optimum designation of tolerances and the characteristics to be used to optimize tolerances. It was found that the following should be classed as the main signs of optimality of tolerances: the absolute values of ratings, the absolute values of the tolerances for each parameter and their distribution in total by parameter. On the basis of the investigation a criterion has been formulated for the optimum designation of tolerances--the cost criterion, which best takes into consideration all the signs of optimality.

UDC 621.393.6.019.3

SOLUTION OF THE PROBLEM OF INDIVIDUAL PREDICTION FROM LIMITED INITIAL DATA

[Abstract of article by Rozenbaum, A. N.]

[Text] The problem of individual prediction of the technical state of facilities is examined. An approach based on use of a minimax criterion is offered as a method of solution.

UDC 62-52

DESIGNATION OF TOLERANCES FOR PARAMETERS OF CONTROL SYSTEMS BY METHODS OF MATHEMATICAL PROGRAMMING

[Abstract of article by Gorachev, L. V.]

[Text] The author examines the problem of determining the nominal values and tolerances of control system parameters, which is reduced to solution of the multiparametric problem of mathematical programming. Its properties have been investigated, an approximate method of solving it is proposed and the form of the criterial function is discussed.

UDC 621.396.6.07.019.3

SELECTION OF HARDWARE ADJUSTMENT PARAMETERS

[Abstract of article by Abramov, O. V., and Inberg, S. P.]

[Text] The authors propose a criterion for the selection of parameters preferable for hardware adjustment. The conditions of sufficiency of the selected aggregate of parameters to assure complete adjustability of the equipment have been investigated and obtained. Algorithms are proposed for the selection of adjustment parameters.

UDC 621.396.6.07.019.3

DETERMINATION OF THE RANGE OF TUNING PARAMETERS VARIATION

[Abstract of article by Inberg, S. P.]

[Text] A method is proposed which permits determining, in the presence of an aggregate of tuning parameters and known scatterings of the values of unregulated parameters, the minimally necessary and maximally advisable ranges of tuning parameter variation which guarantee complete tunability of planned equipment.

UDC 681.5

DETERMINATION OF FINITE VARIATIONS OF HARDWARE PARAMETERS FROM VARIATIONS OF THEIR OUTPUT COORDINATES

[Abstract of article by Izhakevich, V. S.]

[Text] For hardware consisting of mathematical models with linear parameters an algorithm is proposed for determining finite variations of the hardware parameters from the variations of their output coordinates. The basis of the algorithm is a method of solution of the inverse problem of sensitivity. The conditions of convergence of the algorithms are determined.

UDC 62-50.192.001.2

CRITERIA OF OPTIMALITY IN TASKS OF RATING SELECTION

[Abstract of article by Pryabkova, N. V.]

[Text] It is shown that it is necessary to use the criterion of the mean time of no-failure operation in tasks of optimization of nominal values of hardware parameters. The mean time of no-failure operation is calculated in the case of linear processes of variation of parameters of an article. Construction of the criterion of effectiveness of functioning of hardware is described, and stability of solutions found on the basis of that criterion is demonstrated.

UDC 621.3.019 (031)

ESTIMATION OF THE PRECISION CHARACTERISTICS OF THE PARAMETERS OF MODELS OF FAILURES OF RADIOELECTRONIC EQUIPMENT ON THE BASIS OF KINETIC EQUATIONS OF AGING

[Abstract of article by Volochkov, V. V., and Levin, S. F.]

[Text] Estimates of the precision characteristics of the parameters of models of failures are examined. The estimation is made by means of the interpolation method and noncanonical Chernetskiy expansion. Recommendations are presented for practical application of the obtained results.

UDC 621.3.019.3

PREDICTING THE RELIABILITY INDICATORS OF ARTICLES FROM OPERATING DATA

[Abstract of article by Spirkov, S. N., Skrapnik, V. M., and Zaychik, V.S.]

[Text] The authors investigated the prediction of reliability indicators of articles by the method of exponential smoothing. To determine the initial estimates of smoothed values, it is proposed to use the method of weighted least-squares, which permits taking into account the unequal precision of the corresponding data. For example, increased precision of prediction has been shown in comparison with the use of the least-squares method to determine initial estimates.

UDC 519.396.56:621.3.019.3

COMPARATIVE ANALYSIS OF DETECTORS OF SUDDEN CHANGE OF PARAMETERS OF A RANDOM PROCESS

[Abstract of article by Kanin, V. N., Zaychik, V. S., and Spirkov, S. N.]

[Text] The authors examine the use of methods of solving the task of detecting "disorder" in order to control the quality of an object during use. A comparative analysis is made of the detectors from the optimum to the simple in realization and the areas of their application are determined.

UDC 621.396.662

SELECTION OF ADVISABLE INSTRUMENTS FOR THE ADJUSTMENT OF RADIOELECTRONIC SYSTEMS

[Abstract of article by Komarovskiy, Yu. A.]

[Text] A large number of instruments with different purposes are required for the adjustment of modern radioelectronic systems. Increase of the complexity of systems to be adjusted leads to a need for careful selection of instruments. With the use of vector optimization mathematical apparatus a method of determining advisable instruments is described from the point of view of their cost, effectiveness and reliability.

UDC 621.3.01

DETERMINATION OF ELEMENTS OF A MATRIX OF GENERALIZED CONDUCTIVITIES ON THE BASIS OF DIAGNOSTIC EXPERIMENTS

[Abstract of article by Gerasimova, G. N., Kats, M. A., and Kinsht, N. V.]

[Text] Algorithms are proposed for the calculation of characteristic and mutual conductivities of a linear electric circuit from data obtained in a number of diagnostic experiments; they consist in the measurement of currents on a certain set of branches of a circuit in which emf sources operate.

UDC 621.3.01

IDENTIFICATION OF THE PARAMETERS OF SOURCES OF LINEAR ELECTRIC CIRCUITS FROM THE DATA OF TRANSIENT RESPONSES

[Abstract of article by Veshevnik, I. I., and Ragulin, P. G.]

[Text] A method is proposed for processing measurements of currents and voltabes obtained in the transient working regime of a linear electric circuit for determination of unknown signals effective in it. An arbitrary, known a priori form of signals is allowed.

UDC 681.5

DETERMINATION OF THE AREA OF ALLOWABLE VALUES OF INPUT VARIABLES OF A TECHNOLOGICAL FACILITY FROM EXPERIMENTAL DATA

[Abstract of article by Digo, G. B., and Digo, N. B.]

[Text] The authors examine a method of finding a certain area in the space of input variables in which the requirements for the result of functioning of a technological facility are fulfilled. The probability of finding an output variable in an established allowance at a fixed vector of output parameters is examined as a criterion of the result of functioning of a technological facility. In that case the dependence of output on input is estimated from experimental data.

UDC 519.246.8:519.248:658.562.012.7

LINEAR DISCRETE MODELS IN IDENTIFICATION OF TECHNOLOGICAL FACILITIES

[Abstract of article by Aksenov, V. M.]

[Text] The problem of identification in conditions of normal functioning is examined. A brief survey is given of work on the identification and estimation of the parameters of open systems described by linear difference equations. The application of time series analysis for the identification of technological facilities is discussed.

UDC 519.251.9

INVESTIGATION OF THE DENSITY OF A TWO-DIMENSIONAL GAMMA-DISTRIBUTION

[Abstract of article by Bernatskiy, F. I., and Molchanov, B. A.]

[Text] The density of a gamma-distribution of a partial type is examined with reference to problems in the approximation of two-dimensional asymmetric statistical groups. The dependence of that density on parameters is investigated, the extremum conditions are found and the quantitative characteristics of asymmetry are obtained.

UDC 681.5

METHOD OF MATHEMATICAL DESCRIPTION OF COMPUTER SYSTEMS

[Abstract of article by Pashchenko, F. F.]

[Text] Qeustions about computer system identification are discussed. It is shown that the construction of a computer system model is a task of identification in the broad sense. On the basis of a simulating model of a computer system a machine experiment was carried out, on the basis of the results of which a mathematical model was obtained for predicting the throughput capacity of an immediate-access memory.

[368-2174]

2174
CSO: 1863

ABSTRACTS FROM THE JOURNAL 'ENGINEERING CYBERNETICS'

Moscow IZVESTIYA AKADEMII NAUK SSSR. TEKHNICHESKAYA KIBERNETIKA in Russian No 2, 1980 pp 219-224

UDC 007:338.984

EXPERIENCE IN CONSTRUCTING DIALOGUE SYSTEM

[Abstract of article by Pospelov, G.S., Ven, V.L. and P.I. Litvintsev]

[Text] An examination is undertaken of a DSDP [dialogovaya sistema dolgosrochnogo planirovaniya; dialogue system for long-term planning] that was developed for a group (complex) of similar industrial branches of the machine-building type. The principal requirements imposed upon a DSDP during the developmental process are set forth and a description is furnished of the work process of users with the principal dialogue program modules for the DSDP. Illustrations: 1, Tables: 2, Bibliography: 3 titles.

UDC 62-50

METHOD FOR SOLVING CERTAIN STOCHASTIC TASKS WITH PARTIALLY DEFINED DISTRIBUTION FUNCTION

[Abstract of article by Golodnikov, A.N.]

[Text] A study of a digital method for solving a special class of minimax tasks, in which the internal task consists of searching for an extremum for a special purpose functional in the class of distribution functions and the external task -- an optimized task in terminal-dimensional space. The link between these minimax tasks and various spheres in the theory of making decisions is pointed out. Bibliography: 9 titles.

UDC 519.10

USE OF ANALYTIC METHODS IN COMBINER TASKS

[Abstract of article by Buzytskiy, P.L. and Freyman, G.A.]

[Text] A study of the solvability of linear control with Boolean variables. The proposed method of study is based upon the analytic theory of numbers. A broad class of equations is obtained which permits an effective check on the solvability. Bibliography: 3 titles.

UDC 62-50

FOR A SYSTEMS ANALYSIS OF A DEVELOPING ECONOMY: ANALYTIC STUDY OF A SIMULATION MODEL

[Abstract of article by Pospelov, I.G.]

[Text] The results of an analytic study of a mathematical model for economic development are furnished. During this study, use was made of methods considered to be traditional for economic-mathematical studies and also new asymptotic methods for this theoretical sphere of differential equations. Bibliography: 7 titles.

UDC 517.96

GUARANTEED EVALUATIONS IN DIFFERENTIAL GAMES WITH VECTORIAL CRITERION FOR QUALITY AND A FIXED TIME

[Abstract of article by Nikol'skiy, M.S.]

[Text] An examination is undertaken of quasi-linear differential games having a fixed time, a vectorial terminal payment and a free right terminal. Effective methods are developed for obtaining guaranteed and optimum results. Bibliography: 17 titles.

UDC 62-50:531.3

MACHINE PLANNING FOR MOVEMENTS OF MOBILE UNITS

[Abstract of article by Ignat'yev, M.B. and Petrov, V.I.]

[Text] The task of remote planning for movements of mobile units, to be used for work on actual terrain, is examined. A description is provided for an algorithmic system which will make it possible, using machines, to implement not only the laying out of routes but also the construction of appropriate mathematical models of the terrain. Estimates and experimental data are provided on the machine expenditures for planning. Illustrations: 8, bibliography: 12 titles.

UDC 62-50:531.3

CONTROL OVER A FLEXIBLE MANIPULATOR IN A TRAJECTORY

[Abstract of article by Rakhmanov, Ye.V., Lakota, N.A. and Shvedov, V.N.]

[Text] An equation was obtained for the dynamics of the actuating organ of a manipulating robot having flexible component elements. Based upon these equations, an approach was proposed for constructing an actuating system for carrying out accurated movements of a loaded grab bucket along a given trajectory. A structural plan was prepared for such a system and a study of its stability was carried out on a TsVM [digital computer]. Illustrationa: 3, bibliography: 6 titles.

UDC 338.984.001.57(104)

STUDY OF SERVICE SYSTEMS HAVING INSTANTANEOUS SWITCHING OF AN INSTRUMENT UPON INTERROGATION BY ONE OF THE CONFLICTING FLOWS

[Abstract of article by Vaganov, A.O. and Fedotkin, M.A.]

[Text] The necessary and adequate conditions are found for the existence of the established regime in a system of mass services, in which the flows of requests are controlled by an automatic machine having instantaneous switching of certain internal conditions. The automatic machine carries out these switchings depending upon the requests received at definite intervals of time. The study of such a system leads to a study of the properties of the Markov chains included. An example is furnished on the use of the theoretical results obtained for organizing quasi-optimum control over the movement of transport vehicles through an intersection. Illustrations: 2, bibliography: 6 titles.

UDC 519.2.004.14

THE PROBLEM OF OPTIMUM ORGANIZATION OF THE STORAGE OF INTERMEDIATE INFORMATION DURING ACCIDENTAL FAILURES OF THE SYSTEM

[Abstract of article by Brodetskiy, G.L.]

[Text] Optimum control was found for the system's work process, with the productivity of the system being at a maximum at those times when the solution of the initial task can be interrupted for the carrying out of a higher priority task. Bibliography: 5 titles.

UDC 621.3.019.3

SEMI-MARKOV MODELS OF RELIABILITY OF MULTICHANNEL SYSTEMS HAVING AN UNREPLENISHED RESERVE OF TIME

[Text] An examination is undertaken of the task of reliability of multichannel restored systems, under conditions involving an excess of time and semi-Markov shifts from one condition to another. The results for particular incidents are cited: systems having interchangeable channels and single-channel systems. A summary is provided of certain results obtained by V.S. Korolyuk and I.A. Ushakov, for semi-Markov processes in the event of systems having a reserve of time. The overall results are illustrated by two examples of systems having unreplenished and combined reserves of time. Bibliography: 11 titles.

UDC 681.142.2

ASYNCHRONOUS PARALLEL COMPUTATIONS IN A MODULAR MULTI-PROCESSOR ELECTRONIC COMPUTER. I. PROGRAM MODELS.

[Abstract of article by Maksimenkov, A.V.]

[Text] Discussions are held on the realization of asynchronous parallel computations in a modular multi-processor electronic computer. A model is proposed for presenting programs of parallel computations, referred to by the author as a trilogicak graph-model. Distinct from the well known model of a biological graph, in the proposed model one peak is made to conform with a fragment of the program. This leads to a reduction in the size of the graph and in the memory volume required for realization. Illustrations: 1, bibliography: 23 titles.

UDC 681.325.65

IDENTIFYING EXPERIMENT WITH AN AUTOMATIC DEVICE WHEN INCREASING THE NUMBER OF CONDITIONS

[Abstract of article by Danilov, V.V., Zhirabok, A.N., Filippov, F.V.]

[Text] An examination is undertaken of a task for searching for an identifying test (control experiment) for a synchronous closely-linked Mil' terminal automatic device, on the condition of a possible increase in its number of conditions owing to carelessness. A method for searching for the identifying test is proposed which makes it possible in some instances to reduce its length substantially. An example is furnished. Illustrations: 1, tables: 1, bibliography: 3 titles.

UDC 62-507

EQUIVALENT CONVERSIONS FOR A SYSTEM OF SEQUENCES

[Abstract of article by Lopukhov, A.A. and Chaptsov, R.P.]

[Text] An examination is undertaken of equivalent conversions for systems of sequences used for presenting the operating conditions of discrete devices. Descriptions are provided for the operation of equivalent conversions and conditions are formulated for their use. Examples are furnished. Bibliography: 8 titles.

UDC 62-507

JOINT DECOMPOSITION OF A SYSTEM OF BOOLEAN FUNCTIONS

[Abstract of article by Bibilo, P.N. and Yenin, S.V.]

[Text] The problems concerned with the joint decomposition of a system of Boolean functions are examined. The concept of decomposition of a vectorial Boolean function (regulated system of Boolean functions) is introduced. A theorem is formulated for the existence of such decomposition, on the basis of which algorithms are developed for the synthesis of multi-output combination plans. An example is cited. Illustrations: 2, tables: 3, bibliography: 8 titles.

UDC 681.3.06

COMBINER MEMORY

[Abstract of article by Belyayev, I.P., Kapustan, V.M. and Medvedev, V.G.]

[Text] A storage method is proposed which is not associated with the creation of extensive records by objects and which excludes the process of searching for storage from memory during the restoration of an object. Storage leads to the formation of a number according to a set of signs and restoration from memory -- to the placing of this number in the set of signs. Moreover, the search process is reduced to computations. Illustrations: 4, tables: 3, bibliography: 5 titles.

UDC 62-501.5

TASK OF SYNTHESIS OF AN ALGORITHM FOR CONTROLLING A LINEAR DYNAMIC SYSTEM HAVING RANDOM PARAMETERS

[Abstract of article by Batkov, A.M. and Grinchenko, S.T.]

[Text] The task of synthesis of a linear dynamic object having a random coefficient of reinforcement and a fixed time is examined. The phase state of the object is presumed to be observed, the criteria for quality is issued in the form of a quadratic functional. A study is undertaken for a rough solution of the equation for dynamic programming, with the algorithm for sub-optimum control being dependent linearly upon the phase coordinates. Bibliography: 3 titles.

UDC 62.50:519.24

FOR THE TASK OF DETERMINING AN OPTIMUM SYSTEM

[Abstract of article by Mel'nikov, B.G.]

[Text] A task is formed for the multi-dimensional non-fixed linear filtration in space of conditions, using the criterion of maximum probability of no filtration mistakes from the particular sphere, with no limitation on changing the evaluation. A method is proposed for solving the established task which includes, as a special case, the Kalman-V"yus' method of optimum linear filtration. Illustrations: 3, bibliography: 4 titles.

EVALUATION OF ACCURACY IN DETERMINING THE VECTOR FOR THE STATE OF A LINEAR DYNAMIC SYSTEM

[Abstract of article by Loginov, V.P. and Ustinov, N.S.]

[Text] A method is proposed for computing the accuracy characteristics of a linear recurrent algorithm for an evaluation. Measurement mistakes and the noise of the system are represented by white noises, by processes correlated in time and by processes having partially assigned statistical characteristics. The correlation between the measurement mistakes and the system's noises is taken into account. Bibliography; 5 titles.

UDC 531:62-5

ALGORITHMS FOR OPTIMIZATION OF MOVEMENT TRAJECTORIES DURING A CONTROLLED SEARCH OF OBJECTS

[Abstract of article by Vereshchagin, A.F., Medvedev, V.S. and Puzanov, V.P.]

[Text] An examination is undertaken of digital methods for optimizing movement trajectories during a controlled search of moving objects, the spatial movement of which is determined by the terminal number of random parameters. Ratios were obtained which define the gradient of a functional, in the case of an analytic task for the instantaneous review sector of the search system. A description is furnished for a digital method for solving the task of a controlled search, which utilizes values for a special purpose function which were computed using the Monte Carlo method and which are subsequently smoothed out by means of the splain-functions. Illustrations: 3, bibliography: 9 titles.

UDC 62-50

INITIAL OPERATIONAL REGIMES OF AN ORIENTATION AND STABILIZATION SYSTEM FOR A GEO-STATIONARY SPUTNIK

[Abstract of article by Kalinovich, S.N., Miroshnichenko, L.A. and Rayevskiy, V.A.]

[Text] A study is undertaken of the algorithms for controlling the orientation of a geo-stationary sputnik (Ekran) in the regimes of stabilization and initial orientation on the sun and earth, the realization of which is achieved by the minimum amount of equipment required for augmenting the principal composition of the system. Illustrations: 11, bibliography: 1 title.

UDC 62-505.1:330.115

METHODS FOR OPTIMUM PLANNING OF REGRESSION EXPERIMENTS IN THE PRESENCE OF SYSTEMATIC MISTAKES

[Abstract of article by Zhiglyavskiy, A.A. and Sedunov, Ye.V.]

[Text] An examination is undertaken of the task of planning regression experiments in the presence of systematic mistakes. A number of theorems are formulated, on the basis of which digital methods are developed for the synthesis of optimum changing plans in metrics L_2. Bibliography: 14 titles.

UDC 62-50

MOVEMENTS ALONG A STRAIGHT LINE OF POINTS FOR THE COLLECTION OF A DISTRIBUTED RESOURCE

[Abstract of article by Tuyev, S.V.]

[Text] The conditions required for achieving an optimum solution for the task of movements along a straight line of a given number of points for the collection of a distributed resource, taking into account the capability limitations of the points, are cited. An algorithm is proposed for finding the optimum solution, based upon a screening of all solutions which satisfy the required conditions. Bibliography: 3 titles.

UDC 519.24

USE OF DEPENDENT TESTS DURING STATISTICAL SIMULATION OF SYSTEMS HAVING A MONOTONIC CRITERION FOR QUALITY

[Abstract of article by Revyakov, M.I.]

[Text] It is established that two random functions which increase in a monotonic manner for each of the independent arguments were correlated in a positive manner. Based upon this fact, methods were pointed out for organizing dependent tests of systems which bring about a reduction in the number of girders for models on an electronic computer, during a comparison of the parameters for these systems and also when evaluating the parameters for one system. Bibliography: 5 titles.

UDC 62-507.019.3

EQUIPMENT CONTROL OF SYNCHRONOUS POLYNOMIAL DISCRETE ARRANGEMENTS

[Abstract of article by Soshin, M.P. and Shcherbakov, N.S.]

[Text] The problem of equipment control over complicated discrete arrangements (DU's) using systematic codes is reviewed. Based upon an analytic polynomial description for a discrete arrangement, a system of equations is developed for equipment control and a method is set forth for solving it. A model is proposed for functionally dependent mistakes which makes it possible, during the joint realization of various functions of a combination system, to use the well known codes computed for a given frequency of mistakes in it and for any coefficient of multiplication. Illustrations: 1, bibliography; 7 titles.

UDC 62-50

ALGORITHMS FOR SYNTHESIS OF SYNCHRONOUS TERMINAL AUTOMATIC MACHINES WITH THE DETECTION OF FAILURES

[Abstract of article by Sapozhnikov, V.V. and Sapozhnikov, Vl.V.]

[Text] An examination is undertaken of the task of synthesizing synchronous terminal automatic machines with the detection of failures of memory elements, taking into account the simplicity of the control circuit. Two methods are proposed. The first ensures the possibility of including the control circuit at the output of the automatic machine, in the absence of direct control over the memory elements, and the second makes it possible to arrange the structure of the automatic machine for the detection of failures during a given control circuit. Illustrations: 2, tables: 5, bibliography: 6 titles.

UDC 62-50:519.9

TASK OF ANALYTIC DESIGNING OF A NON-LINEAR REGULATOR DURING MINIMIZATION OF FUEL RESOURCES

[Abstract of article by Kudin, V.F.]

[Text] An examination is undertaken of a task for the analytic designing of an optimum non-linear regulator (AKONR), with a control limitation, based upon the condition of minimization of fuel resources, expended for the stabilization process. A new class of integrands will be introduced for a minimized functional, which take into acoount the harmful effect of imperfections in a dynamic system, by means of the weak sensitivity of the regulator in a state of equilibrium. An overall approximate solution is found for the task of AKONR, based upon a proposed criterion for systems of an arbitrary nature. An example of a computation for a non-linear regulator is furnished. Illustrations: 4, bibliography: 9 titles.

UDC 681.323

GRAPHS OF INTER-MACHINE LINKS FOR SIMILAR COMPUTING SYSTEMS

[Abstract of text by Korneyev, V.V., and Monakhov, O.G.]

[Text] By way of a criterion for optimum graph conditions for inter-machine links, a minimum diameter and average diameter are selected for it so as to present the maximum necessary and average distance between the pairs of crests. The introduction in the proposed family of graphs $\Lambda(n, v, g)$, as a parameter, with the order n, degree of crest v and amount of circumference g, will make it possible to determine the quasi-optimum structure OVS, thus permitting a change in the number of machines in the system, without a radical breakdown in the existing inter-machine links. Illustrations: 2, bibliography: 17 titles.

UDC 62-503.3

SPECTRUM CONTROL IN SYSTEMS HAVING INCOMPLETE INFORMATION

[Abstract of article by Romanenko, V.N.]

[Text] For a linear multi-dimensional stationary system

$$\dot{x} = Px + hu, \quad y = Hx, \quad x = R^n, \tag{1.1}$$

on the general assumption that the minimal $\psi(\lambda)$ and characteristic $\Delta(\lambda)$ polynomials of the matrix P may not coincide, that is, that the system (1.1) is not necessarily completely controlled; the vector k and the scalar r of the equation

$$\dot{u} = ky \quad ru, \tag{1.2}$$

are determined, such that the closed system (1.1), (1.2) had the prescribed spectrum $S_{n+1} = S_{m+1} \cup S_{n-m}$. Bibliography: 5 titles

[332-7026]

7026
CSO: 1863

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