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CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

(FOUO 15/80)

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CONTENTS

HARDWARE

PLANS FOR FURTHER DEVELOPMENT OF UNIFIED SYSTEM OF COMPUTER EQUIPMENT

Moscow EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV in Russian
No 3, 1980 pp 80-84

[Article by Rudol'f Ashastin, division chief at USSR Gosplan, director of the Economic Council of the Intergovernmental Commission on Cooperation among the Socialist Countries in the Field of Computer Technology: "Cooperation in the Field of Computer Technology Is on the Rise"]

R. Ashastin

[Excerpts] The Governments of the People's Republic of Bulgaria, the Hungarian People's Republic, the German Democratic Republic, the Union of Soviet Socialist Republics, and the Czechoslovakian Socialist Republic in 1969 signed the Agreement on Cooperation in the field of the production and application of computer technology. The republic of Cuba and the Socialist Republic of Romania joined the participants in the agreement later.

In a few years the fraternal countries have established a scientific base and powerful productive potential for the development and production of computer technology. In the decade since the agreement was signed the volume of production of computer equipment has risen more than six times, while the mutual trade of the countries that are participating in the agreement has increased more than 18 times.

At the present time about 30 scientific research institutes and design bureaus are at work in the countries according to coordinated plans and more than 70 plants are producing computer equipment. To them we should add the large number of scientific research, planning-design, and technological organizations engaged in planning and introducing automated control systems.

Line of Four Storage Units Using YeS-5066 Replaceable Magnetic Discs (with Stacks of YeS-5266 Discs with 100 Megabyte Capacities) with a YeS-5566 Control Unit within the Complement of a YeS-1060 Computer

In the last decade 12 models of YeS computer processors have been developed, passed interntaional testing, and gone into industrial production. Their speeds range from 3,000 to 1 million operations per second. In addition four models of small computer systems and more than 300 peripheral units for YeS computers and systems of small computers were developed, tested, and put in production.

Work began in 1974 to modernize the Ryad-1 computer, devise a second phase of the Ryad-2 YeS Computer, and develop the first phase of a system of minicomputers. As a result of this work production was begun on improved models of the Ryad-1 computer: YeS-1010 and YeS-1012 (Hungary), YeS-1022 (USSR), YeS-1032 (Poland), and YeS-1033 and YeS-1052 (USSR), as well as the Ryad-2 and the first phase of a small computer system (SM EVM).

The experience of the socialist countries shows that the most effective form of introduction of computer equipment is using it to automate industrial processes and works (ASUTP). In the Soviet Union alone more than 2,000 systems of this type are now in operation.

Development of a program for further elaboration of the YeS computers and small computer systems is now being completed.

YeS-1060 Computer

The primary objective of development of the Unified System (YeS) of computers (Ryad-3) is to create a new generation of competitive computer equipment, more powerful and economical, whose use will make possible an evolutionary transition to new principles and offer the computer user the means to satisfy growing requirements. This objective is to be achieved by considerably reducing the size, cost, and energy use of the computer by employing large integrated circuits and microprocessor sets and increasing the productivity and carrying capacity of the systems by hardware realization of numerous software functions and use of special processors, development and broad introduction of methods of automating programming, developing the principles of critical path employment of computer equipment, and significantly raising the reliability of the equipment. During this provision will be made for elaboration and sequential continuity in the use of software developed earlier. The result will be creation of YeS models that can perform more than 5 million operations a second; when they are combined their productivity will be practically unlimited.

To raise the productivity and efficiency of computer complexes, in addition to a significant increase in the capacities of traditional memory units (magnetic disc and tape stores) and reducing access time for them, work is underway to develop a large-scale memory system with a capacity of at least 10^{12} bits and devices that record and reproduce digital information optically. The optical units will have capacities of 10^{13}-10^{14} bits.

Development of the second phase of the system of small computers envisions an improvement in the technical-economic indicators of minicomputers, elaboration of the potential of the problem orientation method,

Minicomputer as Part of the IVK-1
Measurement-Computing Complex

improving reliability, refining the monitoring and diagnosis system, and reducing the dimensions of the computing equipment. The second phase of the system of small computers includes several classes of computers (from eight-place microcomputers to highly productive computers with virtual memories on the order of 16 megabytes) as well as multiprocessor and multimachine complexes that use problem-oriented and functional special processors.

New printers based on microprocessors (some using laser) will be built. They will make possible a reduction of half to two-thirds in the volume of electronic equipment and have a printing speed of 6,000 lines a minute for parallel printing and up to 400 and more characters a second for sequential printing. A series of models of alphanumeric and graphic display units with expanded potential for representing and editing information is to be developed. Development of systems for operator dialogue with the computer in the voice mode is to be completed.

Even though the CEMA members have in fact freed themselves of the need to import computers from the capitalist countries by developing their own unified system of computer equipment, they are always ready to develop mutually advantageous trade in the computer field with all countries of the world. But of course, this must be on an equal basis, with no restrictions or discrimination whatsoever. And if certain short-sighted Western politicians, to please the most reactionary and aggressive circles, are attempting to impose an embargo on trade with the socialist countries, which would include computer equipment, this will hurt them most of all.

[405-11,176]
11,176
CSO: 1863

REVIEW OF DEVELOPMENTS IN CONTROL AND MONITORING EQUIPMENT FOR INTEGRATED CIRCUITS AND SEMICONDUCTOR INSTRUMENTS

Moscow TRUDY MOSKOVSKOGO ORDENA LENINA ENERGETICHESKOGO INSTITUTA, VOPROSY KONTROLYA INTEGRAL'NYKH MIKROSKHEM I POLUPROVODNIKOVYKH PRIBOROV in Russian No 375, 1978 pp 3, 100

[Editorial preface and contents of "Works of the Moscow Order of Lenin Power Engineering Institute. Questions of Control in Integrated Circuits and Semiconductor Instruments," Moscow Power Engineering Institute 1978, 500 copies, 100 pages]

[Text] Editor's Preface

In implementing the decisions of the 25th CPSU Congress, Soviet industry is also successfully developing series production of new types of integrated circuits, semiconductor and optical electronic instruments. Monitoring their parameters both at the producer enterprise and by the consumers is an important national economic task on whose resolution the successful introduction of new instruments in radioelectronic and other equipment depends.

For a number of years scientific research work has been conducted by the industrial electronics faculty of the Moscow Power Engineering Institute's Smolensk Branch connected with the investigation of various types of integrated circuits and modern semiconductor and optical electronic instruments, and also with the development of control equipment for their parameters. This book represents a collection of articles containing some of the results of the research conducted by the personnel of the department in honor of the 60th anniversary of the Great October Socialist Revolution.

In the book a review is made of questions concerning the development of control equipment for operational amplifiers, integrated comparators, high-speed transistors and LED's. There are descriptions both of completed developments and their individual assemblies: measuring circuits for basic parameters, amplifiers and special-purpose generators and so

forth. The latter may be of interest in their own right. The book is intended for scientific workers and engineers engaged in the development of automated electronic control and measuring systems. It may also be of interest to students in a number of specialities: 0606, 0612, 0648 and others.

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[393-9642]

9642
CSO: 1863

UDC 681.326.34

ADDRESSING AND CONTROL OF DEVICES

Moscow INSTITUT TOCHNOY MEKHANIKI I VYCHISLITEL'NOY TEKHNIKI AKADEMII NAUK SSSR in Russian preprint No 14, 1979, 18 pp

BYAKOV, A. Yu., BURDONOV, I. B. and SMIRNOV, Yu. P.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TEKEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B922 by T. M. Kuznetsova]

[Text] The problem of input-output organization is considered, taking into account the specific layout and types of distributed peripheral equipment, for the solution of which there is formulated a method of identification and representation of external devices. For the operating systems of central processors there are introduced the concepts of an elementary type of devices and of dislocations, on the basis of which the problems of input-output connectedness and of redundancy are then analyzed. Classiciations of devices are given, input and output as well as dialog and logic devices are described. Analogous problems are treated in the section on "controlling a network of peripheral equipment", as such a network being regarded the part of an actual network containing input and output as well as dialog devices accessible to the user. The operating system executes interrogations and rejections, these operations being described here in detail. Particular attention is paid to procedures for adjustment of the control cluster, identification and deactivation of logic devices.

[376-2415]

UDC 681.322.066

CLUSTERS IN THE OPERATING SYSTEM OF A CENTRAL PROCESSOR

Moscow INSTITUT TOCHNOY MEKHANIKI I VYCHISLITEL'NOY TEKHNIKI AKADEMII NAUK SSSR in Russian preprint No 17, 1979, 13 pp

BYAKOV, A. Yu., GONTARENKO, S. V. and KUZNETSOV, S. D.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6 B184]

[Text] None

UDC 621.396.6.001.66:1

SYSTEMATIC AND PROBABILISTIC METHODS AND THEIR ROLE IN SOLVING PROBLEMS OF MORE EFFICIENT PRODUCTION OF ELECTRONIC EQUIPMENT

Ryazan' MIKROMINIATYURIZATSIYA RADIOELEKTRONNYKH USTROYSTV [Miniaturization of Radioelectronic Devices] in Russian No 2, 1979 pp 3-17

PESTRYAKOV, V. B.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6A525]

[Text] The system approach to treatment of radioelectronic equipment is expounded, as well as the content of probabilistic methods and philosophical aspects of solving the problem. Figures 6.

UDC 681.325-416

WAYS TO INCREASE THE FUNCTIONAL STABILITY OF OPERATING DEVICES BUILT ON CYLINDRICAL MAGNETIC DOMAINS

Omsk AVTOMATIZATSIYA ANALIZA I SINTEZA STRUKTUR EVM I VYCHISLITEL'NYKH ALGORITMOV [Automation of Analysis and Synthesis of Computer Structures and Computation Algorithms] in Russian 1979 pp 83-86

NESTERUK, G. F.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B376 by V. A. Nikitov]

[Text] Ways are considered to increase the functional stability of logic interaction modules built on cylindrical magnetic domains and serving as the basis for the organization of operating devices. In the design of functionally stable operating devices one strives to minimize the distance between cylindrical magnetic domains and to simultaneously maximize their diameter. This is achieved by application of current-conducting coatings all around the region of logic interaction modules. Another way to increase the functional stability is to use channels without clearance for the movement of cylindrical magnetic domains. It is demonstrated that optimization of the microstructure topology of logic modules requires the aid of a computer. The optimization criteria for the control structure of a logic module are formulated. As far as the vectors of forces acting on cylindrical magnetic domains are concerned, it is necessary to ensure: equal sums of the magnitudes of their projections when the magnetic domains are in their critical positions, the maximum algebraic sume of the projections of the resultant vector on the possible directions of domain movement, and the maximum distance between mutually attracting poles of the control coatings.

UDC 681.322.01

DESIGN FOR AN ASSOCIATIVE PARALLEL PROCESSOR EMPLOYING MAGNETIC BUBBLES, ORIENTED TOWARD THE SUPPORT OF RELATIONAL DATABASES

Moscow INSTITUT PRIKLADNOY MATEMATIKI AN SSSR. PREPRINT [USSR Academy of Sciences Institute of Applied Mathematics. Preprint] in Russian No 180, 1979, 24 pages

ZADYKHAYLO, I. B., MEL'NIKOV, B. F. and SADYKHOV, Ya. A.

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 5, 1980 Abstract No 5B27]

[Text] A design is proposed for a processor accomplishing the associative parallel processing of data arrays and oriented toward the support of relational databases. The design is based on using magnetic bubble structures as the component base. A description is given of the architecture of the processor, of the structure of the data and of the set of instructions. A study is made of possible methods of handling operations in parallel. Several layouts are given for the structure of a chip for a processor utilizing magnetic bubbles.

[371-8831]

UDC 681.322.004

'GRAFOR' FOR 'YES' UNIFIED-SYSTEM COMPUTERS

Moscow INSTITUT PRIKLADNOY MATEMATIKI AKADEMII NAUK SSSR in Russian preprint No 12, 1979(1980) 15 pp

MIKHAYLOVA, T. N. and SMIRNOV, A. S.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B826]

[Text] The distinguishing features of lower-level facilities of graphic devices in the GRAFOR complex for YeS Unified System computers are described. Described is also the generation process in this GRAFOR complex, for a specific configuration of the computer complex.

[376-2415]

UDC 681.326.34.001.2

ONE METHOD OF SIMULATING LOGIC CIRCUITS WITH THE RELATION BETWEEN DELAY IN ELEMENTS AND DELAY IN CONDUCTORS TAKEN INTO ACCOUNT

Moscow TRUDY INSTITUTA ELEKTRONNYKH UPRAVLYAYUSHCHIKH MASHIN in Russian No 76, 1979 pp 33-37

BRODSKIY, M. A.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B366 by S. G. Romanova]

[Text] A method of simulating logic circuits is proposed which takes it into account that the time delay in conductors is much shorter than the time delay in circuit elements. One way of refining the septenary simulation is considered. The gist of this method is shown to be that: 1) an analysis procedure is introduced for refinement of the septenary simulation, 2) this procedure is followed every time an element (only a principal element in a loop) is reasonably suspect of having been calculated incorrectly according to the rules of septenary algebra, 3) this analysis procedure also explains how a principal element in a loop will behave while the initial state of the principal input remains invariable, and establishes the correct state of such a principal element. References 2.

[376-2415]

UDC 681.326.7

ALGORITHMS OF CALCULATING FAILURE LISTS IN THE CASE OF OSCILLATIONS IN THE CIRCUIT

Moscow TRUDY INSTITUTA ELEKTRONNYKH UPRAVLYAYUSHCHIKH MASHIN in Russian No 76, 1979 pp 38-45

BASOK, B. M.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B374 by S. G. Romanova]

[Text] It is noted that during ternary simulation of logic circuits containing delay lines there can occur "oscillations" in such a circuit. The rules are examined according to which failure lists are calculated by the deductive method in the case of such oscillations. Several statements are made based on comparing the results of calculation of failure lists by the deductive method and the results of simulation of faulty circuits. It is demonstrated that the calculation process for determining the completeness of a test by the deductive method must not necessarily be a converging one. The following situations are possible: 1) the process of simulating a faulty circuit is converging and the process of calculating failure lists in diverging, or 2) both processes are diverging. Two algorithms of calculating failure lists for these cases are shown. References 5.

[376-2415]

UDC 681.327.13(088.8)(47)

A DEVICE FOR DATA READOUT FROM MEMORY MODULES BUILT ON MAGNETIC DOMAINS

Moscow USSR PATENT CLASS G 11 C 11/14, No 2,466,517 in Russian 28 Jan 79 (disclosure No 643, 971 25 Mar 77)

POTAPOV, V. S., KRASOVSKIY, V. Ye. and SMIRNOV, S. N., Institute of Electronic Control Machines, Moscow

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B714 P]

[Text] A device for data readout from memory modules built on magnetic domains is proposed which contains a magnetically uniaxial film with magnetic domains carrying the main channel for domain movement, a domain

divider whose input and one output are connected to the main channel for domain movement, also an auxiliary branching channel for domain movement connected to the main channel, and galvanomagnetic transducers. The device includes also another auxiliary channel for domain movement connected to the second output of the domain divider and the main channel. Figures 2; references 2.

UDC 681.326.3(088.8)(47)

A MICROPROGRAMMED CONTROL DEVICE

Moscow USSR PATENT CLASS G 06 F 9/16, No 1,848,859 in Russian 25 Oct 79 (disclosure No 693,375 23 Nov 72)

GLUKHOV, Yu. N. and RODIONOV, V. V., Institute of Electronic Control Machines, Moscow

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B470 P]

[Text] The microprogrammed control device in this invention contains a microcommands memory, and operations decoder, a microcommands address generator, and a mode-of-operation trigger. The outputs of digits in the address group, operational group and control group in the microcommands register are connected to corresponding outputs of the microcommands memory. The device includes a mode-of-operation decoder, an operations selector and an address selector. Extra digits are added to the address group and the control group in the microcommands register. The outputs of mode-of-operation digits of the control group in the microcommands register are connected through the mode-of-operation decoder to the inputs of the mode-of-operation trigger, this trigger's "0" and "1" outputs being connected to corresponding inputs of the operations selector and the address selector, while the information-carrying inputs of these two selectors are connected to corresponding outputs of digits of the operational group and the address group in the microcommands register. The outputs of the extra digits of the address group in the microcommands register are connected to corresponding inputs of the address selector, and the outputs of the extra digits of the control group in the microcommands register are connected to corresponding control outputs of the operation selector. Figures 1; references 2.

UDC 681.34.01

REALIZATION OF AUTOMATIC SOLUTIONS TO PROBLEMS ON HYBRID EXTREMAL MODELS

Kiev INSTITUT ELEKTRODINAMIKI AKADEMII NAUK UKRAINSKOY SSR in Russian preprint No 220, 1979 33 pp

GISHCHAK. K. I. and TKACHENKO, O. V.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B959]

[Text] Described are the structure, the basic design and the practical realization of a programmable scanning device which broadens the possibilities of solving multiextremal problems with the aid of hybrid computers of the "ekstrema" type. The approach taken here is based automatically scanning the space of problem variables by local searches from starting points located at nodes of a uniform grid with an adjustable step. The device makes it possible to further automate computer-aided solutions and to effect a global search for the extremum in problems of low dimensionality (n= 4-8). Figures 8; tables 1; references 8.

[376-2415]

UDC 681.32.021.1:681.32.057.1

A COMPUTER TERMINAL FOR SIMULATION OF DIGITAL OBJECTS

Moscow TRUDY INSTITUTA ELEKTRONNYKH UPRAVLYAYUSHCHIKH MASHIN in Russian No 76, 1979 pp 18-26

SERGEYEV, B. G. and CHUCHMAN, V. G.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B886 by S. I. Volchek]

[Text] An improvement of hardware-software simulation of static synchronous objects is proposed which will ensure a faster checking of the test object than by software simulation alone. A special feature of this method is also that the checking speed does not depend on the complexity of circuit integration in the object. The model of an object is, according to this method, built on the basis of an identical set of integrated circuits known to function as in the test object, but here interconnections between integrated circuits and connections to the external inputs of the model are made in the program rather than by physical means. Implementation of this method requires a very intensive data exchange between

computer and terminal during the simulation process. For eliminating this drawback, a new variant of a general-purpose terminal is proposed capable of storing and executing the program of IC interconnections without the aid of a computer. The functions left for the computer are feeding the program into the terminal, transmitting the given text at the model input, receiving and analyzing the responses from the model output. The structure of such a terminal and the methodology of simulation with the aid of such a terminal are described. Figures 2; references 3.

[376-2415]

UDC 681.322-185.3

SETTING UP A LINK BETWEEN A MICROPROCESSOR SYSTEM AND THE 'ELEKTRONIKA-60' COMPUTER

Moscow VOPROSY ATOMNOY NAUKI I TEKHNIKI. YADERNOYE PRIBOROSTROYENIYE [Problems of Atomic Science and Engineering, Nuclear Instrument Making] in Russian No 3/41, 1979 pp 194-202

GORN, L. S., DRUZHININ, V. S. and KLIMASHOV, A. A.

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 8, 1980 Abstract No 5B251]

[Text] A structural diagram of an interface adapter is discussed for the program exchange of data between an "Elektronika-60" type microcomputer and a microprocessor system based on a model K580IK80 microprocessor. As an example, a description is given of the program exchange algorithm for the case when the initiator of the exchange is the microcomputer. Figures 2; reference 1.

[371-8831]

UDC 681.325.5(088.8)(47)

N-BIT COMPUTING UNIT

Moscow USSR PATENT NO 686028, CL. G 06 F 7/38 in Russian applied for 16 May 77, Application No 2486284, published 18 Sep 79

ZHUKOV, V. A. and MEDVEDEV, I. A., Institute of Control Problems

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 5, 1980 Abstract No 5B458]

[Text] This matrix-type unit contains a multiplier register, n/2 AND gates, n/2 decoders and K groups of arithmetic-logic modules. The first

input of the i-th AND gate is connected to the (2i - 1)-th output of the multiplier register, where i = 1, 4, ..., n. The inputs of the decoders are connected to the outputs of the multiplier register. An (n/2 + 1)-th AND gate and a commutator are added for the purpose of expanding the functional capabilities of the unit by the performance of addition, subtraction, right shift and left shift operations. Figures 1.

UDC 681.322

GENERAL-PURPOSE DIGITAL ELECTRONIC COMPUTERS, METHODS OF TESTING

Moscow USSR BUREAU OF STANDARDS, GOST [All-Union State Standard] 23773-79 in Russian

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 5, 1980 Abstract No 5B244 by V. T. Mitroshina]

[Text] This standard applies to stationary computers designed for solving scientific and technical, economic planning and other problems, both independently and in data processing systems, and to equipment included in the structure of a computer, and establishes testing methods to meet the requirements of GOST 16325-76. A list of instruments and equipment used for making tests is given, as well as a procedure for a comparative estimate of the productivity of computers. Informative data are given on the agreement of GOST 23773-79 with CEMA Standard 1117-78.

UDC 681:142.2

ABSTRACTS FROM 'TECHNICAL CYBERNETICS'

Moscow IZVESTIYA AKADEMII NAUK SSSR. TEKHNICHESKAYA KIBERNETIKA in Russian No 3, 1980 p 221

ASYNCHRONOUS PARALLEL COMPUTING IN A MODULAR MULTIPROCESSOR COMPUTER. II. REALIZATION OF THE MODEL

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

[Text] The article discusses asynchronous parallel computing on a modular multiprocessor computer using a trilogical graph-model program. The

proposed method is oriented toward a wide class of tasks, uses a program representation in tiered parallel form, and permits parallelization both of program logic and of data. An algorithm is presented for synchronization for accomplishing a fragment of a program. Illustration 1; references 2.

[272-9645]

VERY LARGE-SCALE INTEGRATED MEMORY CIRCUIT 'SUPERCOMPONENTS'--A PROMISING COMPONENT BASE FOR FOURTH-GENERATION DIGITAL SYSTEMS

Moscow MIKROELEKTRONIKA in Russian Vol 4, No 1, 1980 pp 3-14

[Article by A. G. Aleksenko and V. A. Lapshinskiy]

[Text] A characteristic feature of the present stage in the development of microelectronics is a striving to integrate circuit functions within the range of structural units of digital systems (to integrate morphologically) [1]. This tendency has led to the appearance of microprocessors and microcomputers with a degree of integration of 10^3 - 10^4 components per crystal, which are capable of performing completed sequences of logical and arithmetic operations, data storage and exchange with peripherals [2] and are "supercomponents" of the processor parts of fourth-generation digital systems. In the given case by supercomponents are understood very large-scale integrated circuits, programmed, autonomous, combined by a main line, with high reliability and durability, which serve as the main structural units for the construction of micro- and minicomputers and digital systems based on them.

Along with microprocessors and microcomputers the most widespread devices produced in the form of large-scale integrated circuits and very large-scale integrated circuits are memory systems, which have now achieved a capacity of 65 kbits ($\sim 10^5$ components/crystal) [3]. However, in spite of superiority over microprocessors in the degree of integration, memory systems have preserved the traditional structural organization. Therefore a qualitatively new approach to the structural organization of very large-scale integrated memory circuits is needed, that is, the development of supercomponents based on memory subsystems with a capacity of over 4 kbits ($\sim 10^4$ components/crystal), capable of performing completed sequences of operations of information retrieval and input-out (recording-readout) operations without multiple intervention of the central processor of the computer.

The present work had the purpose of formulating the requirements for the structural organization of memory subsystem supercomponents as a promising component base for fourth-generation digital system memories and the estimation of equipment expenditures to implement some structural principles.

Structural features of the new-generation digital systems and probable ways to improve the structural organization of memory systems

Multiprocessor organization with main-line connections on all levels of the system, microprogrammed control and an intellectual periphery [4] can be distinguished as the main features of the structural organization of fourth-generation digital systems.

The memory systems also undergo architectural changes. In particular, there is a considerable increase of the volume of the main memories (about 10^7- 10^{12} bits) on the basis of very large-scale integrated memory circuits, their structural organization is complicated for the effective processing of information in various forms (symbols, tables, graphs, etc) and the performance of accelerated information exchange, accomplishable by equipment, between different levels of the memory system hierarchy and between memory systems and central processors.

There now are several ways to construct memory systems with the above-stated characteristics. The first direction consists in a "strict" delimitation of the functions of arithmetic-logical processing and storage of processed and controlling information between processor (microprocessor) very large-scale integrated circuites and very large-scale integrated memory circuits. The organization of memory subsystems of various types (immediate-access, permanent, buffer, etc) remains traditional (typical) and includes a correspondingly connected store and direct control units. The efforts of workers have been directed mainly toward increasing the information capacity and speed of very large-scale integrated memory circuits without any sort of changes in principle in structural organization. That direction has had considerable successes. In particular, very large-scale integrated memory circuits of various types with a capacity of about 65 kbits and high technical characteristics have been developed [3].

To control the work of very large-scale integrated memory circuits arranged on a printed circuit plate, for example, special large-scale integrated controller circuits (large-scale integrated multifunctional interface circuits) are being developed. By means of the controllers a connection with the central processors and other computer units is accomplished directly or through a universal main line for input-output, information regeneration, etc [5]. However, the absence of a single approach to planning, the narrow specialization and the large variety of types of large-scale integrated controller circuits as a function of type, technical characteristics and the volume of the very large-scale integrated memory circuits and memory systems in combination with considerable expenditures on the development of memory and controller very large-scale integrated circuits determine the high cost of planning and realization of semiconductor memory systems. Evidently the creation and application of very large-scale integrated memory circuits with traditional organization cannot lead to the appearance of qualitatively new memory systems. There occurs only improvement of already existing characteristics. This happened because strict

delimitation of the functions of processing and storage leads to strict organization of the very large-scale integrated circuits, which is not universal and is incapable of reorganization and adaptation to operating conditions.

A second direction in the creation of digital systems, characterized by a striving to combine the functions of processing and storage in a single universal cell, is the direction of uniform computing media. The elementary cell of the uniform computing medium is capable of storing information and performing a set of arithmetic and logical operations [6]. The merit of planning digital systems on the basis of uniform computing media is expressed in the fact that the uniform computing media cell matrices are universal and permit testing and the diagnosis of errors and increasing the dimensions of accumulation. By means of uniform computing media it is possible to eliminate parallelism of the computing process and by the same token increase its speed. Digital systems with higher working capacity and reliability on account of redundant cells are also easily constructed. However, at the present time the organization of digital systems based on uniform computing media has not become widespread. This has happened because the uniform computing media cells have considerable dimensions and do not permit, even at the present level of development of integrated technology, the creation of subsystems with high information density. According to estimates made in [6], at a degree of integration of $\sim 10^5$ gates/crystal the realization of uniform computing media very large-scale integrated circuits containing $\sim 10^3$ cells is possible. Characteristic of uniform computing media are considerable redundancy and complexity of "adjustment" (programming). The computer software based on uniform computing media is inadequately developed. Among the shortcomings of digital systems based on uniform computing media are a lack of uniformity and great complexity of the framing intended for uniform computing media control. In [7] the opinion is expressed that the rates of development of the uniform computing media direction has been held back by the absence of very near prospects. Obviously, with the development of integrated technology the importance of those shortcomings of uniform computing media will be diminished.

Evidently the most promising way to solve the problem under consideration in the present stage of development of the technology is the "supercomponent" approach to structural organization of memory subsystems, which occupies an intermediate place between the directions considered. The memory elements are not complicated in that case and the very large-scale integrated memory circuits preserve a high information capacity. Introduced into the structural circuit, besides the basic units, are additional control units which expand the functional possibilities of the subsystems in accordance with the determination of the memory subsystems. Possible on the basis of the memory subsystems is the realization of an "intelligent" memory, characterized by flexible access. Evidently the next stage of morphological integration will be the combination on a single crystal of microprocessor units and a distributed memory for the construction of multiprocessor uniform structures [8].

Let us examine a typical structural circuit and formulate the requirements for the memory subsystem as a memory subsystem with expanded functional possibilities for retrieval and input-output, starting from the structural features of new-generation digital systems.

Typical memory subsystem structural circuit, its shortcomings and estimation of equipment expenditures on the main control units

A typical memory subsystem structural circuit (Fig 1) contains a memory element matrix, address and digit decoders, address former units and digit former units, read-out preamplifiers, crystal selection units, information input-output and a unit for the formation of levels of reference currents and voltages, that is, all the main units necessary for the performance of single information recording-readout operations with a volume of 1-5 bits for an arbitrary address [9].

The most repeated element in a very large-scale integrated memory circuit is the memory element, and the store occupies a large portion of the crystal. Among the memory elements of subsystems of various types, dynamic memory elements have minimum dimensions. The area of the dynamic memory elements is 100-500 square microns and they are constructed on the basis of injection valves in subsystems based on bipolar transistors or MDP [expansion unknown] transistors in MDP subsystems [3,10]. Therefore it seems convenient to estimate equipment expenditures on control by comparing them with expenditures on the storage of the dynamic main very large-scale integrated memory circuits. Assuming that each gate or basic circuit element of the unit (for example, an address former) is equivalent to a definite quantity of dynamic memory elements in area and number of components, it is possible to estimate the equipment expenditures on each control unit. It also is easy to determine the expenditures on the organization of control in the subsystem as a whole if its capacity is known. To simplify the estimates we will consider that in a structural circuit a two-stage decoder is used [9], the first stage being combined with the input buffer circuits and the second with the formers. In addition, the total number of gates in the selection, input-output and reference level formation units amounts to 20-50.

For main very large integrated memory circuits with a capacity of 65 kbits and a typical structural circuit the equipment expenditures or expenditures in area amount to 5-10 kbits or 2.5-5.0 mm^2 respectively (table). In a percentage respect the control units occupy 20-30 percent of the area of the crystal.

Similar estimates can be made for very large-scale integrated memory circuits of other types.

Let us examine equipment expenditures on the realization of memory subsystem supercomponents based on dynamic main very large-scale integrated memory circuits with a capacity of 65 kbits.

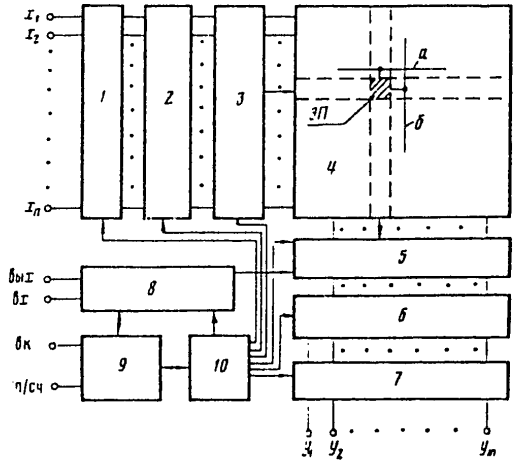

Fig 1. Typical memory subsystem block diagram.

1 - address buffer circuits unit
2 - address decoder
3 - address formers
4 - memory element matrix
a - address b - digit
5 - digit former-preamplifiers
6 - digit decoder
7 - digit buffer circuits unit
8 - input-output unit
9 - crystal selection unit
10 - reference current and voltage level formation unit

Requirements for memory subsystem supercomponents and estimation of equipment expenditures on the realization of certain structural principles

Universality of memory subsystem supercomponents. The main requirement for such supercomponents is universality, which means the possibility of having a fairly broad set of information selection algorithms and memory system configurations on the basis of a small number of types of memory subsystem components with a different structural organization. In an ideal case a universal supercomponent based on memory subsystems represents a crystal with great information capacity and built-in microprogrammed controller which is capable of performing a definite set of single-cycle and multi-cycle, address and addressless operations of information selection from storage. In particular, the performance of selection with arbitrary change of address, of successive, parallel, associative selection, etc. In that case the realization of various levels of memory system hierarchies for universal and specialized computers is possible on the basis of supercomponents based on memory subsystems. Universality of supercomponents based on memory subsystems can be achieved during construction of structural circuits on the principle of processor orientation, which

Equipment expenditures on realization of supercomponents based on a dynamic very large-scale main memory integrated circuit with a 65-kbit capacity

Principle of structural organization	Information storage and selection methods	Control units	Main circuit elements	Equivalent equipment expenditures on control unit main circuit elements (e)	Area of control unit main circuit elements (f)	Equivalent equipment expenditures on control units, kbits (g)	Control unit area, mm^2 (h)
(a)	(b)	(c)	(d)				
Typical organization	Main storage static file		Memory elements	1	1000-3500		65-230
	Main storage dynamic file		"		100-500	65.4	7-30
	Permanent storage file		"		200-2000		14-120
	Semipermanent storage file		"		1000-3500		65-230
		of address formers	Former	10-15	3000-4500	2-4	0.8-1.5
		of digit former-pre-amplifiers	Former-pre-amplifier	15-20	4500-6000	2.5-5	1.2-1.5
		of crystal selection, input-output and reference currents and voltage formation	Gate	2-10	600-3000	0.04-0.5	0.03-0.15

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Processor-oriented organization	Unit selection	Memory element line (column) selection register				2.5-5	1.2-1.5
		Adjustable digit organization control unit (Nx1, Nx4, Nx8, etc)	Cyclable RS-trigger	10-20	3000-6000	0.2-0.4	0.02-0.1
		Format organization and masking				0.2-0.7	0.04-0.6
	Associative selection	Associative retrieval control				2.8-5.6	1-5
		Associative signs storage	Associative memory element	10-30	3000-9000	30-60	5-18
Modular (autonomous) organization	Active-passive feeding of storage and control units	Formation of pulsed feeding signals	Pulsed current switch			1.5-2	0.4-0.8
	Quasi-static data storage	Regeneration control				5-10	1.5-3.0

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Main line organization	Multiplexing of address and control data	Multiplexor	Cyclable RS-trigger				0.04-0.1
	Main line input-output	Main line formers		10-20	3000-6000	0.2-0.4	0.04-0.1
Microprogram organization	Multicyclic information selection	Microprogram "residual" control				0.8-1.6	0.16-0.4

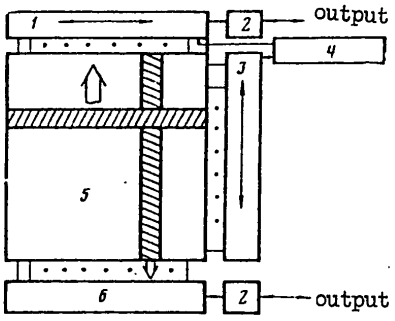

Fig 2. Packing of input-output channels by means of accelerated input-output data files in the form of a line (or column) of memory elements
1 - input-output line register
2 - input-output line (column) buffer circuits
3 - input-output column register
4 - time check circuit
5 - memory element matrix
6 - digit former-preamplifier

includes accelerated, equipment-performed unit ("page") selection, adjustable digital organization for accomplishing parallel selection, the possibility of organizing formats and conducting masking operations, and combined address-associative or address-stack selection, accelerated and equipment performed.

Accelerated, equipment-performed unit selection is necessary for the movement of programs and data within memory systems (for example, within the main memory or between high speed and main storages, etc), exchange between memory systems and the input-output of data files to peripherals. The need for acceleration during selection (of data files) is based on the fact that when reference is made to any given memory element, reference to a neighboring memory element can be expected with great probability. The equipment realization of unit selection in supercomponents based on memory elements increases the speed of the memory systems, as the number of transmissions of signals along the main line of memory system control is diminished.

A vary simple method of unit selection in supercomponents based on memory elements is recording-readout of information in the form of a memory element line or column in a special register, and then successive input-output under the effect of a cyclic signal. The selection rate is determined by the rate of shift of data into the register for the input-output circuit (Fig 2). A gain of 20-30 percent in speed is achieved because time is not spent on the addressing of each bit, which is 20-40 percent of each reference cycle. The unit selection control unit also includes a time check circuit which blocks the address (digit) decoder and cycles the register (table). Several register working regimes obviously can be envisaged. For example, shift back and forth, input-output of 18 digit layers (by the same token having organized 8-16 digit formats), etc.

Unit selection can be accomplished in the form of rectangular files, that is, of several, for example, four to eight columns (lines) of memory elements simultaneously (by the parallel-successive method). The adjustability of the digit organization (Nx1, Nx2, Nx4, etc) permits using supercomponents based on memory subsystems on different levels of the memory system hierarchy and in different systems. In particular, in microprocessor systems it is convenient to use supercomponents based on memory elements with the organization (Nx8), the volume of which greatly exceeds several hundred or thousand words--multidigit organization.

To accomplish parallel-successive selection it is necessary to increase in the input-output unit the number of circuits for information reception and circuits of output readout amplifiers, for example, to eight (table). The digit capacity of the output files can easily be changed by means of an additional decoder to rearrange the organization of supercomponents based on memory subsystems.

In most applications the memory system architecture is planned on the basis of address reference. In a number of cases, however, for example in memory systems for specialized computers, addressless selection is required for data processing in the form of lists, graphs and tables. Therefore it is advisable to make provisions in control unit supercomponents based on memory substystems for combined address and associative selection.

Various alternatives of the organization of supercomponents based on memory subsystems with address-associative selection are possible. To reduce equipment expenditures, part of the main storage can be used to store characteristics (Fig 3). In that case the associative retrieval is accomplished successively by lines and in parallel by m-digits. The unit selection register is used to control retrieval or to sort the lines. Upon indication of coincidence in the indicator unit with a sign that has arrived in the input sign register, the selection of (n-m) digits of the line corresponding to the k-sign occurs. Operations of masking and retrieval according to any criterion can be performed by means of special registers (see table and Figure 3).

Speed is successfully increased during associative selection during parallel comparison in an additional storage based on associative memory elements. However, the equipment expenditures increase sharply (table).

From the point of view of technology the mass production of very large-scale integrated circuits of universal supercomponents based on memory subsystems is convenient when they are planned on the principle of the base crystal. In that case the memory subsystem supercomponents are made in large volumes according to a unified developed technology and circuit technology, and the selection and changes in the structural organization in accordance with the needs of users are obtained through action of logical signals on special inputs or subconnections of those inputs, for example, to the power source. Provision is made on the memory subsystem supercomponent crystal for a certain number of contact areas for those inputs. If there is no need for adjustment, some of them are not connected to the outputs of the memory subsystem supercomponent casing.

The unified principle of memory subsystem supercomponent structural organization. The creation of memory systems for various purposes and volumes with nearly optimum characteristics evidently is possible when there is orientation toward a unified structural principle of construction of new digital systems. That principle is formulated as follows: reduction of the entire variety of memory systems to a structure based on a small number of types of memory subsystem supercomponents (modular construction) combined by means of standardized connections (main line organization) and controlled by means of standardized signals (microprogrammed control). On that basis digital systems based on microprocessors and microcomputers will be constructed [4], the characteristics of which should be taken into consideration in the organization of memory subsystem supercomponents and memory systems.

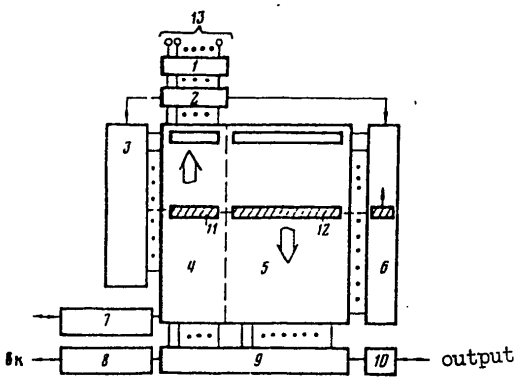

Fig 3. Associative retrieval of data file.

1 - input sign register
2 - associative retrieval control unit
3 - address decoder
4 - associative sign storage
5 - memory element matrix
6 - data file selection register
7 - associative sign input-output unit
8 - crystal selection unit
9 - digit former-preamplifiers
10 - input-output channel buffer circuit
11 - sign code
12 - data file
13 - input sign code

By a memory system module is understood certain structural units in the form of one or more memory subsystem supercomponent very large-scale integrated circuits. The modular memory system assumes a certain autonomy of the memory subsystem supercomponent which can be achieved by processor integration, built-in active-passive feeding of the control unit [11] and quasi-static organization of storage. The built-in active-passive feeding of the control unit means the disconnection of a large part of the control unit from the power source in the absence of turning to memory subsystem supercomponents. During the operations of retrieval and input-output a special pulsed power unit (Fig 4) automatically triggers the necessary control units. The portion of the control units that preserve useful information, for example, the unit for storage of associative signs, and determine the speed of memory subsystem supercomponents (the crystal selection unit and the pulsed power formation unit), is permanently connected to the power source. Active-passive feeding permits reducing the power required by the memory subsystem supercomponents and is accomplished by means of intermediate formers on the basis of pulsed current switches (table). The number of formers corresponds to the number of control units disconnected from the power source, and on the basis that each intermediate former triggers 8-10 circuit elements in a unit (Fig 4). Quasistatic organization means the self-regeneration of information in the memory subsystem supercomponents on the basis of dynamic memory elements regardless of external

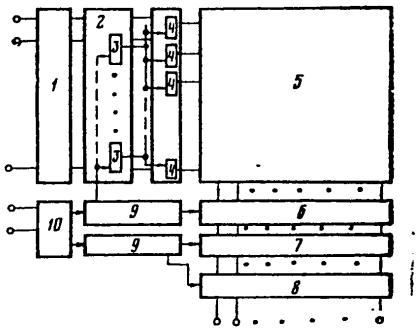

Fig 4. Built-in active-passive feeding of control units

1 - address buffer circuits unit
2 - address decoder
3 - intermediate formers
4 - address formers
5 - memory element matrix
6 - digit former-preamplifiers
7 - digit decoder
8 - digit buffer circuits unit
9 - pulsed feeding unit circuits
10 - crystal selection unit

references (for example, in pauses between them). In that case the central processor is freed from the need to keep track of the restoration of information and in the subsystems there is an absence of so-called employment time, when access is forbidden and regeneration is produced under external control. The information regeneration unit (Fig 5) can also include an additional register of data to be regenerated, an address counter and a circuit for formation of a time interval equal to the period of regeneration (timer). The regeneration is done, for example, successively along the memory element lines (see table).

A distinctive feature of main line organization of memory subsystem supercomponents is that it is necessary to integrate on the crystal powerful buffer circuits for work on the considerable capacitive load of the main lines. The buffer circuits must also assure compatibility with respect to levels of logical signals taken as standards, for example, TTL-logical levels. To construct the requirements for time diagrams of main line work, the input buffer circuits can be constructed on the basis of cyclable RS-triggers with powerful outputs (table).

Microprogrammed control of the work of memory subsystem supercomponents can be accomplished if the controlling signals in the form of microinstructions are recorded in special registers (the "residual" control unit) and then the control unit is strobed by means of those microinstructions. Thus several data files in succession are withdrawn (in the form of memory element columns or lines) and also other retrieval and input-output sequences. Obviously, provision must be made to disconnect the residual

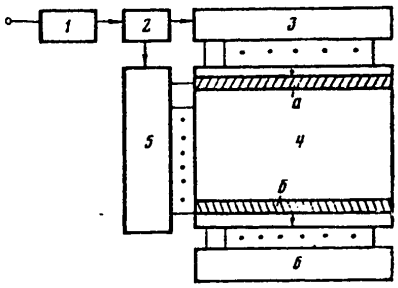

Fig 5. Quasistatic organization of data storage.

1 - time interval formation unit
2 - address counter
3 - register of data to be regenerated
4 - memory element matrix
a - to be registered
b - to be processed
5 - address decoder
6 - digit formers-preamplifiers

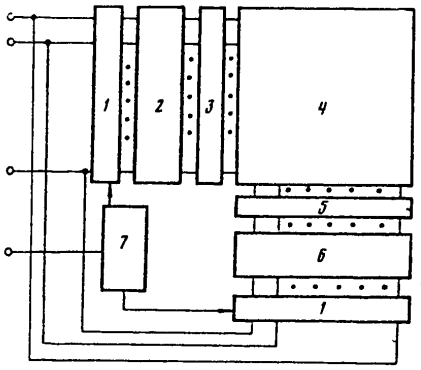

Fig 6. Multiplexed input of address data.

1 - input buffer circuits
2 - address decoder
3 - address formers
4 - memory element matrix
5 - digit formers-preamplifiers
6 - digit decoder
7 - time check unit

control unit for control directly from the central processor. The unit under consideration, in the form of 2-4 8-digit registers, can control the work sequence of up to eight control units.

Degree of morphological integration. The third requirement for memory subsystem supercomponents is the maximum possible information volume with a

minimum number of casing outlets of the microcircuit and a justified degree of morphological integration (additional functional possibilities). The need for a minimum number of outlets of the memory subsystem supercomponent casing is obvious because, usually, the memory system that determines the digital system dimensions occupies up to 70-80 percent of its physical volume. There is no criterion of morphological integration, but it can be assumed that the control units in memory subsystem supercomponents will occupy 40-60 percent of the area.

To meet the third requirement it is necessary to plan memory subsystem supercomponents on the basis of memory elements with an essentially three-dimensional structure and multiplex the input address and controlling data. In the case of memory subsystem supercomponents for main memories the increase of the information capacity of the storage is achieved by the application of three-dimensional dynamic memory elements [3,10].

It should be noted that a large portion of the casing outlets of very large-scale integrated memory circuits with a typical organization is the address inputs ($\sim \log_2 N$, where N is the information capacity in bits). Increase of the capacity of very large-scale integrated memory circuits requires the re-planning of memory systems and large-scale integrated controller circuits, as the number of lines in the address main line is increased. However, if the multiplexed address input is used, the increase in capacity of memory systems is achieved by direct replacement of some memory subsystem supercomponent casings by others with a larger capacity and by increase of the number of address input cycles p ($p \geq \log_2/\alpha$, where α is the number of lines in a universal main line). In particular, the two-cycle input of a complete 16-digit address code into an memory subsystem supercomponent with a 65-kbit capacity on an 8-digit main line. To do that it is necessary to introduce into the very large-scale integrated circuits additional 8-digit registers and a time check unit, which previously connects registers to a main line (Fig 6). The role of the register digits can be filled by input buffer circuits based, for example, on RS-triggers.

Thus by multiplexed data input-output is understood multicyclic input-output on a universal main line with a fixed number of lines. The input information is distributed among the required memory subsystem supercomponent control units by means of a special multiplexing control unit.

The advantages of multiplexed input of address information consist in the possibility of selecting information with the required delay with respect to a fixed address, in increase of the reliability of address fixation and the number of memory subsystem supercomponent casing outlets which can act for microprogrammed memory subsystem supercomponent control.

The main shortcoming of multiplexing is reduction of the real-time memory subsystem supercomponent speed. Therefore in memory subsystem supercomponents intended, for example, for high-speed storages it is necessary to use single-cycle input of address and controlling information. Single-cycle

input is readily realized if in the "basic" memory subsystem supercomponent crystal provision is made for the connection of all address inputs to the contact areas and the disconnection from the power supply of the multiplex control unit (Fig 6). The memory subsystem supercomponent speed increases if it is possible to combine in time current selection and the input of address and controlling information for further reference.

Conclusion

At the present time one promising way to develop an elementary base of fourth-generation digital systems and, in particular, of memory systems, is the construction of memory supercomponents with a processor-oriented structural organization. Such an approach permits increasing the effectiveness of data processing. A limited set of sufficiently universal memory subsystem supercomponents with adjustable organization together with microprocessor sets makes it possible rapidly and with very low expenditures to develop memory systems with complex organizations and varied technical characteristics.

Preliminary estimates of equipment expenditures on the application of some structural principles of memory subsystem supercomponent organization permit drawing the following conclusions:

1. It is possible to create single-crystal memory subsystem supercomponents, the structural organization of which allows processor orientation on the level of memory subsystems with a capacity of 65 kbits (see table), equivalent equipment expenditures will amount to 10-60 kbits or 30-50 percent of the area of a crystal with dimensions of 25-50 mm^2.

2. With increase of the information volume of memory subsystem supercomponents the possibilities of morphological integration will increase.

3. It is advisable to combine control units to perform the functions of counting, shift and temporary monitoring during the performance of various operations, that is, orientation toward multifunctionality of control units in memory subsystem supercomponents. This will permit optimizing equipment expenditures in such supercomponents.

For objective evaluation of possible alternatives of memory subsystem supercomponent structural organization it is necessary to develop a system of morphological indicators--purpose functions of effectiveness (speed, equipment expenditures, reliability, etc) for the estimation and optimization of those alternatives with consideration of memory subsystem supercomponent information, the purpose and organization of memory systems and distinctive features of various basic elements (N-MDP transistors and bipolar transistors).

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SOME PROBLEMS OF STRUCTURAL ORGANIZATION OF SPECIALIZED ELECTROOPTICAL COMPUTER COMPLEX

Novosibirsk AVTOMETRIYA in Russian No 2, 1980 signed to press 3 Apr 80 pp 3-9

[Article by M. A. Kartsev and B. G. Marshalko, Moscow]

[Text] Attempts now undertaken to utilize optical phenomena and various types of devices based on these phenomena to develop digital computers are encountering a number of serious difficulties, the main one of which is apparently the absence of optical internal stores (OOZU).

The advantages of optical phenomena have been utilized successfully only in permanent holographic stores. These advantages include higher information storage density, rapid retrieval of recorded information, the possibility of retrieving an entire data file for parallel processing and the high reliability of information storage [1].

An obstacle for utilizing the enumerated advantages in OOZU is the absence of reversible storage media which would permit rapid recording and replacement of information. The efforts of investigators are now concentrated mainly on development of these media [2].

Structural organization of a computer complex in which modern capabilities of electrooptics are utilized is considered in the given paper. The proposed structural diagram does not claim to determine to any extent the future trend of introducing optical methods in computer technology. However, it indicates the possibility of overcoming the existing difficulties by structural methods and points out ways of solving some problems which arise in development of electrooptical computer systems.

A block diagram of a specialized electrooptical computer complex which includes a specialized electrooptical computer (OEVM), a large permanent holographic memory (BPGP), a fiber optics communications system (VOSS) and a universal computer, is shown in Figure 1.

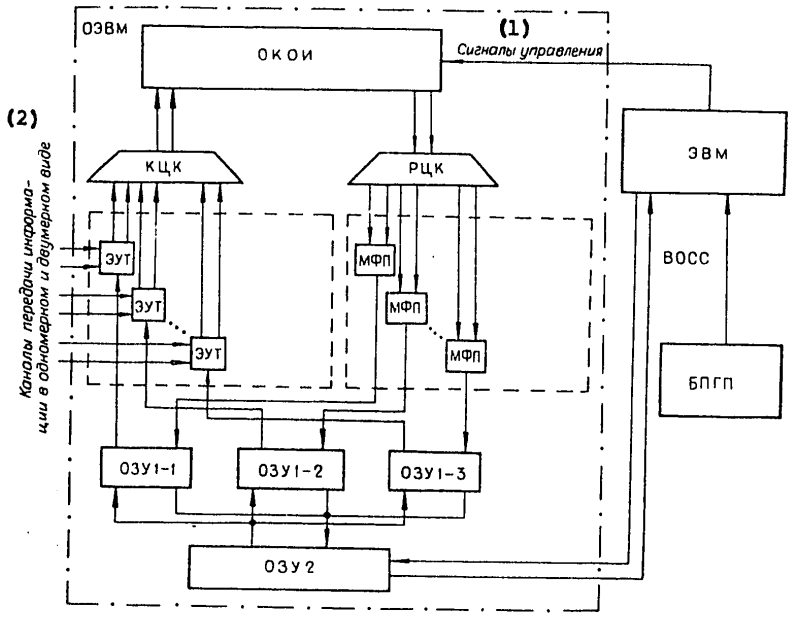

Figure 1.

Key:
1. Control signals
2. Information transmission channels in one- and two-dimensional form

With regard to the fact that the most significant advantage of optical information processing systems is their multichannel capacity, determined by the two-dimensional nature of the optical image, the discrete method of processing digital patterns (two-dimensional discrete optical images) is used in the OEVM. The known versions of this method include "pattern" logic, the method of optical resolving filters and the method of control operators [3].

Besides providing high productivity and accuracy, the discrete method of digital pattern processing permits one to make the next step in developing the structure of digital computers. Computers which have been constructed up to the present were designed to perform operations on multidigit binary numbers. In other words, the relationships of meaning among the information which the binary digits of the number carry were taken into account in them by the schematic method. Development of a computer operating by two-dimensional patterns permits one to take into account the deeper relationships of meaning in information than the relationship usually taken into account in modern machines: not only between individual digits of one number, but also between individual numbers which are values of a single function.

The discrete method of processing digital patterns is serialized in the optical information processing channel (OKOI) of the specialized electro-optical computer by means of a system of electrooptical matrix elements--optically controlled digital transparencies (OUT) [4]. Optically controlled transparencies, having a two-dimensional structure, are uniquely adapted for processing optical-digital images. The high degree of integration achieved during manufacture of these components permits the information to be processed in rather small volumes.

Besides controlled transparency, the optical information processing channel contains a number of permanent holographic stores (GPZU) in which a set of operators is stored. The control operators are read from the permanent store and are sent to the control surface of the optically controlled transparency, thus being given the type of operation being performed in the optical information processing channel. The number of performed operations is determined by storage capacity and can be rather high. It should be noted that the structure of the optical channel can be different as a function of the class of operations for which the given channel is designed.

However, in any case high productivity of the optical channel can be achieved only with sufficiently homogeneous processing of large information files. On the other hand, it is difficult and disadvantageous to carry out complex and diverse transformations of small volumes of control information—to process instructions of the programs being carried out—in the optical channel. Modern computers are best adapted for this purpose.

Homogeneous processing of large information files is accomplished in the proposed block diagram of the electrooptical computer complex (OEVK) in an electrooptical computer, while the operational control functions of the OEVM, of the entire complex and fulfillment of operations on the results of information processing in the OEVM are entrusted to the computer, i.e., the data and instruction flows are completely separated.

Due to the absence of an OOZU at present, a two-level system of electronic (semiconductor) wide-format stores is used in the electrooptical computer of the complex. This system, through a number of electrical to optical signal converters, called electrically controlled transparencies (EUT), and optical to electrical converters called photodetector matrices (MFP) is connected to the optical information processing channel. The converters transform not only the type of information carrier (electrical signals to optical signals and vice versa), but also the forms of displaying it (one- to two-dimensional and vice versa). The limitation on the converter capacity explains the need to introduce a digital pattern commutator (KTsK) and splitter (RTsK) into the broad diagram. A KTsK is essentially an OR circuit which realizes this logic operation over digital patterns formed in the electrical to optical signal converter.

The functions of the KTsK and RTsK can be realized by fiber optics devices but this will be related to great technological difficulties with the large

number of elements in the digital pattern. There is a persistent need in this regard to develop devices which perform the functions of KTsK and RTsK and which operate by two-dimensional digital patterns in space. It will shown below that sufficiently high characteristics of OEVM cannot be achieved without using the indicated devices. They are required to enter information from external devices, mainly the information carrier in which there will apparently be an electrical signal for a very long time, into the OOZU.

A more detailed block diagram of OKOI is shown in Figure 2. The OKOI includes optically controlled transparencies (OUT-1...5), luminous radiation sources (LG) and collimators (K), a multichannel optical-acoustic commutator (MAOK) and permanent holographic stores (GPZU).

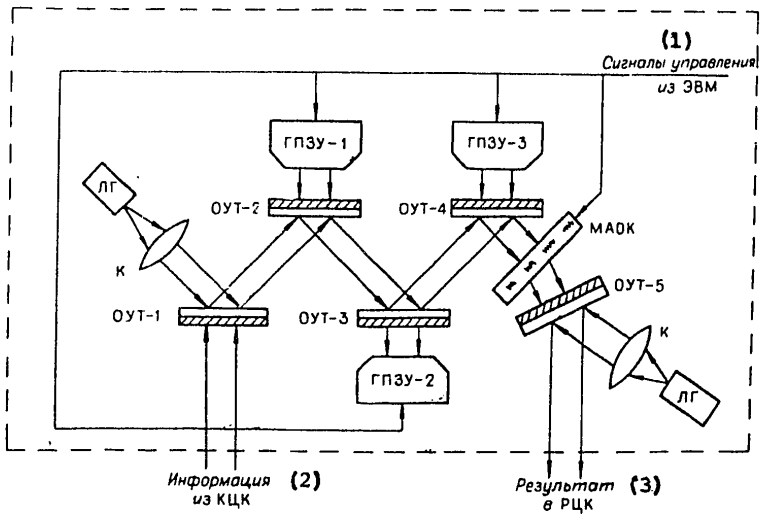

Figure 2.

Key:
1. Computer control signals
2. Information from KTsK
3. Result to RTsK

The OUT-1 performs the functions of the light signal input amplifier; the OUT-2, OUT-3 and OUT-4 combine (superpose) the digital pattern containing the input information with the digital patterns of the control operators stored in the GPZU. The MAOK performs AND and OR logic operations on the elements of the resulting digital pattern. The OUT-5 performs the functions of light signal output amplifier. At least one of the OUT can invert the digital pattern, i.e., it can be a negative.

The OKOI can contain more or fewer OUT and GPZU as a function of how broad the class of operations performed in it should be. Thus, it is sufficient to have a single OUT to calculate logic functions and three OUT are required to carry out arithmetic operations.

Without dwelling on the methods of performing logic and arithmetic operations in the OKOI, which are considered sufficiently fully in a number of papers [5, 6], let us analyze the capacity of the OKOI and the productivity of the OEVM.

The method of control operators permits the required conversion of information in the OKOI during the time

$$T_0 = kT_\tau + T_\Phi + T_p, \tag{1}$$

where k is the number of sequentially OUT required to perform the given group of operations ($1 \leq k \leq 5$ in the OKOI of the considered structure), T_t is the OUT switching time, T_f is the time of recording the processing result by the photodetector matrix and T_r is the time of light beam propagation in the OKOI.

The following volume of information can be converted in the OKOI during time T_0

$$V = m^2/k_p \text{ bits}.$$

Here m is the length of the line (column) of the OUT and k_r is the "multiplication" factor which takes into account the redundancy of information display when processing it by the method of control operators ($k_r \geq 1$).

The capacity p_0 of the OKOI is

$$p_0 = V/T_0 = m^2/k_p T_0 \text{ bits/s}. \tag{2}$$

For convenience in comparison to computers in which joint conversion of all operands is usually accomplished, the productivity of an OEVM containing l OKOI, in each of which parallel processing of r numbers is carried out, can be estimated in the following manner:

$$P = lp_0/2n = lr/2k_pT_0 = lm^2/2nk_pT_0 \text{ oper./s}, \tag{3}$$

where $n = m^2/r$ is the number of bits in a single number.

To provide the required productivity P in the OEVM, one must have N_{po} electrical to optical signal converters:

$$N_{no} = lp_0/p_{no} \tag{4}$$

(p_{po} is the capacity of this converter).

Moreover, the OEVM should include N_{pe} optical to electrical signal converters with capacity p_{pe}:

$$N_{пэ} = lp_0/p_{пэ}. \tag{5}$$

It is obvious that

$$p_{пэ} = k_c p_{по}, \tag{6}$$

where k_s is the compression (reduction) coefficient of the volume of information as a result of processing in the OKOI ($0 \leq k_s \leq 1$).

The information can enter the KTsK from the external communications channel (one- and two-dimensional) and from the internal stores. Let us consider the extreme case for determining the characteristics of stores when all the information enters the KTsK from the store. In this case first-level stores carry on an exchange with the KTsK, RTsK and second-level ZU. To ensure an exchange of the required intensity, the capacity of the first-level ZU is

$$p_{зу1} = (p_{по}N_{по} + p_{пэ}N_{пэ}) + (k_{он}p_{по}N_{по} + k_{ор}p_{пэ}N_{пэ}) \text{ bits/s}$$

or with regard to (6)

$$p_{зу1} = p_{по}[(1 + k_{он})N_{по} + k_c(1 + k_{ор})N_{пэ}] \text{ bits/s}, \tag{7}$$

where k_{oi} is a coefficient which takes into account the intensity of arrival of input information from a second-level to a first-level store ($0 \leq k_{o1} \leq 1$) and k_{or} is a coefficient which takes into account the intensity of issuing the result of processing from a first-level to a second-level ZU ($0 \leq k_{or} \leq 1$).

On the other hand, the p_{zul} can be expressed by the exchange format and the access time in the following manner

$$p_{зу1} = N_{зу1}(2\Phi_1 + (k_{он} + k_{ор})\Phi_2)/t_п = [2 + k_ф(k_{он} + k_{ор})] \times$$

$$\times (\Phi_1 N_{зу1}/t_п) \text{ bits/s},$$

where N_{zul} is the number of parallel operating first-level stores, F_1 is the exchange format between the first-level ZU, the KTsK and RTsK, F_2 is the exchange format between the first-level and the second-level ZU, $k_f = F2/F1$ and T_{ts} is the access time to the first-level ZU. From expressions (7) and (8) and with regard to (4)-(6), we find

$$t_п = [(2 + k_ф(k_{он} + k_{ор}))\Phi_1 N_{зу1}]/[(2 + k_{он} + k_{ор})lp_0].$$

For a single OKOI ($l = 1$) at $F_1 = 128$ bits and $k_f = 4$, in the most difficult case ($k_{oi} = k_{or} = 1$), we have

$$t_п = 320N_{зу1}/p_0 \text{ s}. \tag{9}$$

The value of p_0, on the one hand, is determined by requirements on productivity P of the OEVM and on the other hand is limited by the characteristics

of the components (optically controlled transparencies, photodetector matrices) and by their number k. However, taking into account the circumstance that OUT have a storage capability, it is easy to note that conveyor information processing is easily organized in OKOI. In this case each new result will appear at the OKOI output within a time equal to the response time of the single transparency although the total time of receiving the result will depend on the number of sequentially arranged transparencies in the OKOI. Thus, the capacity of the OKOI in the steady mode will be determined only by the value of T_t. This time for a universal transparency of the "latrix" type is estimated in [4] as $T_t \approx T_f \approx 10^{-6}$ s. $T_r \approx 0.3 \cdot 10^{-8}$ s with length of the optical path in the OKOI of $L_O \approx 1$ m.

As a result, from (1) we find $T_0 \approx 2 \cdot 10^{-6}$ s.

It is pointed out in [6] that $k_r = 17$ when performing arithmetic operations by the control operator method in an OKOI containing no fewer than three OUT.

Having assumed that $k_r = 20$ for a transparency measuring $m^2 = 128^2$, from (2) we find

$$p_0 \approx 4 \cdot 10^9 \text{ bits/s}$$

Substituting the derived value of p_0 into (9), we find

$$t_n = N_{зу1} \cdot 80 \cdot 10^{-9} \text{ s} \qquad (10)$$

The best modern semiconductor internal stores have $t_{ts} \leq (0.08\text{-}0.2) \cdot 10^{-6}$ s [7]. It follows from (10) that the OEVM must have 1-3 of these ZU per OKOI.

The productivity P of one OKOI can be found from (4). At l = 1 and n = 32,

$$P = p_0/2n = 62{,}5 \cdot 10^6 \text{ oper./s.}$$

The number of OKOI in the OEVM is determined by the characteristics of those problems for which the OEVK is being developed. It depends on the volume of the input information flow, the list of operations performed in processing it (different OKOI can be oriented to perform different classes of operations), the required productivity of the OEVK and finally the number of parallel-processed objects which form the input information file. Moreover, the maximum number of OKOI depends on the capabilities of controlling their operation and the information exchange between them by the computer used in the OEVK. If the number of OKOI is high (for example, greater than 4), they can be realized among several OEVM, each of which has its own control device operating on instructions of the computer which controls the complex.

The second level of ZU in each OEVM (OZU2) contains 2-3 devices having in the maximum case (at $k_{oi} = k_{or} = 1$) the same access time as first-level devices and a four times larger exchange format. Information is exchanged

between the OKOI of one OEVM and between OEVM and the computer which controls the complex through the second-level ZU. The storage capacity is selected on the basis of the characteristics of those problems, for solution of which the OEVK is designed.

When using electrical to optical signal converters having capacity of 10^9 bits/s per OKOI, one must have $N_{PO} = p_O/p_{PO} = 4$ of these converters. It is obvious that the KTsK should provide commutation of no fewer than four digital patterns during a time equal to the response time of the OUT in the OKOI.

The highest requirements are placed on RTsK when $k_S = 1$. If $p_{PE} = p_{PO}$ in this case, the RTsK should provide entry of the resulting pattern to four separate photodetector matrices during the response time of the OUT in the OKOI. If the volume of information decreases significantly during processing in the OKOI (i.e., $k_S \ll 1$), the RTsK may be absent altogether.

The derived structure corresonds to a multiprocessor computer system with common control oriented toward solution of problems having natural parallelism [8].

In conclusion, let us enumerate the main characteristics of the considered block diagram: total separation of the data flow and instructions flow between the OEVM and computer, the use of the discrete method of processing digital patterns and of optically controlled transparencies to realize this method, the use of an electronic internal store and a converter system instead of an optical internal store and the presence of two-dimensional digital optical images in the commutator and splitter circuit.

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HOLOGRAPHIC MEMORIES AND INFORMATION MACHINES

Novosibirsk AVTOMETRIYA in Russian No 2, 1980 pp 9-23

[Article by P. Ye. Tverdokhleb, Novosibirsk]

[Excerpt] 7. Conclusions. Compared to existing types of memories, a permanent holographic memory corresponds more closely to the problem of long-term storage and processing of large mixed data files, is distinguished by high stability to production and operation noise, is "universal" for the hierarchical family of long-term ZU [stores] and permits one to realize on their basis a class of information machines (devices) with unique characteristics: storage capacity of approximately 10^{11}-10^{12} bits, recording speed of 100-1,000 Mbits/s, processing speed of approximately 10^{9}-10^{10} bits/s and storage time with multiple data readout of tens of years. The specific cost of storing a unit of information with comparatively low capacities of a holographic memory (approximately 10^{7}-10^{8} bits) is now at the level of semiconductor MOP ZU and it is less than the specific cost of magnetic disc and magnetic tape stores with large storage capacities (10^{11}-10^{12} bits).

There are prospects for reducing energy consumption, overall dimensions and cost and for increasing the service life of holographic memories, i.e., those characteristics which now inhibit introduction of them. Thus, it has become possible to reproduce holograms by a reference light beam arriving along a planar dielectric waveguide [53, 54]. Controlled commutation of the light beam in dielectric waveguides has been accomplished [55]. One can expect the appearance of small matrix photodetectors with sensitivity of 10^{-13} to 10^{-14} J/electrons [56]. The intensively developing technology of integrated and fiber optics are contributing to development of new optical components of holographic memories.

The foregoing permits one to conclude that it is feasible to develop the industrial technology for a permanent holographic memory to create new information devices. Investigations in this direction can be set up on the basis of the component base and the results of model realization of such devices available in laboratories.

IM [information machines] (devices) with permanent holographic memory can be oriented toward working with large formatted and rarely-restored data

files. This situation is typical for the extremely large number of problem-oriented libraries (spectroscopy, medicine, space, criminal law, radar, production and so on).

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THE OPTICAL-GEOMETRIC METHOD OF CALCULATING FRAUNHOFER DIFFRACTION IN THREE-DIMENSIONAL BODIES

Novosibirsk AVTOMETRIYA in Russian No 2, 1980 pp 25-35

[Article by V. P. Koronkevich, B. Ye. Krivenkov, S. V. Mikhlyayev and Yu. V. Chuguy, Novosibirsk]

[Excerpts] Most articles subject to monitoring by optical methods are three-dimensional. Determination of the geometric parameters of these objects by spectrum [1] may lead to difficulties principally of the nature of [2, 3]. It is important in this regard to determine the effect of the length along the optical axis of the system on the spectrum of an object.

It is known that there is no well-developed diffraction theory for three-dimensional bodies similar to Kirchhoff's theory for flat objects. Strict solutions of the diffraction problem (based on Maxwell equations) have been found only for some idealized objects (an ideally conducting sphere, an infinite cylinder and so on) [4]. But even in these cases the solutions are represented in the form of infinite series by special functions, which essentially excludes clear physical interpretation of diffraction phenomena.

Approximate (heuristic) methods of solving the problem were suggested for this reason [5]. The geometric theory of Keller theory [6] is of special interest. It permits one to record the diffracted waves in analytical form, which is especially convenient for numerical calculations. However, the expressions found in this case are cumbersome, which makes simple interpretation of them difficult.

Some of the simplest three-dimensional configurations permit calculation of Fraunhofer diffraction patterns by formulas of the theory of linear optical systems [7, 8]. However, the results of the calculations in this case, with rare exceptions [9], cannot be represented in analytical form, which makes their practical use difficult to a significant degree.

The possibility of using the optical-geometric method for calculating light diffraction on three-dimensional bodies has now been investigated. This method utilizes the concepts of wave and geometric optics and permits one

to evaluate rather simply and physically clearly the effect of the three-dimensional nature of an object on its Fraunhofer diffraction pattern. A similar method was used previously in solving the special problem of taking into account the effect of lens aperture size on the width of the frequency band transmitted by it [10]. However, direct application of it for calculation of spectra leads to results inadequate to the diffraction pattern on three-dimensional bodies. In view of this, we proposed a method of calculation which takes into account to the best degree the characteristics of light diffraction on three-dimensional bodies. Examples of calculating the Fraunhofer diffraction patterns on absolutely absorbing objects of constant thickness are presented. The theoretical results were confirmed experimentally.

Conclusions. The investigations showed the applicability of the proposed MOG [Optical-geometric method]-approximation for analyzing light diffraction on absolutely absorbing three-dimensional bodies of constant thickness. The results found by using it are in good agreement with more accurate calculations (in Fresnel approximation) and with experimental data.

The effect of the three-dimensional nature on the spectrum of objects of the considered class is equivalent to the effect of some spatial frequency filter. Moreover, this effect has the form of a linear space-invariant transform.

The proposed approach, we feel, is applicable in analysis of light diffraction on bodies of more complex shape.

The authors feel it is their duty to thank P. Ye. Tverdokhleb for the remarks made in reading the manuscript.

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THE SPECTRAL METHOD OF MONITORING THE DIMENSIONS OF ARTICLES BASED ON BIPOLAR INTENSITY FILTERS

Novosibirsk AVTOMETRIYA in Russian No 2, 1980 pp 43-59

[Article by S. V. Mikhlyayev and Yu. V. Chuguy, Novosibirsk]

[Excerpts] The spectral method of checking the dimensions of articles is investigated in this paper; the problem of synthesizing filters which provide given output characteristics of the system is solved. It is shown that filters with bipolar intensity transfer functions meet this requirement. The capabilities of checking systems with the proposed filters are analyzed in the article. Their sensitivity to energy losses compared to known correlation systems are evaluated. Concepts on realization of systems are presented, including systems with operational formation of the required transfer functions. The results of analysis are confirmed by computer calculations and by experiments.

Conclusions. The results of the investigation confirm the prospects for using the proposed spectral method with bipolar transfer functions of filters to check the dimensions of articles. Its advantages over correlation methods include higher sensitivity and higher energy efficiency, the absence of holographing processes and the possibility of finding the necessary output characteristic and also in its invariance to position, and in some cases to orientation of the monitored object during monitoring.

The authors are grateful to P. Ye. Tverdokhleb for useful comments.

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AN EXPERIMENTAL ELECTROOPTICAL (HOLOGRAPHIC) MEMORY SYSTEM

Novosibirsk AVTOMETRIYA in Russian No 2, 1980 pp 60-67

[Article by L. V. Vydrin, N. N. V'yukhina, I. S. Gibin, V. N. Zatolokin, S. F. Kibirev, T. N. Mantush, Yu. Ye. Nesterikhin, B. N. Pankov, Ye. F. Pen, P. Ye. Tverdokhleb, Yu. N. Tishchenko and A. V. Trubetskoy, Novosibirsk]

[Text] A permanent holographic memory can find application in information systems (machines) designed for data gathering, storage and processing in problem-oriented catalogues, card libraries and reference manuals. The data files in these systems are restored comparatively slowly and information processing is most frequently reduced to classification and ordering of data and retrieval and sampling of them by features.

The memory of information systems should be hierarchical, of increased capacity, nonvolatile and noise-resistant to possible defects of the medium--the information carrier, resistant to electromagnetic, radiation and other effects and suitable for storage of binary-coded data and data in the form of picture-documents (text, figures, photographs and so on). Among the existing memory technologies, a permanent holographic memory which, moreover, due to the principle possibility of parallel output of data by files of 10^3-10^4 bits (a physical page), is capable of providing very high data processing speed (10^9-10^{10} bits/s), most fully meets these requirements. Multifunctional memory systems, which can be developed to the level of an applied information system with regard to the characteristics of a specific application (data structure, language of document description), can specifically be created on its basis [1].

This article generalizes the experience of work by IAiE SO AN SSSR [Institute of Automatics and Electronics of the Siberian Department of the USSR Academy of Sciences] in developing an experimental model of one of these systems--an electrooptical (holographic) memory system (OESP) with functions of storage, nonvolatile storage, retrieval and printout of man- and machine-printed data. The OESP includes specialized optical-mechanical, optical, photoelectronic and electronic devices for recording, storage, reading, processing and sampling of data, a computer which controls the components of the system and its external devices and electronic devices for systems

exchange of data. Therefore, the article gives an idea of the structural-functional organization of the experimental model of the OESP, about the specialized hardware and software which we developed and about the results of investigating them within the OESP. The developed devices were investigated at the given stage of work mainly to realize high-quality holographic recording, sampling and reliable readout of files consisting of 10^3-10^4 of these pages rather than individual pages of binary-coded data, as follows from most known works on hologram ZU [memory unit], electrooptical parallel (associative) logic processing of pages of binary-coded data with capacity of 32 X 32 bits--processing which permits significant acceleration of the operations of simple and complex data retrieval and holographic recording, automatic sampling and display of documents. The goal of achieving maximum storage capacity (for information systems) was not posed in the considered paper.

The structure of the OESP. The specialized hardware of the OESP forms a subsystem of data preparation and recording and a subsystem of data storage, readout and processing. The first of them is designed for holographic recording of input data on standardized memory modules. The recording is made by using intermediate microfilm on which the pages of binary-coded, text or graphical data are first formed. The second subsystem forms the information archive of the OESP with apparatus retrieval of data and is oriented toward information support of man and an external computer. Both subsystems operate autonomously since the hologram recording and reading operations are conducted separately, require different times (due to the use of a nonreversible medium) and do not coincide operationally. The basic set of the M-400 computer with storage capacity of 8K words, external devices (PM, ATsD, FS and PL) and a punch tape operating system. The major part of the system contains three CAMAC crates and can be increased to seven crates.

The configuration of the OESP is shown in Figure 1. The M-400 processor interacts with the indicated subsystem through three program-exchange crate-controllers (KK1-KK3). The crate-controllers used are similar to devices described in [2]. Each of them controls one CAMAC crate, providing reception of instructions and other control data from the computer, data exchange with modules, preliminary processing of requests, formation of interrupt vectors, checking, testing and also emission of all the required CAMAC signals.

The main M-400 computer limits the capability of connecting a considerable number of external devices; therefore, a common bus expander (ROSh) is introduced into the system. A separate CAMAC crate through which the working crates of the system emerge to a common bus (OSh) is used as the ROSh; the main line of this crate is a continuation of the common bus. The ROSh contains two modules, one of which repeats the output signals of the OSh and the second gathers the input signals from the controllers. The ROSh crate control system is nonworking and all the normal stations can be used for the adaptor modules for connection of crate controllers.

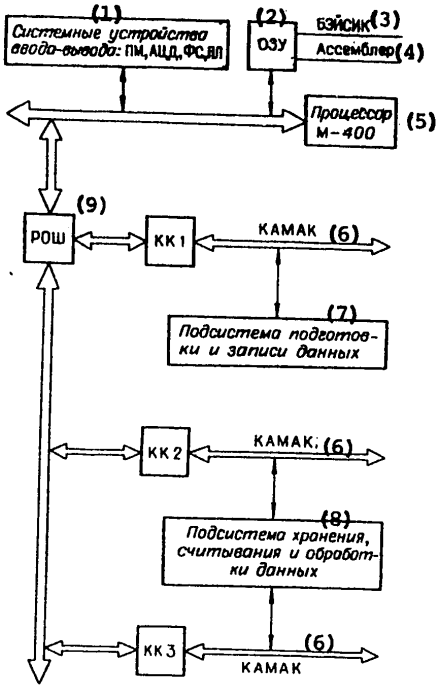

Figure 1.

Key:

1. Input-output systems devices: PM, ATsD, FS and PL
2. Internal store
3. Basic
4. Assembler
5. M-400 processor
6. CAMAC
7. Data preparation and recording subsystem
8. Data storage, readout and processing subsystem
9. Common bus expander

Data recording. The data preparation and recording subsystem shown in Figure 2 includes a binary-coded (digital) data matrix recording device, a text and graphical (document) data matrix recording device and microfilming apparatus.

Microfilm (a set of phototransparencies) with binary-coded data is prepared on the "Carat" device [3] by the method of [4]. The frame size of the microfilm (a page is 32 X 32 bits) is 10 X 10 mm. The "Carat" operates with a self-contained computer. The microfilm is then used in the digital data recording device.

The optical system (OS) of the recording device, as shown in Figure 2, shapes the signal and reference light beams and provides holographic recording of the moving microfilm frame on a given section of the memory module.

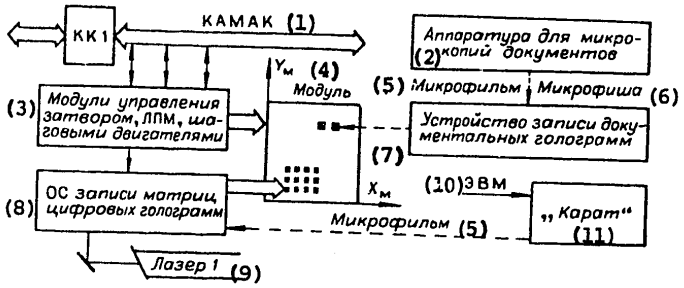

Figure 2.

Key:

1. CAMAC
2. Apparatus for microcopies of documents
3. Gate, lpm and step motor control modules
4. Module
5. Microfilm
6. Microfiche
7. Document hologram recording device
8. Optical system for digital hologram matrix recording
9. Laser 1
10. Computer
11. Carat

A movable two-coordinate table from the BMI microscope is used to move the module and the RFK-5 movie camera tape-feed mechanism is used to change the microfilm frames.

Hologram matrices with spacing a multiple of minimum spacing of 0.4 mm, which is achieved by program control of table motion, can be recorded within the range of the memory module, which is a photocarrier measuring 51 X 51 mm.

The maximum dimensions of the memory module which can be recorded is 128 X 128 holograms (the size of the hologram is 0.3 mm and the spacing between them is 0.4 mm). With data page dimensions of 32 X 32 bits, the capacity of this module is equal to $1.6 \cdot 10^7$ bits.

The electronic part of the digital data recording device includes photoshutter, tape-feed mechanism (LPM) and step motor control blocks used to move the memory module in coordinates X_m and Y_m.

More detailed data about the digital data matrix recording device can be found in [5].

Microcopies of the documents are obtained by using a filming camera of the DOCUMATOR type. Document holograms are recorded on the same modules as

digital holograms. A document data matrix recording device (not shown in Figure 2) is used for this purpose. The structure and operating principle of this device are similar to those of the digital data matrix recording device. The number of holograms in the module is determine by the document size and the required number of resolution elements. For example, if pages of text with sheet size of 210 X 256 mm are being recorded, the module will contain only 25 X 25 holograms.

Memory modules with digital and document data are used as the second subsystem the OESP.

Data storage, readout and processing. Electromechanical, optical, photoelectronic and electronic devices of the OESP archive are integrated with the M-400 computer by means of KK2 and KK3 controllers (Figure 3).

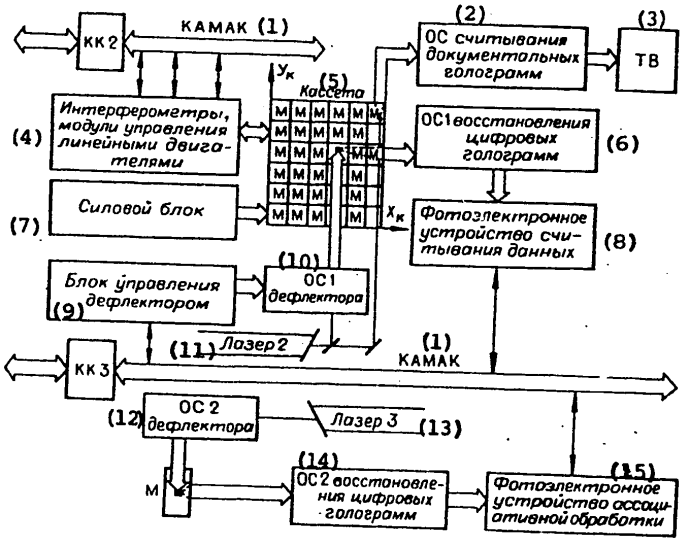

Figure 3.

Key:

1. CAMAC
2. Optical system for reading document holograms
3. Television
4. Interferometers and linear motor control modules
5. Cassette
6. Optical system 1 for restoration of digital holograms
7. Power supply block

[Key continued on following page]

[Key continued from preceding page]

8. Photoelectronic data readout device
9. Deflector control block
10. Optical system 1 of deflector
11. Laser 2
12. Optical system 2 of deflector
13. Laser 3
14. Optical system 2 for restoration of digital holograms
15. Photoelectronic associative processing device

The archival memory of the system is organized on the basis of a cassette containing 6 X 6 + 36 horizontally oriented memory modules. This arrangement of modules is not optimum, but is caused by the design characteristics of the Zenit two-coordinate positioning device [6], which we used for address sampling of the hologram subfile subject to reading. The maximum time of moving the cassette (in a field of 420 X 420 mm) is approximately 3 seconds. The total storage capacity of a cassette is $5.76 \cdot 10^8$ bits. The positioning device contains interferometers, linear motor control modules for moving the cassette and a power supply block.

The second stage of sampling the digital data--sampling a page from a subfile of 32 X 32 holograms--is carried out by an optical-acoustic deflector on paratellurite with light beam switching time of approximately 10 μs, working frequency band of 50-100 MHz and signal-noise ratio of 70:1 which controls the electric output (for one cell) of 0.5 W [7, 8]. The document holograms are sampled only by electromechanical motion without a deflector.

The optical digital data readout system from a subfile of 32 X 32 holograms contains a laser, two-coordinate optical-acoustic deflector (OS1 of the deflector), a prism for exit of the "zero" beam and the restoring objective (OS1 for restoration of digital holograms). Readout and entry of data to the computer memory are carried out by a photoelectronic device containing an integrated photo matrix (32 X 32 photodetectors), digit amplifiers (with regulated threshold), buffer memory unit for a single page of 32 X 32 bits [9, 10], block for communicating with the CAMAC mainline and address and control blocks. A block diagram of this device is shown in Figure 4, a.

Images of the documents read from the document holograms are reproduced on a television screen. The simplest optical system (the OS for reading document holograms) and a transmitting television camera are used for these purposes.

A high-speed "catalogue," designed for storage and retrieval (simple and complex) of data addresses according to the given description (feature, index, cipher and key), is used in the considered subsystem. The catalogue has a permanent hologram ZU (laser 3, OS2 of the deflector, memory module (or modules) and OS2 for restoration of digital holograms) and a photoelectronic device for associative processing of binary-coded data pages. The

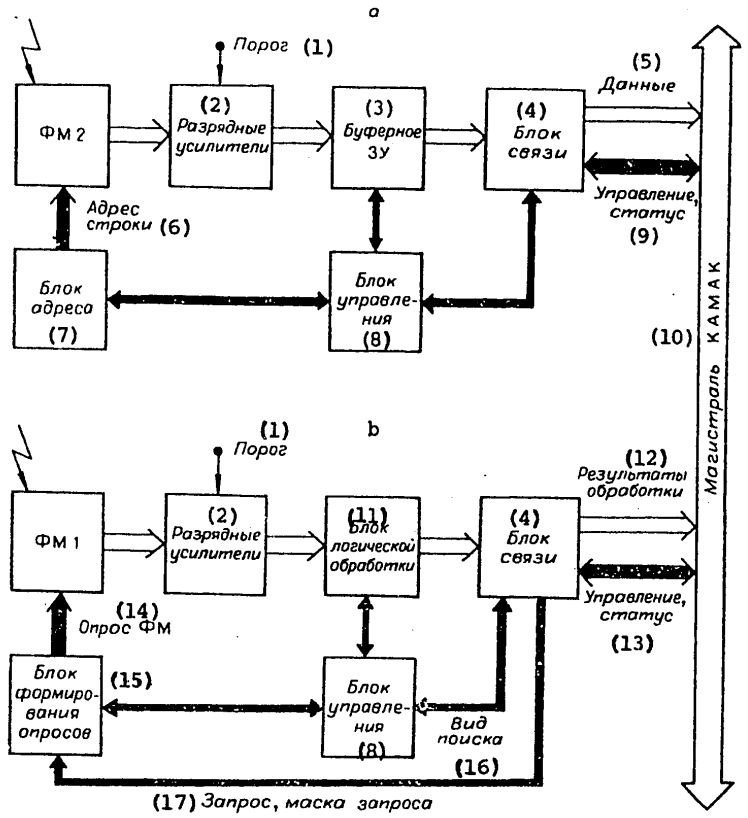

Figure 4.

Key:

1. Threshold
2. Digit amplifiers
3. Buffer memory unit
4. Communications block
5. Data
6. Line address
7. Address block
8. Control block
9. Control and status
10. CAMAC mainline
11. Logic processing block
12. Results of processing
13. Control and status
14. Photomatrix interrogation
15. Request formation block
16. Type of retrieval
17. Request and request screen

ZU is used to store descriptions of data in page format (32 X 32 bits) and to sample pages and the photoelectronic device is used for parallel logic processing of the contents of pages sequentially sampled from the permanent

hologram ZU. The photoelectronic device given in Figure 4, b includes an integrated photomatrix (32 X 32 photodetectors), discharge amplifiers with regulated threshold, logic processing blocks, a block for communicating with the CAMAC mainline and interrogation and control formation blocks [11]. The operating algorithms of these blocks are determined by the request, request screen and type of retrieval, data of which are entered from the computer before the beginning of processing the pages. The device then functions autonomously and issues the results of processing to the computer. The method of parallel processing of data pages, proposed previously in [12], is realized in the catalog.

Software. The software of the OESP is developed on the basis of available software for the M-400 computer using BASIC and Assembler languages. A BASIC interpreter, which performs time non-critical operations: dialogue, preliminary formation of control data files and so on, is used in the programs. The programs which operate with OESP devices in real time are written in Assembler language.

The software is designed for performing the following operations in the OESP in dialogue mode:

1) reproduction of the optical-acoustic deflector pattern for estimating the uniformity of the diffraction efficiency of the cells in the working frequency band, geometric distortions and tuning of the optical deflector circuit;

2) recording the hologram files in the memory modules;

3) address sampling of hologram files from a cassette (the minimum addressable block is a physical page) and readout of them with program control and error diagnosis;

4) logic parallel processing of data pages in the photoelectronic device of the catalog with printout of messages about the results;

5) determination of the variation of intensities in the optical images of pages restored from the holographic memory modules (achieved by automatic measurement and printout of the levels of output signals of the integrated photodetector matrices);

6) testing the CAMAC electronic modules and crate-controllers of the system.

The characteristics of using the Basic interpreter in automation of investigations of the components and devices of a holographic memory are considered in [13].

Experimental results. The hardware and software of the OESP were used for experimental investigation of the operating characteristics and modes of

the optical-acoustic deflector, the integrated photomatrices, phase screens, two-coordinate positioning devices, CAMAC blocks and the specialized electrooptical devices developed on the basis for recording, sampling, readout, processing and display of the hologram files with control from the computer. The results of investigating individual OESP components have already been presented in a number of publications [5, 7-11, 14, 15]. Therefore, we shall present here only the data which characterize the operation of the OESP subsystems.

Hologram files with test pages of 32 X 32 bits ("checkerboard" and "unit" fields, in paraphase code and so on) were recorded by using the data preparation and recording subsystem. The photocarrier of the memory module is a high-resolution photoemulsion on a glass substrate. Recording was accomplished in the green wavelength of light. The diffraction efficiency of the holograms was 1 percent (with restoration by an argon laser). The ratio of the green light intensities corresponding to "1" and "0" was 20:1. Intensity fluctuations of "1" were $\pm$ 30 percent and those of "0" were $\pm$ 50 percent. The variation of the diffraction efficiencies in a subvial of 32 X 32 holograms comprised no more than $\pm$ 10 percent. The maximum recording speed was approximately 100 holograms/minute.

Address sampling of any of 6 X 6 X 4 X 4 = 576 subfiles (32 X 32 holograms) and installing them in the reading position with error not exceeding 20 microns were realized by using the second subsystem. Sampling was accomplished by using an electromechanical positioning device by means of two-coordinate cassette motion with memory modules.

Photoreadout and computer entry of test pages of data were made from a file of 16 X 16 holograms arranged with spacing of 0.8 mm. These holograms filled the field corresponding to a file of 32 X 32 holograms with minimum recording spacing of 0.4 mm. Addressing to the holograms was accomplished by using a two-coordinate optical-acoustic deflector. The results of photoreadout were displayed on the screen of an alphanumeric display. Approximately one error per 10^4 bits of data entered into the computer was observed in these experiments.

The results of photoreadout are considerably dependent on the nonparallel nature of the reading light beams shaped by the deflector and on the aberrations of the restoring objective, as which the Helios-44/2 serial photographic lens was used, the variation of intensities in images "1" and "0" and on the levels of the output signals of the photomatrix cells. There are real possibilites for reducing the effects of most of the indicated factors and for improving the results of photoreading. Specifically, the best results will be found when using a new, more improved integrated photomatrix (32 X 32 photodetectors) with ratio of $\alpha = I_{t\ max}/I_{t\ min} = 1.13$ ($I_{t\ max}$ is the maximum value of dark current at the cell output and $I_{t\ min}$ is the minimum value) and with variation of dark currents (with respect to the mean value) of $\pm$ 6 percent. Let us note for comparison that the photomatrix which we used in the experiments has a value of $\alpha = 1.6$ and variation of $\pm$ 24 percent.

Automatic sampling, readout and display of test images of documents (text, test-table and a drawing) were also carried out. Display was accomplished on television and scattering screens. The document holograms were recorded from microfilm on chalcogenide glass-like semiconductor films by the method of [15].

The operation of a photoelectronic device designed for parallel (associative) data processing was investigated. The device was developed on the basis of an integrated photomatrix with $\alpha = 1.13$, operating in a mode in which saturation energy did not exceed $0.3 \cdot 10^{-11}$ J. Images of binary pages from a real memory module were transmitted to the optical input of the device. Test problems of simple and complex searches were solved. The storage time in the photomatrix was 60 μs when using the LG-79 laser with $\lambda = 0.63$ microns. The words for interrogation of the photomatrix were shaped at frequency of 1 MHz, which corresponds to data processing speed of 10^9 bits/s with processed page capacity of 1,024 bits.

Conclusions. The developed hardware and software permit experimental confirmation of the possibility of automatic operation of OESP in the following modes:

1) data recording in a permanent holographic memory module with maximum format of 128 X 128 holograms (diameter of 0.3 and spacing of 0.4 mm) and recording speed of 100 holograms/minute);

2) sampling of any of 576 data subfiles (of 32 X 32 holograms) within 3 seconds;

3) photoreadout of data within the field of a single subfile with error frequency of approximately 10^{-4}*; investigations are being conducted to increase the reliability of photoreadout;

4) parallel (associative) microprocessing of digital data pages (32 X 32 bits) according to the given retrieval feature with productivity of 10^9 bits/s; test problems of simple and complex retrievals are solved;

5) sampling an arbitrary document from the memory and display of it on a screen; sampling time is 3 seconds.

Compared to the HRMR system [16], which is now the most improved of the known holographic archival memory systems, the OESP has advantages in retrieval time, readout and display of data. However, the OESP will apparently be inferior to the HRMR system in the volumetric density of data packing, which is related to the use of memory modules based on a glass

*The achieved level of readout reliability characterizes the current technological level of the experiment rather than the maximum reliability of the holographic memory.

substrate rather than the use of microfiches as in the case of the HRMR. This decision was made due to the absence of high-quality microfiches of domestic manufacture.

The authors feel that it is necessary to note that the given OESP could not have been developed without using the results of the work of V. Ye. Butt, V. N. V'yukin, Ye. A. Kovalev, L. V. Burogo, A. M. Shcherbanenko, V. P. Kir'yanov, V. P. Koronkevich, A. A. Blok, V. A. Dombrovskiy, A. I. Chernyshev, B. V. Vanyushev and A. M. Vasil'yev.

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Novosibirsk AVTOMETRIYA in Russian No 2, 1980 pp 68, 74, 84, 87, 85

UDC 621.397.331

AN AUTOMATIC HOLOGRAM MATRIX RECORDING DEVICE

[Abstract of article by Blok, A. A., Vanyushev, B. V., Vasil'yev, A. M., Vydrin, L. V., Gibin, I. S., Dombrovskiy, V. A., Mantush, T. N., Pankov, B. N., Pen, Ye. F., Tverdokhleb, P. Ye. and Chernyshev, A. I.]

[Text] An automatic hologram matrix recording device with dimensions up to 128 X 128 has been worked out and developed. Matrices measuring 32 X 32, 64 X 64 and so on have been manufactured. The characteristics of the quality of the restored images are presented. 7 figures, 7 references.

UDC 621.376.52:535.8:535.241.13

SYNTHESIS OF BINARY INFORMATION HOLOGRAMS BY OPTICAL-ACOUSTIC MODULATORS

[Abstract of article by Vovk, Yu. V. and Shchepetkin, Yu. A.]

[Text] The possibilities and some characteristics of hologram synthesis are analyzed on the basis of the principles of frequency signal coding. The results of investigating the recording of one-dimensional binary information holograms, when an optical-acoustic correlator is used as the signal-light converter, are presented. 6 figures, 12 references.

UDC 681.327.13

NORMALIZATION OF OPTICAL INFORMATION RECORDING AND ERASURE IN A MULTICOMPONENT PHOTOTHERMOPLASTIC HOLOGRAM MATRIX

[Abstract of aricle by Ayazyan, A. A., Mamuliya, L. K., Savranskiy, S. M., Sokolov, N. I. and Tarshinov, I. V.]

[Text] A multicomponent photothermoplastic matrix is described in which optical information recording and erasure are normalized by means of a

specially developed control block. The topology of the matrix and its control device permit access to any cell of the matrix in arbitrary sequence with recording and erasure as a function of the access address. The presence of feedback systems in the control device ensures identical quality of hologram recording in different cells of the matrix, having variation of cell parameters. 4 figures, 3 references.

UDC 681.327.66

INVESTIGATING THE CHARACTERISTICS OF LIGHT-SENSITIVE MNOP-STRUCTURES IN THE OPERATING MODE OF AN ELECTROOPTICAL MEMORY UNIT

[Abstract of article by Kitovich, V. V., Samutsevich, S. O., Sakharov, V. T., Strakhov, V. G. and Ferchev, G. P.]

[Text] The results of investigating processes and optical recording, readout and erasure of information in matrix MNOP-structures in operating modes of an electrooptical memory unit with bit information recording. The range of efficiency of the memory cells of the matrix MNOP-structure is determined and it is shown that even with very wide range of efficiency of individual memory cells, the tolerances on the variation of parameters of the control light and electrical pulses for a combination of cells operating under cross-talk conditions are rather rigid: $\pm$ 40 percent for light intensity and $\pm$ 5 percent for recording voltage amplitude. A method of checking matrix MNOP-structures, which takes into account the physical principles of functioning of the memory medium and the operating logic of the electrooptical memory unit, is proposed. The readout circuits are analyzed for estimating the value of the output signal. 6 figures, 5 references.

UDC 537.226.33:537.228.3

SELECTING THE COMPOSITION OF TRANSPARENT FERROCERAMICS FOR USE IN SPECIFIC LIGHT-MODULATING DEVICES

[Abstract of article by Antonova, M. K., Bruveris, I. E., Dobre, A. Ya., Kapeniyeks, A. E., Ozolin'sh, M. P. and Shternberg, A. R.]

[Text] The effect of the phase state of electrooptical ferroceramics on the light-modulating parameters is analyzed to optimize these parameters. The contribution of the "secondary" electrooptical effect to the total electrooptical effect in TsTSL ceramics is determined. The physical characteristics of lead scandate-niobate (SNS) produced for the first time in the form of transparent ceramics are presented. The advantages of SNS to develop matrix-addressing devices are shown. Barium-modified SNS ceramics can be used in light-modulators operating below 0°C. 1 table, 5 figures, 17 references.

6521
CSO: 1863

SOFTWARE

ABSTRACTS FROM THE JOURNAL 'PROGRAMMING'

Moscow PROGRAMMIROVANIYE in Russian No 3, May-Jun 80 pp 93-96

UDC 681.142.1.01

LOGIC DIAGRAMS FOR PROGRAMS AND ALGORITHMS

[Abstract of article by Klinitskiy, N. A.]

[Text] The basic subdivisions of diagramming science are singled out and their status is briefly described. Logic diagrams are examined and compared with some other classes of diagrams; the standard form of logic diagrams and their equivalent transformation are described. Eleven bibliographic references.

UDC 519.681.3

SOME OPTIMIZATION PROCEDURES PERFORMED ON OPERATOR FLOWCHARTS. I.

[Abstract of article by Arkhangel'skiy, B. V.]

[Text] Problems associated with the theory of transforming operator flowcharts are investigated, and the concepts of equivalence and equivalent transformations are introduced for one class of operator flowcharts. A description is given of algorithms that have, in addition to theoretical significance, practical value because they can be used to create optimizing translators. Seven bibliographic references.

UDC 681.142

ORGANIZATION OF EFFECTIVE ACCESS ON THE BASIS OF HASHING

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

[Text] Methods for organizing effective access to data based on hashing (randomization) are presented. Three bibliographic references.

UDC 681.142.2

A NEW FORM OF CYCLIC OPERATION STATEMENT

[Abstract of article by Golovach, V. I.]

[Text] An operator prescribing actions to be performed with data banks is proposed. Its use in ALGOL-like programming languages may promote both greater programming convenience and higher effectiveness of the objective program. Six bibliographic references.

UDC 681.3.06

PROBLEMS OF LINKING MODULES TRANSLATED FROM FORTRAN, PL/1, AND ASSEMBLER TO AN OS YeS COMPUTER

[Abstract of article by Filina, L. N.]

[Text] Problems associated with linking FORTRAN, PL/1, and ASSEMBLER modules to an OS YeS computer are examined. The texts of linking modules written in PL/1 are proposed as a means for achieving a FORTRAN-PL/1 link. Practical recommendations are provided. Six bibliographic references.

UDC 681.326.06

A METHOD OF DIALOG PLANNING OF COMPUTATION PROCESSES

[Abstract of article by Gnezdilova, G. G.]

[Text] A method of dialog synthesis and control of computation flowcharts is proposed. The method is based on subdividing the planning process into two independent parts: planning the computation flowchart, and its execution. The flowchart is executed in Lisp and Paskal' programming languages for the BESM-6 computer. Five biliographic references.

UDC 681.3.51

A FAMILY OF OPERATIONS FOR MANIPULATING RELATIONSHIPS BROADENING THE CLASS OF OPERATIONS OF RELATION ALGEBRA.

[Abstract of article by Nikolayev, V. I., Pemukhov, O. A., and Khodorovskiy, L. A.]

[Text] A family of operations performing actions upon relationships is defined. It is demonstrated that the possibilities afforded by these operations are broader than the possibilities permitted by operations of relation algebra. Some problems associated with using the introduced operations are examined. Five biliographic references.

UDC 681.3.016.2:519.854.2

THE EFFECTIVENESS OF USING INFORMATION-RELATED PROGRAMS IN ONE CLASS OF COMPUTERS

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

[Text] Mathematical models of optimum planning of informationally-related program processing are examined. A solving algorithm and a problem algorithm based on the branch-and-bound method are proposed, a program written in PL/1 for an OS YeS computer is described, and the results of computer experiments are presented. One figure, two tables, nine bibliographic references.

UDC 681.3.06

OPTIMUM INTERACTION BETWEEN TWO PARALLEL PROCESSES HAVING SEVERAL CRITICAL SEGMENTS

[Abstract of article by Geninson, B. A.]

[Text] An optimum rule is found for resolving conflicts between two parallel processes in a multiprocessor computation system, minimizing the average number (frequency) of conflicts, with the objective of raising the system's productivity. An expression is obtained for the average frequency of conflicts using the found optimum rule. Eight bibliographic references.

UDC 681.3.068

A PREPROCESSOR FOR EXTENDED FORTRAN--EXFOR

[Abstract of article by Orlov, B. N., and Semin, N. N.]

[Text] The language EXFOR, which is an expansion of FORTRAN, is described. Use of the new language facilitates the writing and debugging of programs. EXFOR takes the form of a FORTRAN preprocessor written in FORTRAN and contained within the composition of the OS YeS and the "Dubna" monitoring system. One figure, nine bibliographic references.

UDC 681.142.2:531.3

SPECIAL SOFTWARE FOR DOMESTIC GENERAL-PURPOSE LARGE AND MINICOMPUTERS USED TO SOLVE THE PROBLEMS OF DYNAMIC SYSTEM PLANNING

[Abstract of article by Chkhartishvili, G. S.]

[Text] A description is given of special problem-orientation languages and programming systems based on them permitting digital computer analysis of continuous and discrete dynamic systems, in both dialog and batch data processing conditions. Eight bibliographic references.

UDC 681.3.06

INTRODUCTION OF THE CDL COMPILER COMPILER INTO THE DESM-6 COMPUTER

[Abstract of article by Makarenkova, A. D., Nazarov, Yu. A., and Khoshenko, A. A.]

[Text] The most characteristic properties of CDL, compiler description language, are examined. A circuit for transferring the CDL compiler from a CDS-6500 computer to a BESM-6 computer and its basic characteristics associated with the use of OS DUBNA resources are presented. Examples using CDL language and the syntactic diagrams of the basic grammatical structures of the language are given. Four figures, six bibliographic references.

UDC 681.3

EFFORTS BY INTERNATIONAL ORGANIZATIONS TO ACHIEVE LEGAL REGULATION OF THE COMMERCIAL SALES OF COMPUTER SOFTWARE

[Abstract of article by Gel'b, A. B.]

[Text] Problems associated with legal protection of computer software and its official registration are examined. Nine bibliographic references.

UDC 681.3.04

AN INTERPRETER FOR LISP LANGUAGE FOR YeS EVM AND SYSTEM 4 (ICL) COMPUTERS

[Abstract of article by Panteleyev, A. G.]

[Text] An interpreter for LISP language for YeS EVM and SYSTEM 4 computers is presented, and its differences from the BESM-6 interpreter are enumerated. Two bibliographic references.
[375-11004]

11004
CSO: 1863

YES COMPUTER DATA BANK

Tartu BANK DANNYKH DLYA YES EVM. TRUDY VYCHISLITEL'NOGO TSENTRA. TARTUSKIY GOSUDARSTVENNYY UNIVERSITET in Russian No 43, 1980 pp 1-132

[Excerpts from the book "Data Bank for YeS Computers. Works of the Computer Center, Tartu State University," edited by Yu. Tapfer, 500 copies, 132 pages]

RECORDING DESCRIPTION TREE IN THE PAMA SYSTEM

[Excerpts from article by A. Isotamm]

In [1] the language RDL was presented for determining a recording in the PAMA system. Each recording description in that language is called a legend. In the present article the result of translation of a legend--a recording description tree--is presented. The corresponding translator is constructed by means of the WIRTH system of translator construction*, which produces a rarefied tree of legend analysis; the body of the translator itself contains procedures for the transformation of that tree.

*A system of translator construction which has received the name WIRTH has been created at the Tartu State University Computer Center (M. Tombak, A. Nigul' et al).

PHYSICAL REPRESENTATION OF A RECORDING IN THE PAMA SYSTEM

[Excerpt from article by A. Isotamm]

The structure of a physical SUBD RAMA recording in the immediate-access storage of a computer is examined in the article.

SYSTEM OF DYNAMIC MEMORY DISTRIBUTION FOR HIERARCHIC DATA STRUCTURES

[Excerpt from article by A. Nigul']

The DYN system examined in the present article is also a means of depiction and development of the structures of data oriented toward needs of the PAMA system.

SEPARATION OF THE MOST ESSENTIAL CLASSES OF DATA

[Excerpt from article by K. Eeremaa]

1. A data base, as a rule, is intended for the storage of a large quantity of information about certain objects and for representation of the connections between those objects. In some cases the investigation of the entire set of objects can be replaced by the investigation of a certain most essential subset of it. The question of the separation of such most essential subsets of objects is also examined in the present article. For that purpose a system is constructed, elements of which are the objects under consideration; the internal connections between the elements were selected in accordance with the prescribed relations between the objects, and the importance (weight) of each element is estimated with a certain number. If the principle of monotony is fulfilled in such a system in the sense defined below, then on the basis of the theory of separation of extreme subsystems of a monotonic system [2,3] it is possible to find the largest nucleus of the system that gives the sought subset.

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ORTHOGONAL ARRANGEMENT OF TREE-LIKE STRUCTURES

[Excerpt from article by Yu. Kikho]

In the creation of a data base control system the problem of visual representation of the developed structures, particularly of trees, arises. The rate of system adjustment depends substantially on the presence of convenient means for graphic display of information on the state of the structures. In the present article the partial problem of planning ternary trees.

CALCULATION OF SINGLE-SYMBOL CONTEXT IN A CONTEXT-FREE GRAMMAR BY MEANS OF BINARY RELATIONS

[Excerpt from article by M. Tombak]

Martin's algorithms for the calculation of relations and vectors of precedence by means of binary relations are well known [1,2]. Similar algorithms for the calculation of single-symbol context of non-terminal symbols in context-free grammars are described and substantiated.

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SEMANTICS OF REALIZABILITY FOR A LANGUAGE WITH VARIABLES WITH RESPECT TO RECURSIVELY ENUMERABLE SETS

[Excerpt from article by R. Prank]

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[382-2174]

2174
CSO: 1863

LANGUAGE FOR MODELLING CMD DEVICES

Moscow IZVESTIYA AKADEMII NAUK SSSR. TEKHNICHESKAYA KIBERNETIKA in Russian No 3, 1980 pp 103, 109

[Article by Ye. F. Kurenkov, Yu. Ye. Sedakov, and V. V. Shcherbakov, Gor'kiy: "Modelling Computing Devices for Cylindrical Magnetic Domains: I. Modelling Language"]

[Excerpts] Introduction. In computing devices of ferromagnetic materials, the information carriers are areas of magnetization (domains), which move along topological structures in planes under the influence of controlling magnetic fields. A large amount of attention has been given to the study of the physical principles of the movement of domains on topological charts which consist of various plane figures (patterns) (see, for example, references 1-6). The geometric structure of the topological chart, the direction of the rotation of the magnetic field, and the laws of the sequence of impulses in current busbars determine the means for input, storage, analysis, and read-out of information in domain technology devices. These physical characteristics permit the domain device to be presented as a finite plane oriented graph, in which all patterns are broken down into peaks and ribs. Thus, the patterns are related to the peaks of the graph in which input, multiplication, and redistribution are accomplished along the channels by which the domains advance, and the ribs are channels for transfer. Such a model takes into consideration not only the logical operation but also temporary correlations in domain devices and defines a single methodology for modelling the peaks and ribs of the graph.

The present work examines the first version of the language of complex programs for modelling cylindrical magnetic domain devices (CMD-devices) on computers. A formal description of the language, the semantics, and examples that explain the basic design of the language are presented.

Conclusion: The modelling of a number of logical and switching circuits for CMD-devices on an ES computer shows that the language examined is convenient and simple in operation. The description of a circuit in this

language can be written down in a free format, possesses sufficient clarity, and does not require additional coding for computer input and analysis. The work introduces means for describing elements which can be applied to other logical elements that were not brought into the first version. The description of the algorithm for modelling will be presented in a following work.

Submitted 19 July 1979

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[373-9645]

UDC 681.325.6

SOFTWARE FOR LOGICAL DEBUGGING OF ALGORITHMS FOR MICROPROGRAMMABLE STRUCTURES

Vilnius PROGRAMMIROVANIYE EVM [Computer Programming] in Russian No 2, 1979 pp 121-132

KARCHYAUSKAS, Eymutis

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 5, 1980 Abstract No 5B97 by V. T. Mitroshina]

[Text] Information is presented on cross software for the logical debugging of algorithms for microprogrammable structures, which can be run on a medium-capacity instrumentation computer. This software consists of a systems half implementing general functions of the debugging process and of a structural half which performs imitative operations of a specific microprogrammable structure. The raw data for the cross simulation system are the results of automated microprogramming--microprogram binary codes. In order to achieve the ability of symbolic addressing for the purpose of simulation, the cross microprogramming system includes a relative addressing module which forms relative addresses satisfying the requirements of a microprogramming translator. This is accomplished by translating all types of jump commands into the unconditional type in terms of omission, i.e., jump instructions are eliminated from the microprogram text. Programming of the structural half has been unified by using prepared procedures for imitating microprocessor units. A description is given of the language of instructions for controlling the simulation process. The system is implemented by means of the PL/1 language of the YeS [Unified System] dialog operating system and is oriented toward the K589 microprocessor unit. Reference 1.

[371-8831]

UDC 519.685

COMBINING OF PROGRAMS WRITTEN IN THE ALGAMS LANGUAGE WITH PROGRAMS WRITTEN IN THE PL/1 AND FORTRAN IV LANGUAGES, IN UNIFIED SYSTEM DISK OPERATING SYSTEMS

Minsk MATEMATICHESKOYE OBESPECHENIYE YES EVM [Unified System Computer Software] in Russian No 20, 1979 pp 47-52

BORODICH, L. I. and ZHEVNYAK, O. N.

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 5, 1980 Abstract No 5B140 by V. T. Mitroshina]

[Text] The following aspects of combining programs are discussed: rules for establishing links between programs written in the ALGAMS language; and possibilities of combining programs written in the ALGAMS, PL/1 and FORTRAN IV languages. Recommendations are given on combining programs in these languages. ALGAMS programs impose the following limitations on the organization of data on external media: The processing of files only with sequential organization is permitted; the processing of only single-volume files on magnetic tape and disks and single-section files on disks is permitted. Therefore, in combining programs in ALGAMS with programs in FORTRAN, as well as programs in ALGAMS with programs in PL/1, it is possible to process only sequential files. ALGAMS permits a maximum size of disk modules of 260 bytes and of 32 X 727 bytes on magnetic tape. From the above it follows that any file created in an ALGAMS program can be processed in FORTRAN and PL/1 programs. Any file created in a FORTRAN program can be processed in an ALGAMS program. Sequential files created in a PL/1 program and not exceeding the maximum dimensions of modules permitted in the ALGAMS program can be processed in an ALGAMS program. References 2.

[371-8831]

UDC 681.327.21.01

DIALOG TEXT EDITOR AND ASSEMBLER FOR A COMPUTER BASED ON AN INTEL-8080 MICROPROCESSOR

Dubna OB"YEDINENNYY INSTITUT YADERNYKH ISSLEDOVANIY. DUBNA. SOOBSHCHENIYA [Dubna United Institute of Nuclear Research Communications] in Russian No 10-12679, 11 pages

CHURIN, I. N.

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 5, 1980 Abstract No 5B639 summary]

[Text] A description is given of a method of preparing new programs, which can be used in the absence of expensive magnetic data storages and is distinguished by the fact that it makes it possible to make intensive use of microcomputer immediate-access memories instead of punched tape for the purpose of storing intermediate data. This method is implemented with a dialog-type compact resident program which has been developed, which includes a text editor and an assembler for the INTEL-8080 microprocessor. The program is designed for operation with a computer based on this microprocessor, furnished with an immediate-access-type memory with a capacity of not less than 16K bytes and with punched tape equipment. It occupies a memory volume of 5K bytes and can be placed in the permanent memory.

[371-8831]

UDC 681.3

EXPANSION OF THE SETL LANGUAGE WITH PROGRAM-DETERMINED TYPES OF DATA

Novosibirsk VYCHISLITEL'NYY TSENTR SIBIRSKOGO OTDELENIYA AN SSSR. PREPRINT [USSR Academy of Sciences Siberian Division Computing Center Preprint] in Russian No 207, 1979, 18 pages

NUMEROV, V. S.

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 5, 1980 Abstract No 5B101 by V. T. Mitroshina]

[Text] Problems are discussed, relating to expansion of the very-high-level SETL language with software for describing types of data. A special language construction is introduced--the type description--which makes it possible for the programmer to define arbitrary new types of data and to use them in his own programs. Any type of data is defined

completely by the set of operations which can be performed on items of this type. The type description separates the external behavior of the type of data from the actual internal representation of items of this type and from realization of its operations. By means of this language software the programmer can determine the set of data types adequately reflecting the subject area of the problem. Access to the representation of items is limited in such a manner that the possibility of incorrect addressing of data is eliminated. In addition to a common arrangement for dynamic monitoring of types, facilities are provided for introducing partial statistical monitoring, which when needed makes it possible to arrive at more effective subject programs. References 6.

[371-8831]

UDC 681.3:519.68

PROBLEMS IN CONSTRUCTION OF LANGUAGE PROCESSORS

Vladivostok VOPROSY REALIZATSII YAZYKOVYKH PROTSESSOROV [Problems in Construction of Language Processors] in Russian, Institute of Automation and Control Processes at the Far Eastern Science Center of the USSR Academy of Sciences, 1979, 111 pp

KLESHCHEV, A. S. (editor)

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B138 K]

[Text] Theoretical and practical problems are elucidated which pertain to construction of programming systems of the translator kind. Existing methods of describing the operational semantics are surveyed. Interaction between modules in programming languages is considered, as the functioning of synchronous parallel processes where messages are exchanged, also methods of coupling (modules, procedures, coprograms, etc). Discussed are problems in construction of programming base systems for research on an artificial brain, in organizing the memory control system, in realizing developed control structures, and in devising processes for operational languages of interaction with a system. A new approach to the solution of software problems is proposed relative to research on an artificial brain. Figures 45.

[376-2415]

UDC 681.322:519.76

RECOVERY OF DESCRIPTIONS OF INPUT LINES FOR PROGRAMS WRITTEN IN THE 'YASP' LANGUAGE

Moscow INSTITUT PRIKLADNOY MATEMATIKI AKADEMII NAUK SSSR in Russian preprint No 195, 1979 30 pp

YEFIMKIN, K. N. and ZADYKHAYLO, I. B.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B276]

[Text] Algorithms of recovering from the text of a program the descriptions of the structure of a set of input lines for that program. A language for describing lines and algorithms of recording these descriptions is also described. The study is a part of a project on producing a verification system for programs written in the language of a symbol processor.

[376-2415]

UDC 681.322.06

'DISOTL' FACTORY OF SOFTWARE FOR MINICOMPUTERS: DIALOG MONITOR

Vladivostok 'DISOTL' FABRIKA PROGRAMMNOGO OBESPECHENIYA DLYA MINI-EVM, DIALOGOVOY MONITOR ['DISOTL' Factory of Software for Minicomputers: Dialog Monitor] in Russian, Institute of Automation and Control Processes at the Far Eastern Science Center of the USSR Academy of Sciences, 1979 21 pp

POPOV, B. G.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B239 K]

[Text] The main principles of constructing a dialog monitor of a DISOTL-type program preparation system for minicomputers are discussed, most attention being paid to problems of interaction of the user with the dialog monitor and the DISOTL system.

[376-2415]

UDC 681.322.06.015

AUTOMATED DEVELOPMENT OF PROBLEM-ORIENTED DIALOG PROGRAMS

Moscow INSTITUT ATOMNOY ENERGII in Russian preprint No 3188, 1979 23 pp

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B210 by V. T. Mitroshina]

[Text] Problems are considered which arise in development of software for man-computer dialog. A method of formally describing the dialog language is proposed, to serve as a basis for automation of the programming process with a resulting more efficient development and operation of a large class of problem-oriented dialog systems. This method has been elaborated in detail and appropriate "SOBESEDNIK" (Interlocutor) procedures have been set up for use with an HP-2100 (Hewlett-Packard) computer compatible with Soviet-made M-6000 and M-7000 computers. Figures 7; references 11.

[376-2415]

UDC 681.322.066

DEVELOPMENT OF SOFTWARE FOR MINICOMPUTERS

Vladivostok RAZRABOTKA PROGRAMMNOGO OBESPECHENIYA DLYA MINI-EVM [Development of Software for Minicomputers] in Russian, Institute of Automation and Control Processes at the Far Eastern Science Center of the USSR Academy of Sciences, 1979 15 pp

GOLENKOV, Ye. A., POPOV, B. G. and POMATILOV, A. N.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B166 K]

[Text] The book deals with ways and means to increase the productivity of programmers developing large and complex software systems for minicomputers. Special attention is paid to the process of debugging minicomputer programs with the aid of large computers. The book is intended for specialists in systematic programming and in computer software, also for programmers engaged in solving application problems.

[376-2415]

UDC 681.322.068

SOME PROBLEMS IN CONTROLLING THE SYNTHESIS OF TESTS

Moscow TRUDY INSTITUTA ELEKTRONNYKH UPRAVLYAYUSHCHIKH MASHIN in Russian
No 76, 1979 pp 51-53

ZOLOTAREVSKIY, V. I.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B145 by S. G. Romanova]

[Text] Some problems are considered which arise in organizing the control in an automatic test synthesis system. It is shown that for each set of elements and devices processed by such a system there can be set up a data array, called a table of states, where information is recorded about which operations a given module performs. Programs can be interrupted only at definite points called stop points. Such an interruption occurs upon a STXIT supervisory macrocommand which is executed at the very start of any operation. It is noteworthy that the described system of test synthesis control appreciably reduces the necessary machine time.

UDC 681.326.3.01

AN APPROACH TO DESCRIBING THE FUNCTION OF TRANSFER TO THE NEXT MICRO-COMMAND IN A MICROPROGRAM

Moscow TRUDY INSTITUTA ELEKTRONNYKH UPRAVLYAYUSHCHIKH MASHIN in Russian
No 76, 1979 pp 54-61

ARUTYANYAN, B. S. and POGOSYANTS, G. M.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B50]

[Text] A regular method is proposed for assigning addresses to micro-commands during layout of microprograms in the control memory. The gist of this method is based on the concept of a transfer group. Formation of addresses A' in microcommand receivers according to this method is described by the address A of a given current microcommand and a certain number of binary digits B (i.e., address bits) in that microcommand. For the description of addressing functions are used facilities of the FOROS language. The variables A',A,B, are treated as registers with a prescribed word length. Examples of how addressing functions can be described are shown. Figures 1; references 3.

UDC 681.322.06

SOME PROBLEMS IN DESIGNING A SYSTEM FOR CONTROLLING A DATA BANK OF THE KODASIL TYPE

Moscow INSTITUT PRIKLADNOY MATEMATIKI AN SSSR. PREPRINT [USSR Academy of Sciences Institute of Applied Mathematics Preprint] in Russian No 3, 1980 30 pages

MAKLASHIN, O. A. and MOLCHANOVA, G. Yu.

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 5, 1980 Abstract No 5B173 summary]

[Text] Two problems are discussed, relating to the design of a system for controlling a data bank of the KODASIL type: the use of an "inquiry-reply" deductive system for analyzing and representing the configuration and memory configuration describing a specific data bank; a description and representation of the structure of a specific configuration and memory configuration, using the language for defining data of the KODASIL type. Figures 2; references 3.

UDC 681.322.066

ASPECTS OF REALIZATION OF THE 'VAMO S-DISPAK' PROGRAMMING SYSTEM FOR THE BESM-6

Moscow PREPRINT. INSTITUT PRIKLADNOY MATEMATIKI AN SSSR [USSR Academy of Sciences Institute of Applied Mathematics Preprint] in Russian 1979 43 pages

KOPYTOV, M. A. and TYURIN, V. F. M.

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 5, 1980 Abstract No 5B137 annotation]

[Text] A description is given of software developed for the DISPAK operating system, by means of which it is possible to use the "VAMO S-DISPAK" programming system. This study includes software both for the user and for the system user. A description is given of features of the FORTRAN-GDR input language.

UDC 681.3

REALIZATION OF A SYSTEM STORAGE OF THE SAFRA (VERSION 2.0) PACKAGE OF APPLIED PROGRAMS

Moscow INSTITUT PRIKLADNOY MATEMATIKI AN SSSR. PREPRINT [USSR Academy of Sciences Institute of Applied Mathematics Preprint] in Russian No 186, 1979 19 pages

GORBUNOV-POSADOV, M. M., KORYAGIN, D. A. and KRASOTCHENKO, V. V.

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 5, 1980 Abstract No 5B99 by V. T. Mitroshina]

[Text] The package of applied programs, designed for solving a wide range of problems of mathematical physics, includes a functional storage containing applied programs and accompanying descriptions, a problem language making it possible to formulate various problems for utilization of the package, and a system storage containing a set of software making it possible to store the functional storage and to interpret the problem language. The description offered for the system storage is oriented, on the one hand, toward package users desiring to become acquainted in greater detail with the system decisions used in it. In addition, it can prove useful to system programmers involving in the development of new applied packages.

[371-8831]

UDC 681.327.067

DEVELOPMENT OF ASSOCIATIVE MEMORY ALGORITHMS FOR A GENERAL-PURPOSE SIMULATION SYSTEM

Moscow SBORNIK TRUDOV INSTITUTA PROBLEM UPRAVLENIYA [Collection of Works of the Institute of Control Problems] in Russian No 8, 1979 pp 98-105

VORONKOV, V. B.

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 5, 1980 Abstract No 5B17 summary]

[Text] Various methods are discussed of constructing an associative memory for a general-purpose simulation system. Two variants are described for the structure of a "Catalog" and "Classifier" memory. The "Catalog" arranges information in the form of tree structures and accomplishes the associative reproduction of this information on the basis of these structures; in the "Classifier" the information obtained is processed and classified by means of algorithms based on the method of potential functions. Figures 3; table 1; references 4.

[371-8831]

UDC 681.322.068

TWO SUBPROGRAMS PARTICIPATING IN THE STRUCTURING AND UTILIZATION OF THE OPERATING EXPERIENCE OF A GENERAL-PURPOSE SIMULATOR

Moscow SBORNIK TRUDOV INSTITUTA PROBLEM UPRAVLENIYA [Collection of Works of the Institute of Control Problems] in Russian No 18, 1978 pp 95-97

DRUGOV, V. Ye.

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 5, 1980 Abstract No 5B157 by T. M. Kuznetsova]

[Text] A description is given of the TREE and USE subprograms written in FORTRAN and designed for operation of the subsystems of a general-purpose simulator. The TREE subprogram, having received from the generating program unit the information necessary to it and a place in the memory, forms an entry representing an element of the general-purpose simulator's experience and containing a data sheet and module entries. Algorithms are presented for the USE and TREE subprograms. Reference 1.

ABSTRACTS FROM 'TECHNICAL CYBERNETICS'

Moscow IZVESTIYA AKADEMII NAUK SSSR. TEKHNICHESKAYA KIBERNETIKA in Russian No 3, 1980 p 219

UDC 007:338.984

EXPERIENCE IN CONSTRUCTING A DIALOG SYSTEM. II.

[Abstract of article by Ven. V. L., and Litvintsev, P. I.]

[Text] This article continues an examination of the dialog system of long-term planning (DSDP), the first part of which was begun in a similarly titled article; it described the work of users with auxiliary program modules and practical mathematical support to DSDP; and it briefly examines the structure of the mathematical support to DSDP. Illustration 1; table 1; references 4.

UDC 681.3.068

PROCEDURE FOR CHECKING THE CORRECTNESS OF MACROINSTRUCTION PARAMETERS

Minsk MATEMATICHESKOYE OBESPECHENIYE YES EVM [Unified Series Computer Software] in Russian No 20, 1979 pp 86-95

MARGOLIN, M. S. and YAKIMOVICH, S. A.

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 5, 1980 Abstract No 5B46 summary]

[Text] A procedure is discussed for checking the correctness of the assignment of macroinstruction parameters. This procedure, based on the use in macrodefinitions of a special internal macroinstruction, the FILTRA, makes it possible to simplify the preparation of macrodefinitions and ensures thorough checking of the correctness of the assignment of actual values of parameters.

UDC 681.513.6.001.12:621.039.56

CREATION OF AN ADAPTIVE OPTIMIZATION SYSTEM FOR CONTROLLING ENERGY DISTRIBUTION IN A NUCLEAR REACTOR

Frunze OPTIMAL'NYYE I ADAPTIVNYYE SISTEMY [Optimal and Adaptive Systems] in Russian 1979 pp 26-29

VAL'CHIKHIN, A. Yu.

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 5, 1980 Abstract No 5A374]

[Text] Questions relating to the identification of a nuclear reactor under static conditions are discussed (finite convergence algorithms are used), as well as to the optimal control of energy release. References 6.

ABSTRACTS FROM THE JOURNAL 'ALGORITHMS AND PROGRAMS'

Moscow ALGORITMY I PROGRAMMY in Russian No 6, 1980 pp 16, 20, 22, 32, 48, 53, 54, 57, 59-60, 60-61, 64, 76, 79-80, 85

[Excerpts]

2062. GANITUDIN, A. Kh., and POLYAKOV, G. A. Estimating the effectiveness of use of multiprocessor electronic computers during realization of complex control system algorithms. In the book: Problemy gibridnoy vychislitel'noy tekhniki; Sbornik nauchnykh trudov AN USSR (Problems of Hybrid Computer Equipment: Collection of Scientific Works of the Ukrainian SSR Academy of Sciences). Institute of Electrodynamics, Kiev, 1979, pp 30-37. Bibliography: 5 items.

2079. POLEVOY, V. B. Evaluation of the discrete spectrum of a Boltzmann operator by the Monte-Carlo method. In the book: Metody Monte-Karlo v vychislitel'noy matematike i matematicheskoy fizike: Trudy 6 Vsesoyuznogo soveshchaniya (Monte Carlo Methods in Computational Mathematics and Mathematical Physics: Proceedings of the 6th All-Union Conference), April 1979, Siberian Department, USSR Academy of Sciences, Novosibirsk, 1979, Part 1, pp 121-131. Bibliography: 12 items.

An algorithm based on Pade analysis by the Monte Carlo method for calculating the Laplace image of non-stationary flow (10,000 histories, 10 minutes) realized in ALGOL is presented.

2087. VELICHKO, I. V. Sistema upravleniya basami dannykh AL'MA (The ALMA data base control system). Moscow, 1980, 71 pages (Report on Computer Software), USSR Academy of Sciences Computer Center. Bibliography: 13 items.

The ALMA (ALGOL-MARS-6) system consists of two subsystems: data description with a data description language and data base control with a data manipulation language. ALGOL-BESM-6 is the inclusive language for ALMA. The ALGOL system constructed on the basis of MARS-6 operations is described.

2131. SAAKYAN, A. A., KOTOLYAN, F. M., KHANAMIRYAN, E. G., and GEOKCHYAN, A. A. On the question of selecting a complex criterion of quality of computer hardware in the process of production. VOPROSY RADIOELEKTRONIKI. Seriya EVT, 1979, No 14, pp 79-83. Bibliography: 6 items.

The authors describe a mathematical model for analysis and improvement of the quality of printed circuit boards, one which is a component part of an automated system for quality control and realization in the PL/1 language.

2194. MOROZOV, B. V. Complex of programs for large-scale integrated circuits containing programmable logical matrices. ELEKTRONNAYA TEKHNIKA. SERIYA 3. MIKROELEKTRONIKA, 1979, No 5 (83), pp 40-44. Bibliography: 5 items.

A FORTRAN program complex is included in an automation system realized in the form of two fragments of programmable logical matrices, each of which contains 84 conjunctions of 16 variables. The output matrix contains valves which generate signsal of 13 micro-operations. The mean number of transistors in a single large-scale integrated circuit is about 2500.

2215. BELOKOPYTOV, YU. A., KALYNSKIY, L. G., KLIMENKO, S. V., et al. Automated RTFAS photo processing system. Communication subsystem. Interprogram communication channel for the DEC-10 computer. Serpukhov, 1979, 19 pages (Preprint No 79-177). Bibliography: 7 items.

The RTFAS is a bubble-chamber photo processing cystem using a controlled PDP-8 mini-computer and a central DEC-10 computer. The general organization of the communication subsystem working in a postal regime is examined. The software of the interprogram communications channel uses dynamic storage apparatus.

2219. Obrabatyvayushchaya sistema SEYSPAK. Podsistema PREPROTSESSING na EVM BESM-6: Metod. rukovodstvo dlya geofizika-pol'zovatelya (The SEISPACK Processing System. The PREPROCESSING System for the BESM-6 Computer. Methodical Manual for the Geophysicist-User). All-Union Scientific Research Institute of Geophysics, Moscow, 1979, 120 pages. Bibliography: 9 items.

The paper describes the general structure of the SEISPACK (seismic package) and the PREPROCESSING subsystem for field format reduction to a single type convenient for processing on a main BESM-8 computer with connected YeS (Unified System) magnetic tape stores. Preprocessing operations are performed on a small computer (M-6000, M-7000, SM-1, SM-2). About 90 percent of the system's programs have been written in the FORTRAN language.

2230. IVANOV, A. A., LASHIN, A. F., MALEVSKIY, A. L., et al. Program computer complex for optimization of parameters and circuits of nuclear power plants. In the book: Avtomatizatsiya proyektirovaniya energeticheskikh ustanovok (Automation of Power Plant Planning). Siberian Department, USSR Academy of Sciences, Siberian Power Institute, Irkutsk, 1979, pp 60-68. Bibliography: 6 items.

The principles of construction and structure of optimization studies of various types of nuclear power plants with use of a set of special service procedures. Models of steam-turbine and steam-generator plants were made in FORTRAN and have a common library of auxiliary programs for determining

the thermophysical properties of water and steam (in the range of 40 MPa and 800°C), the properties of building materials (strength and thermal conductivity); the library includes several optimization programs.

2238. BAKHAREV, I.A., DROZHZHINOV, V. I., and CHUVILOV, D. V. Study of procedures for tracing the topology of a computer network with package switching. Moscow, 1979, 23 pages (USSR Academy of Sciences, Institute of Applied Mathematics, Preprint No 14). Bibliography: 6 items.

A FORTRAN program is described and a comparative analysis is made of the simulation of several procedures for tracing the topology of computer networks with a different configuration (the MERIT network procedure, procedures based on the broadcasting method of data transmission). A new topology tracing procedure that has very good characteristics with respect to the dimensions of the data flow generated in a network during failure (resotration) of the network point or channel and with respect to the time of propagation of information about the change of topology to all network points is proposed.

2241. GITIS, E. I., PISKULOV, Ye. A., and MASNIKOV, V. V. Complex of means of simulating control and computer systems. Tematicheskiy sbornik nauchnykh trudov MAI [not identified], 1979, No 494. Analog-digital systems and devices and automation of their planning, pp 43-46.

The complex contains three systems of simulation and planning: the SM/2 digital control devices and industrial automation systems (60 subroutines of logical element models); the SM/4 analog and analog-digital devices and systems (20 subroutines of signal sensors, component models and voltage transformers); the SM/3--control and computer systems on the level of generalizations of queueing theory (30 subroutines of queue and flow models, etc). The main programs and all the system subroutines are written in the FORTRAN language and can be used with any computer that has a translator from the given language.

2253. IVANOV-MUROMSKIY, K. A., LUK'YANOVA, O. N., CHERNOMORETS, V. A., et al. Psikhofiziologiya operatora v sistemakh chelovek-mashina (Operator Psychophysiology in Man-Machine Systems), Kiev, Naukova dumka, 1980, 344 pages. On title-page: Institute of Cybernetics, Ukrainian SSR Academy of Sciences.

The results of monitoring the state of the operator under experimental conditions are discussed. Programs are presented in the BASIC language for a simulating psychophysiological model of operator activity and a simulating information model of the group activity of operators.

2308. TYURIN, V. F. Events and asynchronous processes in the main and secondary tasks in the DISPACK operating system. Moscow, 1980, 21 pages (Institute of Applied Mathematics, USSR Academy of Sciences, Preprint No 13). Bibliography: 12 items.

The possibilities of a system with respect to processing the main task of events occurring in secondary tasks are examined; the means of a system for processing intercepted extracodes are discussed, as are questions of the synchronization of the main and subordinated tasks. Examples are presented in the BEMSh language.

2319. RUBTSOV, V. L. A model of an electrical circuit of one class of large-scale integrated circuits. ELEKTRONNAYA TEKHNIKA. SERIYA 3. MIKROELEKTRONIKA, 1979, No 4 (82), pp 72-78. Bibliography: 9 items.

Graph-theoretical and numerical models of a large-scale integrated circuit and selection in the form of a set of Boolean matrices are discussed. The expenditure of memory for matrix storage is smaller than the indicator for the structure of circuits containing 300-350 transistors and about 4000 words of the BESM-6 memory.

2342. DAGMAN, E. Ye., and UMANTSEV, G. D. Pseudorandom number sensor for YeS computers. Novosibirsk, 1980, 22 pages. Institute of Semiconductor Physics, Siberian Department, USSR Academy of Sciences Preprint No 40-79. Bibliography: 4 items.

The authors discuss the possibilities of constructing multiplicative sensors of pseudorandom numbers uniformly distributed in the interval (0.1). The format of YeS computer instructions and constants are constructed by sensors with a large period length (with the multipliers $M = 5^{19}$, 5^{21} and $M_{max} = 5^{23}$). Examples of programs and their characteristics on an Assembler are presented.

[374-2174]

2174
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/1 statistical analysis program using multidimensional regression analysis appears in issue No 91.

Issue No 92 lists the DISCOD [non-Russian name] PL/1 program for introducing nonquantitative data into discriminant analysis.

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

[369-P]

APPLICATIONS

MODEL OF ACCESS RIGHTS DELIMITATION IN DATA BASE CONTROL

Moscow TRUDY MOSKOVSKOGO ORDENA LENINA ENERGETICHESKOGO INSTITUTA. ISPOL'ZOVANIYE EVM V INZHENERNYKH I NAUCHNYKH ISSLEDOVANIYAKH (Works of the Moscow Order of Lenin Power Engineering Institute. Use of Electronic Computers in Engineering and Scientific Research) in Russian No 438, 1979, edited by I. A. Bashmakov, 600 copies, pp 84-90

[Article by Yu. Sharr, graduate student]

[Text] The task of a system of access rights delimitation is protection of a data base against all unauthorized access (the concept of access is used here in its broadest sense, that is, including the reading, recording and modification of data) [1].

The access rights delimitation system must be able to:

-- allow only authorized users to enter the system;

-- make sure that after the user has entered the system he works only with data which he has a right to work with;

-- make sure that the user performs on those data only operations authorized for him to perform;

-- in case of need allow access only to certain data (conditions of protection).

The information on the basis of which the access rights delimitation system can realize the above requirements we find in declarations of secrecy. Such declarations allocate to each user the subset of information of data bases with which he has the right to work, in other words, they are the subsets of the data base for a given user which determine which operations the user can perform on which data and under which conditions.

The interaction of the user and that data base can be depicted by Figure 1 [2].

By starting from the schematic shown on Figure 1 it is possible to determine the mechanism of access rights delimitation as verification of the fact that [2]:

-- each operation of D required from P will be allowed by subcircuit Σ with which the given user is connected;

-- each item of information transmitted from D to P as a response to an operation required from P is in the subset D/Σ.

Let us examine the access rights delimitation system model.

Any system contains a series or set of interconnected elements. That set varies in a certain medium and unavoidably interacts with it. A certain goal is the basis of the behavior of the system.

The model consists of a selected method of describing a system [3]. The model is composed so exactly and completely as is necessary for the presentation of interesting facts and their interconnections. There is a large number of various methods of model construction.

Let us also briefly examine two possibilities of constructing access rights delimitation system models: that of secrecy procedures and that on a theoretically multiple basis.

The model of secrecy procedures proposed by Hoffman [4] is one of the representatives of secrecy procedures in which the conditions of secrecy are formed in secrecy procedures [5].

The model has the following components:

-- at least one TALK procedure. It establishes contact with the user (or his program) and obtains from him a description of the data and the operation which he wants to carry out on them;

-- an ACCESS procedure. ACCESS is a central procedure. All the requirements for the data base proceed through it. ACCESS, in turn, calls for a corresponding secrecy procedure also a function of the result of its work, averts or permits conducting an operation on data. It can only call for the elementary operations FETCH and STORE. The user applies to ACCESS only through TALK;

-- the elementary operations FETCH and STORE;

-- at least one secrecy procedure FORMULARY. FORMULARY is a set of precedures controlling access to data. They are called for during each access to data.

Depending on how the specific user designates data elements, how he wants to refer to them and control access and set it in correspondence with certain secrecy procedures. For each possible combination (user-data-conditions of access) a single secrecy procedure must be performed. The model under consideration includes the procedure FORMULARY BUILDER. It is used for the creation of secrecy procedures.

The basic idea is that the user, terminal and previously created procedures must be interconnected so that the user can record and read information or perform operations on it. This connection is performed during performance of the user's program, but only when the combination of user-terminal-secrecy procedure is permitted.

Let us examine the model of the access rights delimitation system on a theoretical multiple basis (see [2,6-10]).

That model includes the following elements:

-- objects: elements which must be protected against unauthorized access. The objects are passive elements of a system on which any sort of operation is being performed. Objects usually are data elements.

-- subjects: active elements of a system. Subjects are the elements against the actions (access) of which the objects must be protected. Users or their programs, for example, can be subjects.

-- operations: actions which a given subject can perform with respect to a given object; the rules of access are formed by the conditions in the fulfilment of which a given subject can perform given operations in relation to given objects.

We distinguish two types of conditions:

-- conditions not dependent upon data (for example, the time segment in the course of which a given subject has access to a given object);

-- conditions dependent on data (for example, a section manager has access only to the personal records of workers of his section).

We will call the following cortege a model of an access rights delimitation system

$$M' = (S, O, P, R), \qquad (1)$$

where S is a finite number of subjects $S = \{S_1, S_2, \ldots, S_i, \ldots, S_n\}$;

O is a finite number of objects $O = \{O_1, O_2, \ldots, O_j, \ldots, S_m\}$;

P is the set of operations which S can apply in relation to O;

R is the set of rules of access during the fulfilment of which S can realize in relation to O;

R determines the possible moment of time for checking access rights. If R contains only conditions not dependent on the data, access can be checked during translation of the user's program.

However, if R contains conditions dependent on the data, access rights can be checked only during execution of the user's program.

To simplify model (1) we will introduce the set C, which combines the expressions R and P, and call it authorization with respect to O, that is, C contains operations and conditions under which those operations can be performed with respect to O.

The access rights delimitation system can then be written in the form

$$M = (S, O, C) \qquad (2)$$

We will represent such a model by means of the matrix Z', the lines of which are the subjects S_i

$$s_i \in S = \{s_1, \ldots, s_i, \ldots, s_n\},$$

the columns of which are the objects O_j

$$o_j \in O = \{o_1, o_2, \ldots, o_j, \ldots, o_m\},$$

and the elements of which are authorizations of S with respect to O_j (C_{ij})

$$c_{ij} \in C = \{c_{11}, \ldots, c_{ij}, \ldots, c_{nm}\}.$$

We will call such a matrix the primary access matrix [5]; it is presented on Figure 2.

The volume of such a matrix Z' most likely will be very large and the number of its elements C_{ij} can change frequently. This makes it increasingly difficult to realize the access matrix in such a primary form, and so possibilities of curtailing X must be found.

For that purpose we will introduce the following definitions:

Definition 1. Upon S and O we determine two relations $=_s$ and $=_o$ such that

$$S_1 =_s S_2 \leftrightarrow \forall o_j : o_j \in O \rightarrow (c_{1j} \leftrightarrow c_{2j}) \; ; \qquad (3)$$

$$O_1 =_o O_2 \leftrightarrow \forall s_i : s_i \in S \rightarrow (c_{i1} \leftrightarrow c_{i2}) \; . \qquad (4)$$

Lemma. $\equiv_s$ and $\equiv_o$ are equivalence relations. Expression (3) indicates that S_1 and S_2 are equivalent if they have identical authorizations in relation to O_j, that is, if the lines S_1 and S_2 are equal to each other. Expression (4) indicates that the two objects O_1 and O_2 are equivalent if all the subjects S_i have identical authorizations toward both O_1 and O_2 (columns O_1 and O_2 are equal).

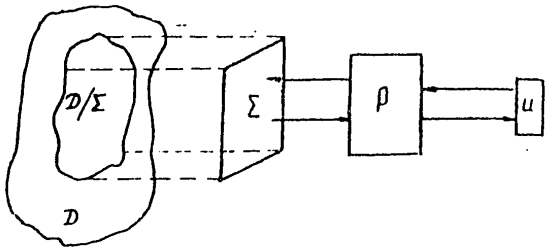

Figure 1

U -- user
Σ -- subcircuit
D/Σ -- subset D generated by Σ
P -- program of use
D -- data base

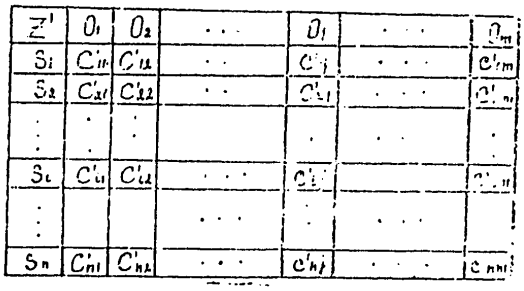

Figure 2

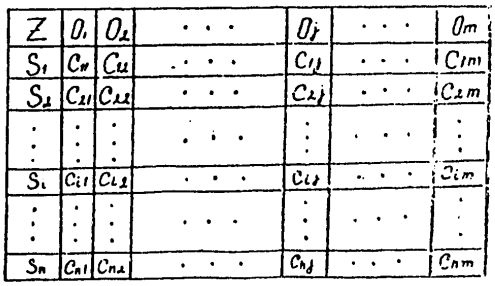

Figure 3

Thus the relations $\equiv_s$ and $\equiv_o$ form classes of equivalence in S and O respectively.

$O = O_i, \ldots, O_j, \ldots, O_m$ are sets of equivalence classes in S and O respectively. Then the authorization C'_{ij}, which exists for the pair (S_i, O_j), by means of the relation

$$S_i c_{ij} O_j \leftrightarrow \forall s_i, o_j (s_i \in S_i \wedge o_j \in O_j) \rightarrow s_i c_{ij} o_j \qquad (5)$$

can be transferred to the pair of equivalences (S_i, O_j).

The expression $S_i C_{ij} O_j$ $(S_i C_{ij} O_j)$ means that $S_i (S_i)$ has the authorizations C_{ij} in relation to O_j (O_j).

On the basis of (5) it is possible instead of the separate elements to consider the corresponding equivalence classes S_i, O_j, which means curtailment of the Z' matrix through the unification of identical lines and columns, that is, we will obtain the curtailed Z matrix shown as Figure 3.

Let us recall that the Z' matrix had the elements C'_{ij} for each pair (S_i, O_j) and the Z matrix has the element C_{ij} only for each pair of equivalence classes (S_i, O_j).

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[388-2174]

2174
CSO: 1863

VOICE COMMUNICATION BETWEEN MAN AND COMPUTERS

Moscow RECHEVOYE OBSHCHENIYE CHELOVEKA I EVM in Russian 1980 pp 2-56

[Excerpts from a booklet by Zvezdin, V. S.]

[Excerpts] This booklet examines ideas and methods for the primary analysis of speech signals, for the classification of acoustic images, for the generation of speech communications in vocoder technology and recognizing systems, and for speech synthesis. The booklet describes several technical solutions, including digital techniques for the transmission of speech in bundle commutation networks.

This booklet is intended for a wide circle of readers.

FOREWARD

We must discuss the question of regulating computer access for the various categories of users. In order to regulate access to the computer, it is necessary to solve the problem of recognizing the speaker by his voice, that is, the speaker must gain access to information only if he is permitted to do so. His voice parameters function as the key with which he will be able t. ›pen the "speech lock"; since such a key is constantly in the user's possession, it is difficult to counterfeit or steal it. Thus the problem of preventing unauthorized access to information is easily resolved. In addition to creating a "speech lock" with a "speech key" (the so-called problem of speaker verification), the question of recognizing a speaker by his voice also touches upon the subject of identification of an individual, that is, identifying an individual by his voice from among a given group of persons, whose speech parameters are known to the identification system. This task has about it a rather obvious suggestion of criminal investigation procedures, and can in fact have an extremely wide range of applications.

MACHINES ANSWER MAN

An experimental two-channel speech response system for an information reference service, based on a BESM-6 computer, was developed in the Soviet Union in 1972. The vocabulary included 40 words and the digital representation of each of the words was stored on a magnetic carrier. The speech generator was a vocoder synthesizer on orthogonal filters; it produced spoken communications of acceptable quality.

SYSTEMS FOR RECOGNIZING AND UNDERSTANDING SPEECH

In our country such a system, which required no preparatory training and which could operate with any speaker, was created at the USSR Academy of Sciences Computer Center about 10 years ago; it was based on the BESM-3 computer. It had a vocabulary consisting of 50 words. It served to duplicate the computer's separate performance monitoring functions (operational insertion of corrections into the program, monitoring the contents of the computer's immediate access memory cells, oral assignments for carrying out the exchange of information between external files, etc.). The system also permitted the computer to receive oral commands for performing certain mathematical calculations. A special device was constructed for the isolation of informative features, and the recognition process itself was carried out by the machine. Segmental features inherent in the method by which phonemes are articulated served as the informative features; these segmental features permitted the classification of sounds by groups (voiced or unvoiced, sonorant or non-sonorant consonants, etc.), and determined the parameters of the quasi-stationary segments of stressed vowels and fricative consonants. The features were selected in such a way that the system need not be adjusted, as we mentioned earlier, to a specific speaker, a fact that simplifies its operation considerably and greatly increases the convenience of working with such a system, in contrast to the Japanese NEC system, for example.

AUTOMATIC IDENTIFICATION OF THE SPEAKER

Information regarding the speech parameters of all persons with access to the computer is stored in the machine's memory. In addition to the tasks, mentioned above, of automatic identification and verification of speakers, a decision based on the analysis of speech signal parameters may be used for medical diagnoses of pathological conditions of the speech organs, for discerning differences between various speakers, and for establishing the identity of an individual.

The results of voice classification may differ considerably depending upon whether the speaker pronounces a pre-determined or arbitrary sequence of words. Thus we talk about either text-dependent or text-free speaker recognition.

It is obvious that if the set of words for the utterance (password) is fixed, the reliability of the classification will be greater, since it is possible to select a greater number of features that reflect the particular characteristics of separate sounds and sound formations and that will be sufficiently stable throughout the entire utterance. Moreover, the procedure for identifying a set of features with a certain speaker from among a given group of individuals closely parallels the recognition of speech commands. For each speaker, the parameters (standards), variable over time, for the given utterance are stored in the automatic recognition system's memory. They also function as the base material with which the speech form in question is compared. Moreover the process of temporal coordination may be accomplished by means of non-linear deformation of the time scale.

In speaker identification, as opposed to speaker recognition, primary attention is focused on that set of parameters which is maximally oriented toward the subtle physiological characteristics of the speaker. The question of precisely what such a set is like remains at present unanswered. However, numerous experiments show that, for a given utterance, the trajectories of the fundamental tone, of the formants, of speech signal energy, and of the coefficients of linear prognostication, that is, the relationships of these parameters to time, permit a significant increase in the quality of verification, in comparison to the averaged values of these and other parameters, even under less than favorable conditions.

Thus prosodic features reflect to the highest degree the structure of a person's vocal apparatus and also his speech habits. But in this case, it would seem to be most difficult to distinguish between the speech of close relatives (brothers and sisters). Research shows that this is not so, although the probability of errors in this case is greater than in the verification of unrelated persons.

This orientation toward "physiological" parameters offers a practical solution to the question of the system's efficacy where there exists the possibility of misuse arising from artificial imitations of someone else's voice. It is interesting to note that in this regard the machine's resources are significantly greater than human resources, provided that there is a sufficient number of features to be isolated (usually not less than five).

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AUTOMATION OF IMAGE ANALYSIS AND RECOGNITION. METHODS AND MEANS

Riga AVTOMATIZATSIYA ANALIZA I RASPOZNAVANIYA IZOBRAZHENIY. METODY I SREDSTVA in Russian No 1, 1979 pp 3-4

[Foreword by E. A. Yakubaytis, Academy of Sciences of the Latvian SSR]

[Text] The automation of image analysis is an important means of raising the effectiveness of scientific research. The great number of visual microscopic studies of various preparations at clinics and research laboratories and the amount of effort that goes into such analyses makes it essential to develop methods and instrumentation for automating the process.

The use of automatic image analysis systems assures greater accuracy and speed of measurements and makes it possible to avoid subject evaluations by the researchers and raise the labor productivity and rate of scientific research. Furthermore, the researcher can obtain fundamentally new information unavailable in analyses by conventional visual means.

At present general-purpose computers are used extensively for constructing image processing systems. At the same time, intensive research is going on, both in our country and abroad, to develop the methods and hardware for specialized image analysis systems for the solution of a wide range of problems in industry.

The Institute of Electronics and Computer Technology of the Academy of Sciences of the Latvian SSR (IECT) has been conducting research along these lines since 1969. Considerable experience has been accumulated since then in both the development of methods and creation of special image analyzers utilizing television and computer hardware.

The materials presented in this collection reflect the results of scientific research obtained in the IECT in the last two years.

The collection consists of two parts. The first deals with questions of theory and methods and algorithms of image analysis with the help of general-purpose and specialized processing means.

The second part includes materials pertaining to the elaboration of technical solutions employed in the creation of specialized hardware constituting essential modules of configuration complexes of image analysis.

[379-9681]

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ABSTRACTS FROM THE BOOK 'AUTOMATION OF IMAGE ANALYSIS AND RECOGNITION. METHODS AND MEANS'

Riga AVTOMATIZATSIYA ANALIZA I RASPOZNAVANIYA IZOBRAZHENIY. METODY I SREDSTVA in Russian No 1, 1979 pp 261-267

UDC 621.397.193

THE MODEL APPROACH TO THE STUDY OF REAL TIME IMAGE PROCESSING SCANNING SYSTEMS

[Abstract of article by Kel'man, I. A., Krupnikov, G. P., Markov, I. A., and Rabinovich, S. I.]

[Text] The article examines the main stages in the process of image processing. It discusses the specific features of scanning systems used in real time image processing and suggests a model for studying the functioning of the first block of such systems. References 2.

UDC 621.391.193

A MATHEMATICAL MODEL OF THE PROBLEM OF ISOLATING ANALYSIS OBJECTS ON DISCRETE IMAGES IN THE COURSE OF SCANNING

[Abstract of article by Rabinovich, S. I.]

[Text] The article treats of formalization of the concept of the problem of object isolation solution of which is a prime component of image analysis and reveals the main properties of the problem and the algorithms for solving it. It presents the conditions necessary and sufficient for solving such problems in the course of scanning. References 2.

UDC 621.397.131

ON MARKING OBJECTS OF A TELEVISION IMAGE

[Abstract of article by Blank, A. M., Nezanov, V. P. and Firsova, T. V.]

[Text] The article examines the problem of isolating objects on a television image. A class of algorithms solving the problem and utilizing different scanning systems is studied and a method of evaluating the complexity of such algorithms is suggested. Illustration 1; References 3.

UDC 621.397.131

AN ALGORITHM OF CONTOUR ISOLATION OF A ONE-BONDED DOMAIN ON A BINARY DISCRETE IMAGE

[Abstract of article by Pavarnieks, I. A., and Rabinovich, S. I.]

[Text] The article examines a contour isolation algorithm based on one of the simplest methods of contour tracing. It proves that the proposed algorithm isolates all points of the contour, and only them, regardless of the shape of the bonded domain and its position on the image. The algorithm is realized in the form of a computer program. References 3.

UDC 621.391:519.2

A MULTIDIMENSIONAL SCATTERING DISTRIBUTION MODEL AND SOME OF ITS CHARACTERISTICS

[Abstract of article by Libenson, M. N.]

[Text] The article examines a scattering model for a wide range of multidimensional distributions. It represents a hyperellipsoid with a specially calculated equivalent radius. The main characteristics of the model depend weakly on the type of distribution, space dimension or correlation between features. The main parameters are analyzed and limiting relations obtains for them. Illustrations 2; References 11.

UDC 62-50

SPECIFICS OF DEVELOPING LEARNING ALGORITHMS OF MULTILAYER IMAGE RECOGNI- SYSTEMS TO A FINITE NUMBER OF MORE THAN TWO CLASSES

[Abstract of article by Zaitsev, S. G.]

[Text] The article presents analytical iteration learning procedures of multilayer image recognition systems constructed in the form of multilayer grids of linear threshold elements contained in the last layer (at

the grid output) of more than one linear threshold element. The idea is illustrated with procedures for minimizing the evaluation of the second moment of the distribution of the discrete error. A learning algorithm for a multilayer recognition system with complete consecutive bonds between the layers is examined in detail, since such multilayer recognition systems are extensively used in specialized image recognition systems. An algorithm is proposed for the selection of the initial values of relocatable coefficients of multilayer recognition systems ensuring the workability of the examined iteration learning procedures. References 7.

UDC 621.397.131

THE 'RASTR' MULTIFUNCTIONAL TELEVISION-COMPUTER IMAGE ANALYSIS COMPLEX

[Abstract of an article of Jakubaitis, E. A., Gromov, G. G., Libenson, M. N., Podvysotskaya, N. A., and Janson, B. A.]

[Text] The article examines the principles and specific features of constructing multifunctional image analysis systems using television and computer hardware. It presents data on the structure of the "Rastr" complex developed at the Institute of Electronic and Computer Technology of the Academy of Sciences of the Latvian SSR. It is shown that the technological solutions used to build the complex make it possible to solve a wide range of both practical and research problems. Illustration 1; References 9.

UDC 681.335.02

A METHOD OF IMAGE CODING

[Abstract of an article by Gromov, G. G., and Popov, Yu. O.]

[Text] A new method of image coding is suggested which is based on preliminary determination and storage of the luminosity values of the darkest and brightest elements of the image and subsequent quantization of the image in the range between the extreme values of the luminosity function. The advantages of the proposed method over the older one are shown. Domains of practical application of the method are outlined in which it is expected to be most effective. Illustrations 2; References 10.

UDC 681.335.02:621.397.62

QUESTIONS OF DEVELOPING A DEVICE FOR SEPARATING OUT EXTREMAL VIDEO SIGNAL LEVELS

[Abstract of article by Bergmanis, A. H., Popov, Yu. O., and Janson, B. A.]

[Text] The article examines questions providing the hardware for separating out extremal video signal levels that would help reduce the amount of

encoded information. This hardware is based on standard items: a television sensor operating in the standard television broadcasting bands and digital-analog transformers made of integrated elements. A block diagram is presented of a method of compensating for errors due to the response threshold of the comparing device. Illustrations 5; References 7.

UDC 681.3:621.397

PROGRAM CONTROLLED MEANS OF PRESENTING AN OBJECT TO A TELEVISION MEASURING SYSTEM

[Abstract of article by Bergmanis, A. H., San'kov, G. F., and Stolov, L. I.]

[Text] The article examines the structure of a system based on a general-purpose computer which makes it possible to automate experiments in solving some television image analysis and recognition problems. An enlarged graph of the operation algorithm of the system is presented and the specific features are revealed of the technical solutions of its component program controlled units. The article describes the course of several characteristic experiments offering a fair idea of the possibilities of this automatic system. Illustrations 7; References 3.

UDC 621.397.131

FOREIGN-MADE SERIALLY MANUFACTURED IMAGE ANALYZERS

[Abstract of article by Krupnikov, G. P., Markov, I. A., Podvysotskaya, N. A., and Sergeyev, M. P.]

[Text] The article examines the main trends in the development of image analyzers over the last three years. It briefly describes the functional possibilities of the new LUZEX 450, OPTOMAX 75, LEITZ-T.A.S. and MIKROVIDEOMAT 2 analyzers, as well as new QANTIMET 720 type modules. The specialized MAGISCAN system is examined in detail. Illustrations 3; References 64.

UDC 621.397.131

ON REAL TIME SEPARATION OF IMAGE CONNECTING REGIONS

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

[Text] The article examines the question of separating the connecting regions of images as a component of the problem of complete parametric counting of objects in line scanning systems. By real time complete parametric counting is meant the separation of every object in the field

of vision of the scanning sensor with the simultaneous calculation of geometrical parameters separately for each object carried out in one scanning. A method is suggested for separating connecting regions of images of objects of arbitrary shape, orientation and reciprocal configuration, based on consecutive indexing of the connecting regions. A block diagram of a device employing this method is presented. Illustrations 8; References 4.

UDC 681.327.23

SELECTION OF THE STRUCTURE AND TECHNICAL PARAMETERS OF A COLOR IMAGE OUTPUT-INPUT CHANNEL FOR A COMPUTER

[Abstract of article by Alyen, I. K., Gromov, G. G., and San'kov, G. F.]

[Text] It is shown that analysis of color characteristics is a highly effective method in many image recognition problems. The present level of color television technology, as well as the possibilities of computer data input channels, make it possible to employ these means for developing color image input-output systems for computers in a television scanning time scale. The work attempts to explain the choice of scanner and signal system in the framework of three-color television. It presents a procedure for forming basic levels for alphanumeric printers and a calculation of the main parameters of the communication channel. A variant of the structure of this channel is suggested which includes an external access memory for bufferizing the image in both the input to, and output from, the computer. The proposed variant of a color image input-output channel may find useful applications in systems for automating color image processing in the computer machine field. Illustrations 3; References 6.

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UDC 621.391

CONSTRUCTION AND ANALYSIS OF INFORMATION TRANSMISSION SYSTEMS

Moscow POSTROYENIYE I ANALIZ SISTEM PEREDACHI INFORMATSII in Russian 1980, pp 2, 140-141

[Annotation and table of contents from book edited by E. L. Blokh, doctor of technical sciences, Institute of Problems of Information Transmission, USSR Academy of Sciences, Izdatel'stvo "Nauka," 1750 copies]

[Text] Annotation

The collection is devoted to a description of various methods of constructing and decoding correcting codes, estimation of the the truth characteristics and the rate of data transmission systems with feedback, working on a real channel, by methods for testing channels and systems for transmission of discrete information.

The book is intended for scientific, engineering and technical workers, and also for graduate students and undergraduate students of senior courses of electrical engineering and radio engineering VUZ's of the country.

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STAND TESTS OF DATA TRANSMISSION SYSTEMS

Moscow POSTROYENIYE I ANALIZ SISTEM PEREDACHI INFORMATSII in Russian 1980, pp 106-111

[Article by O. F. Dmitriyev, A. M. Dolgushev, and A. A. Kiktev from book edited by E. L. Blokh, doctor of technical sciences, Institute of Problems of Information Transmission, USSR Academy of Sciences, Izdatel'stvo "Nauka," 1750 copies]

[Excerpts] 1. Introduction. Complex system tests are the main stage in which all system components are complexly connected and adjusted and the necessary modifications are also made.

Let us examine the procedure and means of conducting complex tests, using mini-computers to organize the tests.

3. Hardware and software of data transmission channel tests. If tests of means of remote processing are conducted on a real communications channel, certain erroneous situations cannot help but be manifested during the tests and defects are discovered in the working system in the course of a long time after completion of the startup, adjustment and tests.

A more complete and accelerated check can be made with a complex of hardware based on a mini-computer.

Figure 1 shows a block diagram and its connection to an AP-EVM (subscriber point-computer) channel. The complex includes an interaction signal register (1), a coupler (2) and an M-6000 mini-computer (3) with circuits for discrete information exchange in the AP-EVM channel and the mini-computer properly speaking. The purpose of the mini-computer consists in the decoding of characters of the information exchanged by the EVM and AP and the introduction of determined or random errors into the information characters. In addition, a mini-computer can be used to analyze the reaction of the system to the introduced distortions. [The coder and signal converter are (4) and (5) on Figure 1].

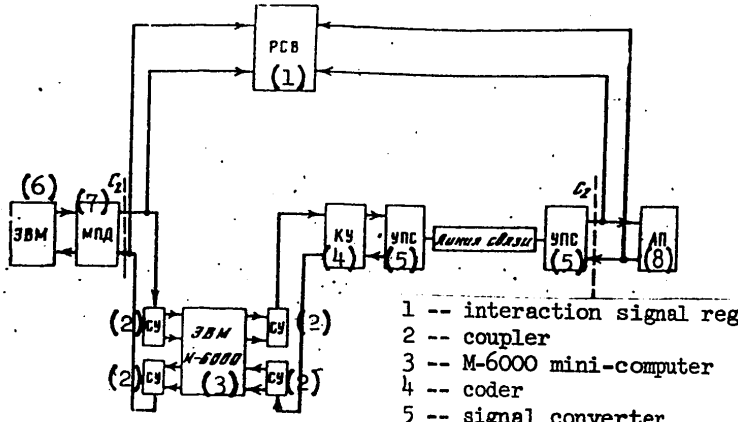

Figure 1

1 -- interaction signal register
2 -- coupler
3 -- M-6000 mini-computer
4 -- coder
5 -- signal converter
6 -- computer
7 -- multiplexor for data transmission
8 -- subscriber point

The interaction signal register is a magnetic recording device by means of which signals are recorded in the information circuits of forward and reverse channels and a number of potential coupling circuits C_5 (see Fig 1). The interaction signal register is connected in such a way that the information is recorded after changes introduced by means of the M-6000 in both the forward and the reverse channels. After conclusion of the registration session with the interaction signal register it is possible to withdraw a section of recording from any moment of time.

The series of beats is recorded on loop oscillograph paper. Analysis of the oscillogram permits constructing a complete picture of information exchange between AP and EVM.

Besides hardware, special main computer programs are needed for the tests, programs which must assure the transmission and reception of test information, and also, after random errors have been introduced, make a comparative analysis of received information with a standard and record the results of the analysis.

A program for character fixation and change, an interruption formation program and a program for introduction of random errors can be included among the M-6000 programs.

Tests of data transmission channels using the indicated complex of means can be divided into two stages--working of the AP-EVM channel during introduction of determined noises and working of the channel during introduction of random noises.

4. Tests with the introduction of determined errors into the information. The algorithm for data exchange determines several regimes which differ in

the procedures for processing data characters or units. For example, in remote processing with Unified System computers one can distinguish regimes of identification, readiness and data transmission. In those regimes there can be various procedures: phasing, coding, decoding, organization if inquiries, completion of data transmission, transmission of iniative, etc.

The finishing of a channel with the introduction of determined errors is done for each procedure in the form of separate examples. To conduct tests of means of Unified System computer remote processing about 50 different examples should be worked out for correspondence with the AP-2 algorithm. They include distortions of text characters, distortions of auxiliary characters (NT, KB, KP, KTM, APl AND KSB [not further identified]), variation of the legibility of response, etc.

Some examples have been designed for processing reactions of the system to a series of distortions of characters. For each example a table of starting data must be prepared for a program of character fixation and distortion for the M-6000 mini-computer.

The functioning of a channel in a given procedure is organized by means of a program of a user of the main computer and an operator of a subscriber point. The correctness of the system's reaction to introduced errors is verified by analysis of necessary sections of the interaction signal register recording, which are determined from the moments of character fixation, calculated with the M-6000. Synchronization of the work of the hardware and software of the complex is achieved by simultaneous starting the recording of interaction signal register and the M-6000 mini-computer program during the working out of each example.

The program which introduces determined distortions produces exchange on two data transmission channels when the M-6000 is connected in accordance with Figure 1.

All the characters arriving over the channels are decoded and verified for correspondence to the series of characters given in the starting data table for each example. During the decoding of the next character it is replaced by a character given in the table (in particular, the character can remain unchanged). The retrieval of each subsequent character in the table starts only after decoding of the preceding one.

In the starting data for each example provision is made for the possibility assigning a table containing as many as 200 characters for each channel. The program includes 3000 characters together with subroutines of the controlling system. The residual store is deawn away under a buffer to arrange the data registered during the work of the program: the time of discovery of the next character in the table and type of character to which the decoded changes. Tests of the program showed that it works reliably up to a rate of 20,000 bits per second on each channel.

The time expended on tests with the introduction of determined noises depends on the data transmission rate, the length of the transmitted units and the type of example (that is, on the verified procedure and the introduced series of errors). The tests showed that on the average 2 or 3 minutes are expended in each channel on the working out of an example with a table of starting data with a length of up to 10 characters, of which time a great deal is spent on decoding.

To check the system's reaction to failure of synchronization, examples were used in working out which the M-6000, starting at a certain moment, shifts the advanced data series by the given number of bits.

Adjustment with the introduction of determined errors permits revealing a large portion of the incorrect reactions of the system to errors in the line of communications, but cannot serve as an exhaustive check, as among the set of examples it is impossible to provide for all possible combinations of errors. Therefore the described tests must be supplemented by testing of the system with the introduction of random errors from the M-6000 computer.

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ANALYTICAL MODELS OF DATA TRANSMISSION LINK CONTROL PROCEDURES IN PACKET SWITCHING COMPUTER NETWORK

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 7, 1980 pp 181-192

[Article by L. B. Boguslavskiy, Moscow, and E. Gelenbe, Paris]

[Excerpts] The protocol structure influences the working effectiveness of the computer network as a whole. Therefore an important element in the investigation and development of computer networks is estimation of the quality and the synthesis of effective protocols.

The present article is devoted to analytical investigation of procedures for data transmission link control (linear protocols). The selection of the parameters of those protocols affects the throughput capacity of the data transmission link--of two nodes connected by a line of communication. In the work explicit expressions were obtained for the quanity criterion of different flows, they are compared with the consideration of different working conditions of the line of communication, and the task of optimization of the protocol structure is solved. The presented results permit estimating the influence of the protocol parameters on the characteristics of computer networks.

Conclusion

The conducted analytical investigation was directed toward estimation of the limiting working possibilities of linear protocols, as the models under consideration assume that in the nodes there always are packets for transmission and that situations do not arise in which the nodes cannot accept data.

The obtained results show that the HDLC protocol gives good results at receipt dimensions small in comparison with the packet length, and the SW_c protocol has the best characteristics in a fairly wide range of packet echelon dimensions and relative receipt dimensions (t/L). It is advisable to use the SW_c protocol during relatively long receipts. These results are useful in the selection of protocol parameters with consideration of the volumes of useful information transmitted to communication subnetworks.

On the whole the protocols under consideration permit achieving a high level of use of the line and throughput capacity at small dimensions of the packet echelons (up to 10), and the probability of packet losses has little influence on the main characteristics of the protocols. A symmetric graph permits best use of the possibilities of lines.

In the work a general method of analytical simulation of linear protocols is proposed. For example, the DDCMP and SDLC protocols are investigated similarly to the HDLC protocol. The DDCMP protocol differs from the HDLC by the presence in the packet of a separate identifier for receipt (of service information). Therefore it is necessary only to take into consideration that when DDCMP is in the packets a large volume of service information is transmitted, and in the analysis of packet losses instead of the probability of loss of an entire packet it is necessary to consider the probability of loss of part of a packet containing useful information.

Investigations have shown [2] that the assumption of an exponential distribution of the packet transmission time has considerable influence on the precision of the final results. It can be expected that these results will also be valid for other packet transmission time distributions. These assumptions are close to the real situation even for an actually recorded packet length (HDLC protocol) because of random delays connected with the work of the data transmission apparatus and the software.

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RESEARCH IN COMPUTATIONAL LINGUISTICS AND LINGUISTIC STATISTICS

Moscow ISSLEDOVANIYE V OBLASTI VYCHISLITEL'NOY LINGVISTIKI I LINGVOSTATISTIKI in Russian 1978 pp 2, 191

[Annotation and table of contents from book edited by V. M. Andryushchenko, associate professor, Computer Center of the Humanities in the Economics Faculty, Moscow State University imeni M. V. Lomonosov, Izdatel'stvo Moskovskogo universita, 550 copies]

[Text] Annotation

The collection of articles "Research in Computational Linguistics and Linguistic Statistics" is devoted to two main problems: detection of structural quantitative regularities of dictionary and text construction and the construction of algorithms for different purposes in the automatic analysis of texts. The collection reflects a spectrum of work on the given problems being done in the Computational Laboratory of Moscow State University.

The collection is intended for a broad circle of specialists in the areas of theoretical and applied linguistics, semiotics, information science and related sciences and undergraduates and graduate students of corresponding specialties.

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UDC 15.3

DATA BANKS FOR DECISION-MAKING

Moscow BANKI DANNYKH DLYA PRINYATIYA RESHENIY (Data Banks for Decision-Making) in Russian 1980 signed to press 2 Nov 79 pp 2-4, 205, 208

[Annotation, preface, table of contents and bibliography from book by Yuriy Ivanovich Klykov and Lev Nikolayevich Gor'kov, Izdatel'stvo "Sovetskoye radio", 12,000 copies, 208 pages]

[Text] This book covers the statement and solution of the problem of setting up data banks for decision-making which evolved from interactive information retrieval systems. The semiotic language on which the bank is based is described. The principles of building semiotic control systems on its basis are discussed.

This book is intended for specialists working in decision-making and artificial intelligence.

Preface

The problem of modeling the process of decision-making is of current interest not only to psychologists and philosophers, but also to mathematicians, linguists, engineers and the generally broad circle of researchers, working to create and practically apply automated decision-making systems. In the native and foreign literature on this problem, the questions discussed deal primarily with quantitative substantiation of the decision being made using the apparatus of operations research. The basic mechanisms of the decision-making process itself, associated with building models of problem environments as well as models of forming decisions in problem situations, may indeed be treated in some works, but as a rule, this is done fragmentarily and on the level of generally philosophical discussions and psychological hypotheses.

This book is the first attempt to fill this gap. It provides for the first time a full presentation of the semiotic language underlying the decision-making process and treats the principles for building man-machine decision-making systems, based on this language and called data banks for decision-making; questions of the effectiveness of their practical application are

also discussed. The basic results of the multiyear effort by the authors in developing and applying practically banks for decision-making in automated systems for control, design and planning.

The book consists of three independent parts that treat respectively: the principles of construction and the language of semiotic control systems; the principles of forming a model of rational behavior in the problem environment and solving problems using the model; and fields of practical application.

In the first part (chapter 1), the basic causes of the limitedness of the classical formal systems and the language on which they are based are analyzed, and the necessity of using to model the decision-making process semiotic systems having the capability of learning and adapting to the problem environment is shown. The path of evolution of banks from the simplest information retrieval systems to semiotic systems is considered. The language of semiotic systems is described. The structure of the bank for decision-making is presented, and the basic functions performed by the bank are discussed. A good deal of attention is paid to constructing the rational base of knowledge of the semiotic language.

The second part consists of chapters 2 and 3. Chapter 2 covers the formalized description of the language for modeling the problem environment. The means of presenting situations of the problem environment and strategies of its behavior, as well as means for presenting mechanisms to build micro and macromodels of the problem environment are treated.

The method of forming the model of behavior is described here. The basic learning algorithms are given; these are used to construct the range of goals and the micro and macromodels of the problem environment corresponding to it, as well as the models for seeking decisions in problem situations. The methods for forming, generalizing and interpreting strategies are described.

In the third part (chapter 4), the primary fields for practical application of data banks for decision-making are considered: control of large systems; designing industrial complexes; planning flows in systems of information exchange and others.

Orientation of the book to a broad range of specialists engaged in developing and applying practically man-machine decision-making systems presented the authors with the problem, difficult to solve, of choosing suitable language for presentation of the material. The quest for full and adequately rigid presentation of the concepts of semiotic decision-making systems, unfortunately, in some places, led to the loss of clarity and ease of grasping the material; the authors apologize to the readers for this. The authors are grateful to the collectives of researchers engaged in developing and applying practically data banks for decision-making as well as situational control who played an active role in discussing the content of the book and expressed valuable criticism.

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[387-8545]

8545
CSO: 1863

REPORT ON WORK OF CEMA INTERNATIONAL SCIENTIFIC INFORMATION CENTER

Moscow EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV in Russian
No 3, 1980 pp 88-92

[Article by Professor Leonid Sumarokov, director of the International Center of Scientific and Technical Information: "The Operations of the MTsNTI and Improving Its Work"]

[Excerpts] The MTsNTI [International Center of Scientific and Technical Information] was established following the 27 February 1969 agreement concluded by Bulgaria, Hungary, East Germany, Mongolia, Poland, Romania, the USSR, and Czechoslovakia. In 1973 Cuba joined the participants in the center and in 1979 the Socialist Republic of Vietnam became a member.

Prof. L. Sumarokov

About 100 scientific associates from the countries participating in the agreement work at MTsNTI. Its chief governing body is the Committee of Authorized Representatives of the countries that are members of MTsNTI.

The center has up-to-date equipment, including a YeS-1040 computer, units of a remote processing system, an operational printing section, and a Pentakta microfilming installation.

Automation of data processing in the automated information systems of MTsNTI is based on use of an expanded packed of applied programs (the AIDOS/DOS), the YeS-1040 computer, non-punched data input units, and a photo typesetting machine.

Work has been done to maintain and expand the YeS computer system software and to develop and introduce applied programs:

a. the OS/YeS 4.1 and DOS/YeS 1.7 operations systems and the KROS monitoring and control system have been put into operation and the OS/YeS 6.1 operations system has been regnerated and put in test operations;

b. the KAMA remote processing system has been generated;

c. a dialogue search monitor for the applied software package of the automated data processing system in the remote processing mode has been developed;

d. the applied software package of the automated data processing system has been incorporated.

As the head organization of the MSIS NIR [International Specialized Information System for Scientific Research Work], MTsNTI offers the following types of information reference services:

1. a reference collection of scientific research projects. It contains abstract reports, dissertations, and surveys and descriptions of computer programs written in the CEMA countries. Each year issues are published in 12 series containing information on an average of 40,000 documents from all fields of science and technology;

2. specialized (problem-oriented) anthologies which are composed with consideration of the information needs of groups of collective users of the sectorial subsystems of MSNTI [International System of Scientific and Technical Information of the CEMA Countries] (on an experimental basis);

3. information service in the modes of selective dissemination of information and retrospective search;

4. information on magnetic tape for computers with descriptions of documents of the International Specialized Information System for Scientific Research Work.

[405-11,176]

11,176
CSO: 1863

CONTROL COMPUTER, 'CAMAC' RING-SERIES MAINS AND PERIPHERAL EQUIPMENT OF THE AUTOMATION SUBSYSTEMS IN THE 'DEL'FIN' LASER PLANT

Moscow FIZICHESKIY INSTITUT AKADEMII NAUK SSSR in Russian preprint No 156, 1979 27 pp

ALLIN, A. P., SENATSKIY, Yu. V., SKLIZKOV, G. V., SUBBOTIN, L. K. and YAKUSHEV, A. K.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B337]

[Text] The control computer as well as the CAMAC ring-series mains and peripheral equipment of the automation subsystems in the "Del'fin" laser plant are described. The apparatus complex for system application, which has been expanded in this plant, as well as software problems and trends in the development of the control complex are also discussed.

[376-2415]

UDC 681.322.066

MEANS FOR DEBUGGING PROGRAMS AT THE TERMINAL

Novosibirsk INSTITUT TEORETICHESKOY I PRIKLADNOY MEKHANIKI, SIBIRSKOYE OTDELENIYE AKADEMII NAUK SSSR in Russian preprint No 19, 1979 24 pp

KARNACHUK, V. I.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B181]

[Text] Characteristics of the TELE complex for debugging programs in the Dubna monitor system are examined, also the operators in FORTRAN language for data exchange with a terminal. A variant of this complex already in

operation in the Computer Center at the Siberian Division of the USSR Academy of Sciences since 1976 has been revised during the 1978-79 period: the TELE subprogram has been modified and the TELECOK subprogram has been completely revised.

UDC 681.322.06:515.12

ALGORITHMS OF THE SOLUTION OF LOGIC-COMBINATORIAL PROBLEMS

Minsk SBORNIK NAUCHNYKH TRUDOV INSTITUTA TEKHNICHESKOY KIBERNETIKI AKADEMII NAUK BSSR [Collection of Scientific Articles, Institute of Engineering Cybernetics at the Academy of Sciences of the Belorussian SSR] in Russian 1979 138 pp

Authors not given

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6B157 K]

[Text] Algorithms of the solution of logic-combinatorial problems are described which cover a large class in the LOGIKA-1 program deck, this deck being intended for the solution of logic-combinatorial problems in synthesis of discrete automata. The deck is controlled by directives stipulating transformations of various kinds to be performed on standard objects (Boolean or ternary matrices, sequences of natural numbers or symbols, tables of natural numbers, etc). This LOGIKA-1 deck has been written in the LYAPAS-M language with the aid of the PROLOG programming system for a BESM-6 high-speed computer controlled by a LISPAK operating system. Magnetic tape (88 zones) serves as the carrier. A standard BESM-6 assembly as delivered is suitable for running the deck. The collection of articles is intended for specialists in logic design of discrete devives and developers of automatic design systems.

UDC 681.532.1

STRUCTURE OF A SYSTEM FOR COMPUTER SIMULATION OF MANIPULATOR DYNAMICS

Leningrad INSTITUT PRIKLADNOY MATEMATIKI AKADEMII NAUK SSSR in Russian preprint No 190, 1979 25 pp

KOMAROV, M. M.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract 6A516]

[Text] The structure of a system for computer simulation of manipulator dynamics is described. Certain requirements are formulated which such systems must satisfy, and possible ways to satisfy these requirements are discussed. The discussion is based on an illustrative realization of a specific system suitable for generating simulation programs with various organizations of the calculation process and with various possibilities. Indicated are also trends and methods of further development of such systems for simulating the dynamics of robots' executing organs.

[376-2415]

UDC 658.012.011.56

INFORMATION SOFTWARE IN A SECOND-GENERATION AUTOMATIC SYSTEM FOR PLANNING CALCULATIONS

Moscow VOPROSY SOZDANIYA ASPR [Problems in Constructing Automatic Systems for Planning Calculations] in Russian No 29, 1979 pp 3-123

Authors not given

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 6, Jun 80 Abstract No 6A424]

[Text] The collection of articles covers problems concerning further development of information software facilities in automatic design systems for the USSR and individual republics' State Planning Committees. The main trends dealt with are development of information of software facilities and improvement of subsystem components such as means for formalized data description, system of indicators, and all-Union classifiers of techno-economic data. Several application-oriented projects are underway aiming at solutions to timely problems in formalization of informative data bases. The collection includes articles written by representatives of the USSR

State Standards Committee and describing the basic methodological principles of constructing and managing all-Union classifiers of techno-economic information contained in the second-generation unified system of information classifying and coding.

[376-2415]

UDC 621.311.22.002.51.681.3

STATUS AND PROSPECTS FOR DEVELOPMENT OF AUTOMATED SYSTEMS FOR CONTROL OF POWER UNITS IN THERMAL AND NUCLEAR POWER STATIONS

Moscow TEPLOENERGETIKA in Russian No 7, 1980 signed to press 20 Jun 80 pp 2-7

[Article by Ye. P. Stefani, doctor of technical sciences, and V. I. Gritskov, candidate of technical sciences, TsNIIKA [State All-Union Central Scientific Research Institute of Complex Automation]]

[Excerpts] The past 20 years of developing and introducing computing, information and control systems for ASU TP [automated systems for control of industrial processes] of power units in thermal and nuclear electric power stations may be divided conventionally into three periods.

The first period (1961-1970) is associated with the development and introduction by the TsNIIKA of the first experimental "Kompleks" IVS [information and computing systems] at the 100 MW district heating and power units at the TETs-21 of Mosenergo [Moscow Regional Administration of Power System Management], the 200 and 300 MW power units of the Zmiyevskaya GRES, and the 500 MW unit at the Nazarovskaya GRES. The IVS at these facilities were given the functions of data collection and processing, calculation of economic and technical indicators of power unit operation, recording parameters on printers, call-monitoring of parameters and signaling any deviation from the norm. The first efforts on using the IVS when starting up or shutting down a power unit were also carried out.

In this same period, the VTI [All-Union Institute of Heat Engineering imeni F. E. Dzerzhinskiy], the INEUM [Institute of Electronic Control Machines, USSR Academy of Sciences], and the TEP [All-Union State Institute for the Planning of Electrical Equipment for Heat Engineering Installations] developed the system to control the 200 MW power unit at the Shchekinskaya GRES, while the Kiev Institute of Automatics developed one for the 200 MW unit at the Starobeshevskaya GRES.

The second period (1971-1978) is associated with the development and introduction by the TsNIIKA and the "Elva" NPO [Scientific Production Association] in cooperation with the Minenergo [Ministry of Power and Electrification] project and installation organizations of the "Kompleks-ASVT"

[modular computer system] IVK [information and computing complex] based on the ASVT-D [modular computer system with discrete elements] information complex and the M-6000 computer complex at the 300 and 800 MW units (in particular, at the Slavyanskaya, Ryazanskaya, Uglegorskaya and Zaporozhskaya GRES), as well as with the widescale introduction by Minenergo organizations of the IV-500 complexes at the 300 MW thermal units and units of the nuclear power stations with the VVER-440 [water-cooled] reactors. In this same period, organizations of the Minelektrotekhprom [Ministry of Electrical Equipment Industry and Power machine Building] and of the Minenergo introduced IVS at several nuclear units with RBMK-1000 [high-power channel] reactors at the Leningradskaya, Kurskaya and Chernobyl'skaya AES, as well as IVS, developed by the KIA [Kiev Institute of Automatics], the BelENIN [Belorussian Power Engineering Institute], the INEUM and the TsNIIKA, into the ASU TP of thermal electric power stations (the Moldavskaya, Burshtynskaya, Konakovskaya, Zmiyevskaya and the Ladyzhenskaya).

The third period (1975-1983) is characterized by the development by the TsNIIKA with the participation of the "Elva" NPO of the "Kompleks-Uran" UVS [information, computing and control system] for nuclear and the "Kompleks-ASVT" for thermal power units based on the M-60 information complex with enhanced information capacity and reliability, the M-7000 dual machine computer complex or the SM-2, as well as "Orion" color displays. The pilot models of these systems are being introduced at the Beloyarskaya (BN-600), the Novovoronezhskaya (VVER-1000), and the Rovenskaya AES, as well as at the 1200 MW power units of the Kostromskaya and the 800 MW units of the Ryazanskaya GRES. These systems are currently of the greatest interest and are therefore discussed below in greater detail [2].

The M-60 information complex is used for input and initial processing of information from analog and discrete sensors and transmission of it to the computer subsystem, as well as for monitoring and recording parameters in the analog and digital call instruments and signaling any deviations of a particular part of the parameters from the norm. The information complex may operate autonomously or under the control of the computer subsystem, and in this case, all devices for monitoring, signaling and recording are auxiliary for operating personnel.

Analog parameters are input through switching and normalizing devices (up to 16 devices), each of which can connect to 120 or 240 analog sensors--thermocouples, resistance thermometers and sensors with a standardized output signal of 0-5 mA. Digital information is input through devices for switching of discrete sensors (up to three), each of which can connect to 2000 sensors.

Parameters in the information complex are monitored on digital instruments with the aid of a keyboard with the call address principle. Each instrument indicates the address of the parameter, its value, as well as the dimensions of the parameter; calling it for the graph recorder is done from this same keyboard.

Monitoring a particular part of the technological parameters (up to 25 percent) in the analog instruments is done with the aid of keys (buttons) with object call. Individual signaling of deviations from the norm is provided, as a rule, for this group of parameters.

The computer subsystem is based on two M-7000 computer complexes [the pilot systems for the Beloyarskaya, Novovoronezhskaya and the Rovenskaya AES] and the SM-2 [pilot systems for the 1200 MW unit of the Kostromskaya GRES and the Yuzhno-Ukrainskaya AES].

Using two complexes makes it possible to sharply increase the indicators for system reliability on functions performed, to provide a considerable volume of real-time and deferred calculations, and to carry out operations on preventive maintenance and repair of the IVK while maintaining the basic functions of the system.

In normal mode, one of the two VK [computer complexes] performs the functions of real-time monitoring, signaling, recording and basic real-time calculations, and also generates certain recommendations to the operators on supervising the technological process and control responses. The second VK performs calculations according to more complex programs and also duplicates the first VK in the generation of the most crucial control responses.

If the first VK goes down, all of its primary functions are automatically assumed by the second, which then ceases performing part of the deferred calculations.

Each VK has a processor (two processors in the SM-2), main memory (64K words in the M-7000 and 128K words in the SM-2), external storage on magnetic disks, and input/output devices.

Communication with operating personnel is provided by the "Orion" color displays and the DM-2000 black and white displays, printers and modules for control of the signaling elements.

Figure 2 shows fragments of the central station for control of the 1200 MW unit at the Kostromskaya GRES. The table gives the basic technical characteristics of the "Kompleks-Uran V" IVK for the VVER-1000 unit at the Novovoronezhskaya AES and of the "Kompleks-ASVT" for the 1200 MW unit at the Kostromskaya GRES.

Characteristics	"Kompleks-Uran V"	"Kompleks-ASVT"
Number of inputs		
analog	2300	1400
discrete	6000	6000
discrete initiative	600	1000
in digital code from ASU TP subsystems	1000	-
Number of outputs for signaling		
grouped	100	100
individual	2 X 512	-
For control		
discrete	360	-
pulse	75	-
Number of		
"Orion" UOI [information displays]	4	4
DM-2000 display modules for operating personnel	2	2
printers	5	4
digital instruments	6	8
graph recorders	-	2
analog call instruments	22	-
Complete cycle of group interrogation of input parameters, sec.	2-3	2-3

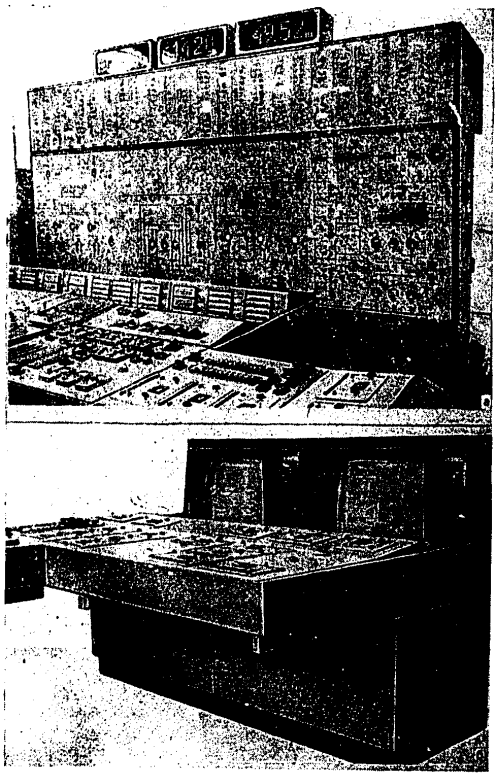

Fig. 2. Fragments of the central station for control of the 1200 MW power unit at the Komstromskaya GRES.
a -- mnemonic diagram of the unit and signaling display;
b -- right portion of the console.

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CSO: 1863

UDC 621.311.22.002.51.681.332/.333

SYSTEM OF ALGORITHMS AND PROGRAMS FOR NONLINEAR MODELING OF POWER UNITS ON DIGITAL COMPUTERS AND ITS USE WHEN MODELING THE 1200 MW POWER UNIT

Moscow TEPLOENERGETIKA in Russian No 7, 1980 signed to press 20 Jun 80 pp 17-22

[Article by A. Ya. Frenkel', candidate of technical sciences, and L. G. Zabelina, engineer, TsNIIKA [State All-Union Central Scientific Research Institute of Complex Automation]]

[Excerpts] Efforts are underway in nonlinear mathematical modeling of thermal power facilities in many organizations (VTI [All-Union Institute of Heat Engineering imeni F. E. Dzerzhinskiy], TsNIIKA, TsKTI [Central Scientific Research, Planning and Design Boiler and Turbine Institute imeni I. I. Polzunov], PO Soyuztekhenergo [expansion unknown], and the PO [planning department] of the Soyuzenergoavtomatika [expansion unknown] and others). The increased attention on nonlinear models stems from the fundamentally new possibilities compared to linear models. Nonlinear models make it possible to study the operation of the ASR [expansion unknown] over a broad range of loads, build simulators, study start-up and emergency conditions, and solve many other problems.

The modeling system software was developed in two versions: in ALGOL-60 to fit the TA-1M translator for the BESM-4 computer, and in ALGOL ASVT and FORTRAN-IV for the M-4030 computer.

The first version has 14,500 cells; in addition, there are 3,500 cells of numerical arrays for calculating the thermodynamic properties of water and steam and 2,500 cells-arrays of digital information on the sections of the facility modeled. The program modules and digital information are stored on magnetic tape, but when calculations are made, primary and supplementary main memory (OZU) and magnetic drums (MB) are used. Because of the small capacity of main memory, intensive exchange between the OZU and the MB has been organized.

In the second version, magnetic disks are used to store the program modules and the digital information. Inasmuch as main memory space is sufficient to hold all of the program system and digital information, which takes up 170K bytes, the time for exchange between the individual storage devices

has been reduced substantially. The transition to third-generation digital computers made it possible to speed up calculations by an order. The ratio of time of calculation of transient processes to time of their passing is 1-2.5.

[397-8545]

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CSO: 1863

UDC 621.311.22.002.51.62-5

DETERMINATION AND ANALYSIS OF ECONOMIC AND TECHNICAL INDICATORS IN THE AUTOMATED SYSTEM FOR CONTROL OF TECHNOLOGICAL PROCESSES OF 800 MW POWER UNITS AT THE ZAPOROZHSKAYA GRES

Moscow TEPLOENERGETIKA in Russian No 7, 1980 signed to press 20 Jun 80 pp 25-29

[Article by M. A. Duel', I. D. Zak, Ya. G. Khait, candidate of technical sciences, and V. A. Korostelev, engineer]

[Excerpt] This article treats the basic conceptual solutions and the experience of the introduction of the tasks associated with determining and analyzing the economic and technical indicators in the ASU TP [automated system for control of technical processes] of a group of three 800 MW power units at the Zaporozhskaya GRES. (Ed. note: the authors are addressing only the computing portion of the ASU TP.) This system has a Hierarchical structure and includes three unit subsystems (the lower level) and one common group subsystem (the upper level). The M-6000 computer complexes are used in all the subsystems.

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CSO: 1863

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Tbilisi GRUZINSKAYA RESPUBLIKANSKAYA NAUCHNO-TEKHNICHESKAYA KONFERENTSIYA VOPROSY VYCHISLITEL'NOY TEKHNIKI, TBILISI, 26-30 NOYAB., 1979. TEZISY DOKLADOV in Russian, Tbilisi Scientific Research Institute of Instrument Making and Automation Equipment, 1979, 356 pages

TODUA, D. A., editor

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No. 5, 1980 Abstract No 5B5 by V. T. Mitroshina]

[Text] In individual sections were elucidated questions relating to the design of control computer complexes (UVK's) for ASU's [automated control systems] for technological processes. A description is given of various UVK structures developed, in particular, for processing seismic data, for controlling the production of lump sugar; for controlling power units of thermal and nuclear electric power plants, and for controlling processes of pressure die casting. Problems of algorithmization and UVK software are discussed. Discussed individually are problems relating to the general principles of designing computers, of organizing parallel computations, of creating such units as immediate-access storages and permanent memories, of software development and of the creation of game-playing automata. In addition, special sections discussed questions relating to the design of input and output units, displays, logic displays, the automation of design, to the improvement of power supplies and questions of reliability.

[371-8831]

UDC 681.322.01

THEORY AND METHODS OF DESIGNING PULSED COMPUTING DEVICES; PROCEEDINGS OF THE EXTENDED SESSION OF THE USSR NATIONAL COMMITTEE OF THE INTERNATIONAL ANALOG COMPUTING ASSOCIATION, RYAZAN', 14-16 SEP 1977

RYAZAN' TEORIYA I METODY POSTROYENIYA IMPUL'SNO-VYCHISLITEL'NYKH USTROYSTV. TRUDY RASSHIRENNOGO ZASEDANIYA NATSIONAL'NOGO KOMITETA SSSR MEZHDUNARODNOY ASSOTSIATSII PO ANALOGOVYM VYCHISLENIYAM, RYAZAN', 14-16 SENT., 1977 in Russian 1978, 256 pages

PUKHOV, G. Ye., editor, Ryazan' Radio Engineering Institute

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 5, 1980 Abstract No 5B842 by S. G. Romanova]

[Text] These papers are devoted to questions of the theory and practice of hybrid computers oriented toward the processing of pulse-time and pulse-frequency signals. Structural methods are discussed of improving the accuracy and speed of response of primary pulse-frequency computing units, as well as a method of analyzing the dynamic characteristics of functional converters with pulse-controlled conduction, and analog methods in digital computer technology. An analysis is made of methods of designing pulse-time and pulse-frequency computer hardware; a method for the optimal design of pulse-frequency computer converters; methods of designing broadband high-precision analog-frequency converters with automatic error correction; and the principle of the design and development prospects of computing units of the pulse-time type. Questions are elucidated, relating to the design of broad-application pulse-frequency converters based on a parabolic approximation algorithm for information and measuring systems, and to the state-of-the-art and prospects for the use of pulse-frequency control in a servo electric drive, by reproducing homogeneous functions of two variables by means of pulse-time equipment, etc. Figures 90; tables 8; references 218.

[371-8831]

UDC 681.325

USE OF FREQUENCY-DIGITAL SERVO CONVERSION FOR PROCESSING MEASURING SIGNALS

Ryazan' TEORIYA I METODY POSTROYENIYA IMPUL'SNYKH VYCHISLITEL'NYKH USTROYSTV. TRUDY RASSHIRENNOGO ZASEDANIYA NATSIONAL'NOGO KOMITETA SSSR MEZHDUNARODNOY ASSOTSIATSII PO ANALOGOVYM VYCHISLENIYAM, RYAZAN', 1977 [Theory and Methods of Designing Pulsed Computing Devices; Proceedings of the Extended Session of the USSR National Committee of the International Analog Computing Association, Ryazan', 1977] in Russian 1978 pp 158-165

TOLCHINSKIY, A. D.

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 5, 1980 Abstract No 5A250 by P. S. Korunskaya]

[Text] Questions are discussed, relating to the use of servo frequency-digital converters for processing infralow-frequency signals, e.g., in vibration investigations of strength, navigational testing of vessels and the like. For the most part in these problems measuring signals represent random processes whose information parameter is the instantaneous values of the ranges of fluctuations of processes and their static characteristics. A description is given of two structural diagrams for the measuring channel of a datq processing system. The first variant is implemented on the basis of a type K145IP2 microprocessor. The disadvantages of a microprocessor of this type are noted. The second variant can be used for solving uncomplicated mathematical problems. In this case it is advisable to use special-purpose devices. Discussed in detail is the operation of a unit designed for computing the mathematical expectation of ranges of a random process. Figures 2; references 4.

[371-8831]

UDC 681.518.5.08

ONE PRINCIPLE OF CONSTRUCTION OF A CORRECTING UNIT FOR MEASURING THE VELOCITY OF WHEELED TRANSPORT VEHICLES

Ryazan' TEORIYA I METODY POSTROYENIYA IMPUL'SNYKH VYCHISLITEL'NYKH USTROYSTV. TRUDY RASSHIRENNOGO ZASEDANIYA NATSIONAL'NOGO KOMITETA SSSR MEZHDUNARODNOY ASSOTSIATSII PO ANALOGOVYM VYCHISLENIYAM, RYAZAN', 1977 [Theory and Methods of Designing Pulsed Computing Devices; Proceedings of the Extended Session of the USSR National Committee of the International Analog Computing Association, Ryazan', 1977] in Russian 1978 pp 222-227

SMYZHKOV, A. I., MEDVEDEV, V. I. and KRIVENKOV, V. I.

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 5, 1980 Abstract No 5A195 by P. S. Korsunskaya]

[Text] In measuring velocity by converting the angular rotational velocity into a pulse repetition rate, errors originate which are caused by specific structural features of the wheel, chiefly by the pressure in the tires. Relationships are obtained between the percentage error in the rate and a change in pressure and traveling speed. These relationships are of a general nature for different types of vehicles. It is demonstrated that a correcting unit should realize functions of two independent variables. Most acceptable is a functional converter based on two series--connected binary multipliers. A structural diagram is given of a correcting unit consisting of the above-mentioned binary multipliers controlled respectively by velocity and pressure code decoders, and of a digital-balance frequency-code converter. The order of the sequence for connecting the binary multipliers is determined by the conditions for the maximum introduced errors in the relationships found; therefore, the functional converter which corrects the frequency determining the traveling speed of the transport vehicle as a function of the pressure in the tires of the wheels becomes the first one. Components of the error in determining the velocity are discussed. The total accumulated percentage error equals 0.23 percent. References 4.

UDC 681.335.2

COMPUTING CONVERTERS BASED ON OPTOELECTRONIC STRUCTURES

Ryazan' TEORIYA I METODY POSTROYENIYA IMPUL'SNYKH VYCHISLITEL'NYKH USTROYSTV. TRUDY RASSHIRENNOGO ZASEDANIYA NATSIONAL'NOGO KOMITETA SSSR MEZHDUNARODNOY ASSOTSIATSII PO ANALOGOVYM VYCHISLENIYAM, RYAZAN', 1977 [Theory and Methods of Designing Pulsed Computing Devices; Proceedings of the Extended Session of the USSR National Committee of the International Analog Computing Association, Ryazan', 1977] in Russian 1978, pp 227-234

RODIONOV, V. N., FEDOROV, M. A. and GERASIMOV, V. G.

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 5, 1980 Abstract No 5B629 by V. T. Mitroshina]

[Text] Quick-response computing converters are required for the purpose of monitoring and controlling rapidly occurring processes. It is possible to improve their accuracy and dynamic characteristics considerably by employing fiber optic information converters, which make it possible to combine the functions of primary measuring converters with functional logic and mathematical processing. Fiber optic converters, especially those utilizing the achievements of integrated optics, make it possible to process multidimensional data arrays according to a specific algorithm. Having the greatest prospects are hybrid optical computing structures in which in the process of processing the data arriving are used optical and electronic elements. Optoelectronic converters based on a light-conducting fiber represent a structural combination of a fiber optic coding unit (VOKU), a photoelectronic transducer (FEP) and an electronic logic unit, whereby the transmission of data to the input of the VOKU and from the VOKU to the FEP is accomplished via optical contacts, and from the FEP to the electronic logic unit, via electrical contacts. A demonstration is given of the ability to create optoelectronic converters with a controllable conversion function by means of employing a special rearrangeable coding structure. For this is employed a unit for forming control signals. In this generalized converter is realized the most promising method of designing functional converters, consisting in the use in the converter itself of a functional coding element whose role is performed by the fiber matrix. As the result of optical coding, at the outlet of the fiber matrix is formed a code representing a combination of emitting and nonemitting elementary bunched conductors--"quanta." By changing the position of the outlet elementary bunched conductors in the matrix it is possible to change both the code and the conversion function. Figures 2; references 3.

[371-8831]

PUBLICATIONS

TABLE OF CONTENTS FROM JOURNAL 'AUTOMATION AND COMPUTER TECHNOLOGY'

Riga AVTOMATIKA I VYCHISLITEL'NAYA TEKHNIKA in English No 3, 1980 pp 93-94

[Text] ARCHITECTURE AND INFORMATION AND COMPUTING RESOURCES

DISCRETE STRUCTURES

CSO: 1863

TABLE OF CONTENTS FROM THE JOURNAL 'AUTOMATION AND REMOTE CONTROL'

Moscow AVTOMATIKA I TELEMEKHANIKA in English No 7, 1980 p 4

[Text]

Mis

Computing Technology in Control

CSO: 1863

SECONDARY SOURCE PATENT INFORMATION

Leningrad MATERIALY VTORICHNOY PATENTNOY INFORMATSII V FONDAKH BIBLIOTEKI AN SSSR. CHAST' 2 in Russian 1979 pp 113-117

[Excerpted sections of selected items from "Secondary Source Patent Information Materials in the Collections of the Library of the USSR Academy of Sciences"]

[Excerpts]

2187. The Design of Digital Computer Junctions. Bibliographic Guide. Moscow, 1976. 219 pages. (USSR Academy of Sciences Institute of Precision Mechanics and Computer Technology imeni S. A. Lebedev. Science Library) compiler - R. A. Brushlinskaya
Soviet and foreign literature and patents from data in the 1969-1974 issues of the journal 'Referativnyy Zhurnal'

2191. The Application of Digital Computers. Moscow, 1964. 36 pages. (Central Scientific-Research Institute for Patent Information. Survey of Soviet and Foreign Patents)

2198. Read-Only Memory Devices. Moscow, 1972. 25 pages. (Elektronika Central Scientific-Research Institute. TUL. Series: Automated Control Systems, issue 2(34)

2210. Digital Integrating Systems. Moscow, 1977. 61 pages. (Elektronika Central Scientific-Research Institute. TUL. Series 3: Microelectronics, issue 1(205)

[77-P]

CSO: 1863

UDC 681.5:621.315.5.04

PROJECT PLANNING OF MAGNETIC AND SEMICONDUCTOR AUTOMATIC CONTROL ELEMENTS

Moscow PROYEKTIROVANIYE MAGNITNYKH I POLUPROVODNIKOVYKH ELEMENTOV AVTOMATIKI (Project Planning of Magnetic and Semiconductor Automatic Control Elements) in Russian 1979 signed to press 10 Dec 79 pp 2-4, 450, 468-471

[Annotation, preface, table and table of contents from book by Nikolay Mikhaylovich Tishchenko, Izdatel'stvo "Energiya", 9,500 copies, 472 pages]

[Excerpts] This book deals with questions of theory and design of the basic types of ferromagnetic and semiconductor elements used in automatic control and monitoring systems. Methods are described for computer modeling of the basic components of magentic and semiconductor automatic control elements. Compared to the first edition (1970), this one has been supplemented with material on current automatic control elements, on computer modeling of elements and on machine methods of project planning.

This book is intended for a broad range of specialists in automatic control hardware.

Preface to the Second Edition

In addition to the reworked first chapter of the book, where the general characteristics of automatic control elements are given, the second and third chapters have been introduced; these chapters cover the physical bases of construction of ferromagnetic and semiconductor automatic control elements respectively. These chapters also contain material on mathematical modeling of ferromagnetic cores, semiconductor diodes, bipolar and unipolar transistors needed to build mathematical models of magnetic and semiconductor automatic control elements.

The material on solid-state elements has been updated substantially, and methods to design them are given.

A new chapter has been introduced (the thirteenth); it covers methods of automated design of automatic control elements.

The excluded material covered elements operating on the principle of nuclear magnetic resonance and monitoring the efficiency of automatic control

elements, inasmuch as this has been updated and covered in detail in [74, 76]. [Bibliography not translated]

Some material has been reduced; this dealt mainly with the traditional automatic control elements, like electromagnetic relays and their characteristics, semiconductor rectifiers, partially magnetic amplifiers, noncontact magnetic relays and others.

Paragraphs 1-6 to 1-8 were written jointly by the author and V. M. Shelenkov, candidate of technical sciences, and paragraphs 3-9, 7-6 and 7-7, jointly with T. N. Tishchenko, candidate of technical sciences.

Invaluable help in making up the manuscript was given by Yu. I. Polyakov, candidate of technical science, and V. S. Temkin. The author wishes to express his deep gratitude to Professor V. K. Zakharov and the collective of his department; Professor M. A. Boyarchenkov, doctor of technical sciences; and G. M. Vedeneyev, candidate of technical sciences, for their vaulable comments which unquestionably facilitated improvement of the book's content.

The Author

Table 13-6. Basic characteristics of the YeS computers

Parameter	YeS-1030	YeS-1040	YeS-1050	YeS-1060
Execution time of basic operations, microsec.:				
short operations	5-10	0.9-1.8	0.65	0.5
addition, subtraction with floating point	10-14	2.5-3.5	1.4	0.5
multiplication with fixed point	32-37	6.5-13.1	2.0	1.0
Main memory:				
capacity, kilobytes	128-512	256-1024	128-1024	256-2048
cycle, microsec.	1.25	1.35	1.25	0.6
Number system	binary and hexidecimal	binary and decimal	binary and decimal	binary and decimal
Occupied area, m^2	110	90	200-250	270
Input, kVA	52	25	70	80

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CSO: 1863

ABSTRACTS FROM THE BOOK 'FORECASTING SEMICONDUCTOR INSTRUMENT RELIABILITY'

Riga PROGNOZIROVANIYE NADEZHNOSTI POLUPROVODNIKOVYKH PRIBOROV in Russian 1979 pp 136-139, 500 copies

UDC 519.2

DEVICE FOR SELECTION OF HIGH-RELIABILITY DIODES

[Abstract of article by Finkel'shteyn, Ye. Ya., and Vol'fson, Ye. Sh.]

[Text] The article examines the work of a device which permits separating from the total quantity of diodes elements with high reliability according to the results of measurement of their parameters. Block diagrams of the device and of separate meters and working algorithms of the logical block are presented.

UDC 621.3.049.77

DEVICE FOR INVESTIGATION OF INVERSE VOLT-AMPERE CHARACTERISTICS OF STRUCTURAL ELEMENTS OF TTL [expansion unknown] INTEGRATED CIRCUITS

[Abstract of article by Strautmanns, L. V.]

[Text] The article describes the basic principles of construction of an automatic electrometric device for investigating the inverse volt-ampere characteristics of TTL integrated circuits with reference to the task of forecasing individual reliability. The currents registered by the device lie in the range of 10^{-12} - 10^{-6} A. A description and block diagram of the controlling part of the device are presented, and also a schematic of the measuring transformer.

UDC: 621.382.8:620.18

INVESTIGATION OF DISTINCTIVE FEATURES OF THE STRUCTURE OF INTEGRATED CIRCUITS BY MEANS OF m-CHARACTERISTICS

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

[Text] An investigation has been made by means of the m-characteristics of emitter junctions of 1000 semiconductor TTL [expansion unknown] integrated circuits made with planar technology with isolation of separate elements by means of p-n-junctions. A connection has been established between structural deviations in the form of the relation $m = f(J)$. Integrated circuits are revealed which have such structural defects as low-quality contact of the Al-Si connector and shunting emitter-base junctions.

UDC 621.382.002

INFLUENCE OF THE CHARGE OF SiO_2 FILM ON THE FUNCTION OF SILICON TTL INTEGRATED CIRCUITS

[Abstract of article by Itskovich, Z. S.]

[Text] An investigation was made of the influence of the charge of silicondioxide on the function of TTL integrated circuites of the AND-NOT type. It is shown that change of the charge in an SiO_2 film involves a process of dehydration of the oxide layer. The possibility of capture of hot carriers by the surface during their avalanche multiplication in the field of the space charge of separate p-n-junctions of integrated circuits was established experimentally.

UDC 621.382.002

METHODS OF CONTROLLING THE NOMENCLATURE IN THE SERIES PRODUCTION OF SEMICONDUCTOR INSTRUMENTS

[Abstract of article by Leydman, T. A.]

[Text] The author examines the influence of different states of semiconductor production on the distribution of instruments by nomenclature. Methods are proposed for control in each stage, methods directed toward obtaining a distribution assuring fulfilment of the nomenclature plan.

UDC 62-50

UNBIASED QUASI-BAYESOV ESTIMATION

[Abstract of article by Paramanov, Yu. M.]

[Text] A method is proposed for calculations of unbiased estimates. The task is reduced to solution of an integral equation following from determination of the unbiased estimate, the solution of that equation being a function of the dimensionality of the argument, equal to that of the unknown parameter Θ, whereas in the ordinary approach a function of the observation $x \in R^n$ is sought. Some solutions have been obtained in explicit form for distributions with parameters of scale and bias.

UDC 519.2

PARAMETRIC METHODS OF SELECTING ELEMENTS WITH HIGH RELIABILITY

[Abstract of article by Finkel'shteyn, Ye. Ya.]

[Text] The author examines methods of selecting elements with high reliability, methods based on statistical estimates of functions of probability of failure. The properties of convex distribution functions are used essentially, for which an upper beta-confidence limit has been constructed.

UDC 519.2

METHOD OF STATISTICAL VERIFICATION OF INFORMATIVENESS

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

[Text] The author examines a method of statistical verification of the informativeness of parameters for separation of a group of high-reliability elements. The method is based on the properties of exponential families of distributions.

UDC 519.2

BILATERAL CONFIDENCE LIMITS FOR CONVEX DISTRIBUTION FUNCTIONS

[Abstract of article by Gural'nik, K. Sh.]

[Text] The author exaimes the task of constructing bilateral confidence limits for distribution functions during consideration of a priori information about the form of the distribution function. Necessary and sufficient conditions are found for confidence limits to satisfy the condition formulated in the work a condition close to the sense of the invariance principle.

[383-2174]

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CSO: 1863

REVIEW OF LEGAL QUESTIONS CONCERNING DECISION-MAKING IN UTILIZATION OF COMPUTERS AND CONTROL EQUIPMENT

Moscow PROTSESS PRINYATIYA RESHENIY I ASU in Russian 1980 pp 2, 188-189

[Editorial preface and content of the book "Protsess prinyatiya resheniy i ASU" [The Process of Decision-Making and the Automated Management System] by S. V. Katrich. Izdatel'stvo "Nauka." Moscow, 1980, 189 pages]

[Text] In the monograph an examination is made of legal questions concerning the organization and implementation of the decision-making process by the state control apparatus and utilizing computers and modern control methods. Major attention is given to the features of the process of decision-making occurring during the functioning of an ASU [Automated Management System]. The study covers problems arising at the "junction" of several branches of knowledge: administrative law, control science, cybernetics, sociology and the general theory of systems.

Chief editor, Doctor of Juridical Sciences B. M. Lazarev.

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PART III

9642
CSO: 1863

ABSTRACTS FROM 'AUTOMATED DESIGN SYSTEMS', PROCEEDINGS OF THE MOSCOW POWER ENGINEERING INSTITUTE

Moscow TRUDY MOSKOVSKOGO ORDENA LENINA ENERGETICHESKOGO INSTITUTA. SISTEMY AVTOMATIZIROVANNOGO PROYEKTIROVANIYA in Russian No 419, 1979 pp 161-171

UDC 681.3.06

AUTOMATED DESIGN AS A MEANS OF IMPROVING THE WORK OF DESIGN ORGANIZATIONS; PROBLEMS IN TRAINING SCIENTIFIC AND ENGINEERING PERSONNEL

[Abstract of article by Venikov, V. A. and Shnell', R. V.]

[Text] Examines problems in the organization and introduction of automated design in organizations designing electric power facilities; examines related problems in training engineering and scientific personnel

UDC 621.398.72.06.001.5

PROBLEMS IN SIMULATION MODELING IN SYSTEMS FOR AUTOMATED DESIGN OF COMPUTERS

[Abstract of article by Polyakov, A. K.]

[Text] Examines trends in the development of languages for the simulation of discrete and continuous systems. Stresses the advent of universal modeling languages based on PL/1 and APL, and also the trend toward the use of the dialog mode in the simulation of multi-processor and microprocessor systems.

UDC 681.3.06

SEMIOTIC SYSTEMS FOR DECISION-MAKING IN AUTOMATED DESIGN

[Abstract of article by Gayfullin, E. Sh., Klykov, Yu. I. and Frolov, A. B.]

[Text] Examines problems in creating a methodology for design based on semiotic systems; treats tasks for the creation of a semiotic design language, operating modes of a semiotic system and mathematical implementation of these modes.

UDC 658.512.2.011.56

MATHEMATICAL MODELING OF DESIGN TESTS

[Abstract of article by Orlov, I. N., Zerniy, Yu. V., Maslov, S. I. and Anisimov, M. N.]

[Text] Examines problems in determining the scope and characteristics of tasks in modeling various types of tests of industrial production. Uses mathematical models to develop modeling methods and algorithms and their practical computer implementation formulated as components of automated design software. Provides examples of the practical use of the program complex developed.

UDC 681.3.06

ALGEBRAIC THEORY OF DISCRETE SYSTEMS

[Abstract of article by Malov, K. M.]

[Text] Examines the structure number system for analysis and representation of discrete systems. Develops and justifies the method of theoretical-functional polynomials over finite fields and develops the mathematical apparatus necessary to apply it.

UDC 621.002:681.39.744

PROGRAMMING AND LINGUISTIC IMPLEMENTATION OF A SYSTEM FOR AUTOMATED DESIGN OF PARTS

[Abstract of article by Gayfullin, E. Sh., Klimov, V. E., Klishin, V. V. and Fedorova, Ye. V.]

[Text] Examines the content of the software and language for describing parts. Presents a description of structure levels of data describing a framework-surface model of a synthesized part. The software includes a driver, language processor, data base management system and a number of operational programs.

UDC 681.32.06.001.2

STRUCTURE AND FUNCTION OF AN INFORMATION SYSTEM IN A SYSTEM FOR AUTOMATED DESIGN OF MEMORY UNITS

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

[Text] Examines problems in creating a data base and a data base management system of a system for automated design of memory units. Presents a class of tasks arising in the development of software for a data base management system and gives as an example operators connecting the data base with problem programs of users. Examines the structure of linguistic means for data description and input into the data base.

UDC 681.3.06

FUNCTIONAL TASKS OF DIALOG IN AUTOMATED DESIGN SYSTEMS

[Abstract of article by Bashmakov, I. A. and Sarkisyan, A. P.]

[Text] Examines graphic models and a system for dialog interaction between the designer and the computer. Presents examples of the description of graphic models of individual functional procedures and a metaalgorithm for dialog interaction between the designer and the computer.

UDC 62.50.007.65

CHOICE OF DESIGN SOLUTIONS IN THE INITIAL DEVELOPMENT STAGE

[Abstract of article by Solov'yev, V. P.]

[Text] Examines a procedure for choosing design solutions at the stage of preliminary analysis of development requirements using an odd set apparatus. Shows how an odd set apparatus may be used to model and produce design solutions in automated control and design systems.

UDC 681.3.06.51

STRUCTURE OF SYSTEMS FOR AUTOMATED DESIGN OF SYSTEMS FOR AUTOMATED CONTROL OF THERMOLOGIC PROCESSES

[Abstract of article by Rotach, V. Ya., Plyutinskiy, V. I. and Pan'ko, M. A.]

[Text] Examines features of a modern system for automated control of thermologic processes. From analysis of these features proposes a structure for such a system and discusses problems in implementing it.

UDC 62-50.001.2:681.3

THE DECOMPOSITION APPROACH IN AUTOMATING THE DEVELOPMENT OF THE MATHEMATICAL IMPLEMENTATION OF A SYSTEM FOR AUTOMATED CONTROL OF THERMOLOGIC PROCESSES

[Abstract of article by Yegorov, S. V., Dadayan, L. G., Prokhorenkov, P. A. and Khakho, I. Kh.]

[Text] Examines the problem of automating the development of the mathematical implementation of a system for automated control of thermologic processes. Presents a methodology for decomposing actual tasks of such a system into a finite number of typical basic monitoring and control tasks. Gives characteristics of a library of intersectorial program modules. Examines the task of automated structural synthesis of complex control algorithms.

UDC 681.322.518.6.001.2

A METHOD OF ORGANIZING A DICTIONARY-LOOKUP FILE IN AUTOMATED DESIGN

[Abstract of article by Gracheva, Ye. K. and Lukanina, V. I.]

[Text] Examines a method of organizing an information system dictionary-lookup file which enables automatic file management, provides for multiaspect search for filed information, and combines direct password access to file elements with associative data presentation.

UDC 681.3.01.51

EVALUATION OF EFFECTIVENESS OF METHODS FOR COMPACT PRESENTATION OF UNIFORM DATA STRUCTURES

[Abstract of article by Il'ichev, V. M.]

[Text] Examines an analytic method of extimating memory losses from placement of data values in discretely changing portions of computer memory. Compares analytic calculations with modeling results. Gives formulas enabling calculation of optimum memory unit length in planning methods of compact presentation of uniform data structures.

UDC 681.3.01.51

ITERATIONAL CALCULATION METHOD FOR CLOSED MULTIPHASE QUEUEING SYSTEM WITH PRIORITIES AND PROBABILISTIC PHASE TRANSITIONS FOR QUERIES

[Abstract of article by Dmitriyev, V. I. and Milevski, Ye.]

[Text] Presents analytic method for calculating queue lengths and average response times for queries having various priorities in each phase for the case of a steady-state regime and presupposing an exponential distribution of waiting times for requests outside a randomly chosen phase. Demonstrates that in comparison with results of simulation modeling the maximum relative error of the method does not exceed 15 per cent.

UDC 681.3.06

AUTOMATED DIAGNOSTICS OF DESCRETE DEVICES BASED ON CALCULATION OF A-CUBES

[Abstract of article by Kryukov, A. F.]

[Text] Describes theoretical prerequisites for construction of the diagnostic portion of a system for designing discrete devices. The prerequisites are based on certain relations on a set of A-cubes. New operations over A-cubes are introduced, making it possible to reduce the set of circuit elements suspected of being at fault. Examines basic requirements imposed upon complementary enumerable A-cubes.

UDC 681.3.06

USE OF A-CUBES IN SEARCH FOR FAULTS IN LOGIC CIRCUITS

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

[Text] Examines the problem of using A-cubes to search for faults in combined logic circuits. Describes a procedure for narrowing the region in which the fault is assumed to lie by calculation of A-cubes for the circuit. Presents an example of a search for a circuit fault.

UDC 681.325.65.021

METHOD OF ANALYZING DESCRIPTIONS OF COMBINATION CIRCUITS FOR CONSISTENCY

[Abstract of article by Kuznetsov, P. A.]

[Text] Describes a method of consistency analysis for incompletely defined descriptions of transformations which are to be performed by a synthesized combination logic circuit. The method is intended for use in the process of pre-defining descriptions in the synthesis of circuits according to incompletely defined initial descriptions.

UDC 681.327

INVESTIGATION OF A DIAGNOSTIC SYSTEM FOR A SEMICONDUCTOR INTERNAL MEMORY DEVICE

[Abstract of article by Ognev, I. V., Rozanov, Yu. A., Sarychev, K. F. and Isayev, O. V.]

[Text] Examines problems in the diagnosis of faults in semiconductor memory devices up to the microcircuit level. Proposes a diagnostic algorithm and determines limits on the structure of a memory module such that the bin in which the faulty microcircuit lies may be determined.

UDC 681.327

INVESTIGATION OF A SYSTEM FOR DETECTING AND CORRECTING ERRORS IN A SEMICONDUCTOR INTERNAL MEMORY DEVICE

[Abstract of article by Ognev, I. V., Sarychev, K. F. and Garbuzov, N. I.]

[Text] Examines problems in detecting and correcting errors in semiconductor memory devices. Examines characteristic errors in such devices and structural methods for reducing the number of bits affected. Proposes a method of constructing a correcting code to correct single-bit and detect multibit errors.

UDC 681.327.2

EVALUATION OF THE EFFECTIVENESS OF TWO-LEVEL MEMORY IN AUTOMATED DESIGN SYSTEMS

[Abstract of article by Deryugin, A. A. and Shigin, A. G.]

[Text] Examines different methods for estimating the operational speed of two-level internal memory: memory efficiency and average memory access time. Analyzes the analytic dependence of memory efficiency on a coefficient characterizing the cyclicity of the program for the task performed.

UDC 621.398.72.06.001.5

SPECIALIZED LANGUAGES FOR SYSTEM MODELING OF COMPUTER SYSTEMS

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

[Text] Examines the graphic facilities and implementation methods of a number of languages for modeling computer systems and describes a subset of MPL/1 operators for system modeling of computer systems. The subset was developed from analysis of a number of existing and proposed computer system structures and was implemented as a macrostructure on the MPL/1 modeling system.

UDC 65.9.21

APPLICATIONS PROGRAM PACKAGE FOR A SYSTEM FOR AUTOMATED DESIGN OF DATA AND STRUCTURAL SCHEMAS OF AUTOMATED CONTROL SYSTEMS FOR CONTINUOUS INDUSTRIAL PROCESSES

[Abstract of article by Rotach, V. Ya., Zver'kov, V. P., Pavlov, S. P. and Smirnova, T. N.]

[Text] Examines the task of designing control systems for power generating units of thermal electric stations and performance of the task using an applications program package implemented on Unified System computers. Presents the structural schema of the package and the tasks performed by various package modules. The package is intended for a broad range of users and makes it possible to analyze widely used control system variants.

UDC 681.3.06

AN APPROACH TO CONSTRUCTING AN APPLICATIONS PROGRAM PACKAGE FOR IDENTIFYING DYNAMIC OBJECTS

[Abstract of article by Chkhartishvili, G. S., Gotsenko, V. I. and Dadi, K.]

[Text] Examines the algorithmic content of an applications program package intended for obtaining a mathematical description of an object in a prescribed form according to the implementation of the input and output of the object. Basic to the package are program modules implementing algorithms for preliminary processing of input data, algorithms for identification methods, algorithms for transition from one form of description to another and algorithms for the organization and formulation of the operational program.

UDC 681.3.06

CONBINED PROGRAM FOR MODELING CONTINUOUS AND DISCRETE AUTOMATED CONTROL SYSTEMS

[Abstract of article by Chkhartishvili, G. S. and Pochinok, I. V.]

[Text] Examines problems in organizing a program for modeling continuous and discrete automated control systems. In the modeling program are included two packets for modeling continuous and discrete control systems operating under the control of a simulator. The language for modeling and synthesis combines the convenience of prescribing the continuous portion of the system using functional-algorithmic notation with that of prescribing the discrete portion by the method of spatial states.

UDC 621.398.52

CONDITIONS FOR SELECTION OF STANDARDIZED INSTRUMENTS IN A DATA ACQUISITION AND PROCESSING SYSTEM.

[Abstract of article by Afonin, V. A. and Sedlitskiy, S. B.]

[Text] Obtains conditions for choosing an aggregate of optimum modifications to elements of the device linking objects with the control computer in a system for automated monitoring and control of an industrial process. Proposes a choice of elements from a known series of standardized instruments. The collection of instruments is optimized according to the criterion of reduced expenditures.

UDC 389.64:001.8

ORGANIZATION OF INITIAL DATA FOR COMPUTER SELECTION OF RADIOELECTRONIC ARTICLES

[Abstract of article by Andreyev, O. N., Ismailov, B. I. and Kandyrin, Yu. V.]

[Text] Examines questions concerning the organization of the data bank in performing tasks in the computer-aided choice of an element base of radioelectronic articles. Shows that a substantial reduction in search time for permissible variants may be achieved by using a descriptor classification and an associative matrix for prescribing the search form of the element sought.

UDC 621.396.6

COMPUTER SYNTHESIS OF HYBRID INTEGRATED CIRCUIT TOPOLOGY

[Abstract of article by Starostina, L. A.]

[Text] Examines the sequence of tasks performed in synthesizing the topology and model of hybrid integrated circuits and proposes algorithms for performing these tasks. FORTRAN programs implementing the algorithms are presented.

UDC 621.316.8

COMPUTER DESIGN OF POTENTIOMETERS WITH PERIODIC FUNCTIONAL CHARACTERISTICS

[Abstract of article by Tikhonov, A. I. and Shirinskaya, N. N.]

[Text] Examines algorithms for synthesizing resistive elements of precision potentiometers with prescribed periodic functional characteristics by the method of regular analytic continuation. Periodic functional characteristics are partitioned into monotonic segments, and the initially rectangular resistive element is then subjected to a conformal transformation using the inverse function of the segment of the functional characteristics. The resistive element, composed of segments of the functional characteristics, has the intended characteristic. In conclusion an example of the synthesis of resistive elements is presented.

UDC 681.322.518.6.001.2

INVESTIGATION OF DESIGN PRINCIPLES USING THE EXAMPLE OF A SEARCH GENERATOR

[Abstract of article by Tsvetayeva, I. L. and Tsybenko, L. P.]

[Text] Examines principles for the design of data base management systems, conducts a comparative analysis of them, presents examples of the implementation of actual systems and the application of these principles to the design of a search subsystem treated as a strategy and search program generator, presents a schema for a search generator and defines the functions of its components.

UDC 621.391

USE OF THE SENSITIVITY CRITERION FOR DISCRETE DATA SIGNAL RECOGNITION SYSTEMS IN ESTABLISHING DESIGN TOLERANCES

[Abstract of article by Arapov, S. M. and Filippov, L. I.]

[Text] Examines problems in the rational choice of tolerances for parameters of the structure of an optimum algorithm for recognition of data signals proceeding from requirements to provide a given probability of false solutions at minimum system cost. Determines a quantitative measure of the sensitivity of statistically optimum solution rules.

UDC 621.396.6.001.2:681.32

LAYOUT OF ELEMENTS OF VARIOUS SIZES

[Abstract of article by Starostina, L. A.]

[Text] Examines an approximate algorithm for the layout of elements of various sizes using the pairwise transposition of elements ordered according to number of external connections and gives formulas for evaluating the possibility of transposing any pair of elements. Presents recommendations for the use of the algorithm.

UDC 621.396.6.001.2:681.32

AN APPROACH TO AUTOMATION OF THE DESIGN OF PRINTED THIN-CONDUCTOR ASSEMBLIES

[Abstract of article by Azepova, Ye. S., Gayfullin, E. Sh., Zharkov, V. G. and Moroz, N. N.]

[Text] Examines automation of the design of printed thin-conductor assemblies. Discusses possible approaches to automation. Examines basic stages in automated design of boards and the design algorithms used in these stages.

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CSO: 1863

ABSTRACTS FROM WORKS OF MOSCOW INSTITUTE OF POWER ENGINEERING

Moscow TRUDY MOSKOVSKOGO ORDENA LENINA ENERGETICHESKOGO INSTITUTA. ISPOL'-ZOVANIYE EVM V INZHENERNYKH I NAUCHNYKH ISSLEDOVANIYAKH (Works of the Moscow Order of Lenin Power Engineering Institute. Use of Electronic Computers in Engineering and Scientific Research) in Russian No 438, 1979, edited by I. A. Bashmakov, 600 copies, pp 164-172

UDC 621.039.624.004.13

PROGRAM FOR COMPUTER CALCULATION OF MULTIRESONATOR MAGNETRON CHARACTERISTICS

[Abstract of article by Gutsayt, E. M., and Longinov, V. V.]

[Text] The article describes the main features of programs for calculating the characteristics of a multiresonator magnetron with known geometric dimensions for different values of the magnetic inductions and anode voltages. The principal parameters characterizing the electron spin are examined, provisions are made for search for the maximum electronic conductivity and the amplitude of the high-frequency voltage corresponding to it, and also estimation of the width of the generation zone.

UDC 681.586.3:681.3.06

NUMERICAL ANALYSIS OF THE POTENTIAL DISTRIBUTION IN CROSS-SHAPED HALL TRANSDUCERS

[Abstract of article by Solov'yev, A. K., Longinov, V. V., and Charykov, N. A]

[Text] An algorithm is proposed for numerical solution of the elliptical boundary-value problem determing the potential distribution in a cross-shaped Hall transducer under the effect of a magnetic field with an arbitrary spatial configuration. The article presents the results of calculations, obtained by means of a YeS computer program which accomplishes the given algorithm.

UDC 621.314:681.3.06

ACCELERATED ALGORITHM FOR MINIMIZING THE GRAPH OF A CIRCUIT FOR UNIVERSAL PROGRAMS FOR TRANSFORMER DESIGN

[Abstract of article by Obukhov, S. G., Remizevich, T. V., and Shemgunov, R. N.]

[Text] The authors examine the principle of construction of a program for minimizing the graph of a transformer circuit, based on exclusion from analysis of branches with the switching-off of thyristors or anodes, and also de-energized sections of the circuit. The program uses only unidimensional files and does not require operations on matrices, and this permits a substantial reduction of machine time on circuit analysis.

UDC 517.544

DISTINCTIVE FEATURES OF SOLUTIONS OF THE DIRICHLET PROBLEM FOR AN ELLIPTICAL EQUATION WITH DISCONTINUITY COEFFICIENTS

[Abstract of article by Lossiyevskaya, R. V.]

[Text] The article studies the question of distinctive features of derivative classical solutions of the Dirichlet problem in a limited plane region for a second-order elliptical equation with discontinuity coefficients at the point of junction of the boundary of the region and the line of the discontinuity coefficient.

UDC 517.9

METHOD OF SOLVING NONLINEAR INTEGRAL HAMMERSTEIN EQUATIONS

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

[Text] A new method is proposed for solving nonlinear integral Hammerstein equations. New criteria are established for the solubility of those equations.

UDC 621.387.1

RESULTS OF OPTIMIZATION OF FORCED REGIME OF HEATING THERMAL CATHODES OF ACTIVE MICROELEMENTS

[Abstract of article by Rench, Ye. I.]

[Text] An equation is examined which describes the process of heating the thermal cathodes of active microelements, taking into consideration heat radiation and the nonlinear dependence also of power capacitance on temperature. It is shown that when power 2-10 times greater than the stationary value is fed to a thermal cathode during heating the time required for

heating to the working temperature can be reduced to a fourth to a tenth as much. The optimum length of the heating stage was calculated on a BESM-4 computer using ALGOL-60.

UDC 621.3

MATHEMATICAL MODEL OF PREDICTION OF THE SERVICE LIFE OF UNINTERRUPTABLE CONTACT CONNECTIONS

[Abstract of article by Balakov, Yu. N.]

[Text] The author develops a mathematical model of ageing of uninterruptable contact connections with consideration of change of the contact resistance in time and with consideration of the influence of short-circuit currents. It is shown that taking short-circuit currents into consideration leads to increase of the predicted service life.

UDC 621.039.624.001.2

MACHINE PLANNING OF MAGNETIC FORCING SYSTEMS OF SMALL-SCALE MAGNETRONS

[Abstract of article by Berezin, V. M., Guttsayt, E. M., Sarayev, V. V., and Kazantsev, A. A.]

[Text] The authors examine a computer method of planning magnetic systems of small-scale magnetrons by the solution of an integral equation of the first kind. The calculating equation is reduced to a system of linear algebraic equations which are solved by an iterative method with the use of regularization. Presented are the results of calculations and experimental investigations of the distribution of magnetic fields in cascade magnetic systems.

UDC 628.93

COMPUTER CALCULATION OF THE LENGTH OF VISIBILITY DURING ARTIFICIAL ILLUMINATION IN AN OPTICALLY PURE AQUEOUS MEDIUM

[Abstract of article by Savenkov, V. I., Gutorov, M. M., and Mel'nikov, G. A.]

[Text] The authors investigate an equation for calculation of the length of visibility of underwater objects during artificial illumination and an integral equation of the first kind for calculation of the minimum base between the illuminator and observer corresponding to the specific case. A block diagram of the program of calculations of indicated values for the "Nairi-2" computer is presented.

UDC 602.81.3:51

USE OF THE COMPUTER IN THE SIMULATION OF COLOR PRECEPTION

[Abstract of article by Matveyev, A. L., Lebedkova, S. M., and Remizova, M. B.]

[Text] The article examines the use of the YeS-1020 computer (FORTRAN IV algorithmic language) in solving the problem of normalizing the estimation of visual perception of the quality of color transmission of a monochromatic object.

UDC 517.5

METHOD OF NUMERICAL INTEGRATION OF A SYSTEM OF ORDINARY DIFFERENTIAL EQUATIONS

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

[Text] A method of numerical integration of a system of ordinary first-order differential equations is examined, one in which an integral matrix is corrected at a current point.

UDC 519.17

DISTINCTIVE FEATURES OF SOLUTION OF THE PROBLEM OF DIGITAL COMPUTER PARAMETRIC IDENTIFICATION

[Abstract of article by Pokrovskiy, F. I., and Artamanov, S. N.]

[Text] The article presents a formulation of a theorem defining the necessary and sufficient conditions for solution of the problem of parametric identification. The sequence of stages of solution of that problem and the composition of the program of its practical realization are determined.

UDC 537.2:517.948.32.001.2

APPLICATION OF INTEGRAL EQUATIONS OF THE SECOND KIND FOR CALCULATION OF ELECTROSTATIC FIELDS

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

[Text] The task of calculation of an electrostatic field in a piecewise-homogeneous medium is examined. A system of integral equations of the second kind in relation to unknown densities of secondary charges is proposed. It is shown that the obtained system of equations has a unique solution.

UDC 537.54

CALCULATION OV VOLT-AMPERE CHARACTERISTICS OF A BEAM DISCHARGE

[Abstract of article by Kruchinin, A. M., and Khusainov, B. N.]

[Text] A system of equations is presented which at the given gas flow rate, inside cathode diameter, presence in the chamber and distance between electrodes and with consideration of the physical properties of the cathode material and working gas permits calculating the volt-ampere characteristics of a beam discharge and determining the energy of the electrons ejected from the cathode cavity. An algorithm is presented for calculation of different variations of the inside cathode diameter and the characteristic gas flow rates.

UDC 621.838.3

APPLICATION OF REGRESSION ANALYSIS TO INVESTIGATE THE EFFECT OF MAGNETIC FIELDS ON ELECTROMAGNETIC RELAYS

[Abstract of article by Bystritskaya, N. B., volchenskov, V. I., and Tseplyayeva, M. S.]

[Text] The article describes amethod of solving the task of investigating the working capacity of relays, consisting of the construction of empirical modules in the form of functional dependences of relay output parameters on external acting factors and further mathematical analysis of the obtained models. A procedure is proposed which permits selecting the optimum orientation of relays in relation to the acting external magnetic field.

UDC 681.31

APPLICATION OF COMPUTERS IN SOLVING A PROBLEM OF DESIGN PLANNING

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

[Text] The problem of the composition of subassemblies during the designing of microelectronic equipment has been investigaged. A new method is proposed for solving the problem of composition, according to which the minimum possible unit volume is determined first and the problem of determining the number of microelectronic subassemblies, the type and the composition of each of them is solved. Realization of the proposed method with the use of YeS computers (using the FORTRAN IV algorithmic language) is examined.

UDC 681.3

APPROXIMATE METHOD OF COMPUTER SYSTEM ANALYSIS

[Abstract of article by Bashmakov, N. A., and Venzel', Ye. F.]

[Text] A method of computer system analysis is proposed, one based on successive variations of reference distribution functions of continuous parameters of a piecewise-linear Markov process, which is selected as a mathematical model of a computer system.

UDC 517.11

MINIMIZATION OF BOOLEAN FUNCTIONS WITH USE OF A NEW KIND OF CANONICAL DECOMPOSITION

[Abstract of article by Tlas-Yako, E.]

[Text] A new method of canonical decomposition is proposed, called the chain method and differing from those known earlier by the fact that in the process of solution sorting is excluded and heuristic criteria are not used. The new decomposition algorithm does not require much time to execute and its result is unique.

UDC 517.11

METHOD OF FOUR TRUTH VALUES AND ITS APPLICATION

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

[Text] The concept of truth value is introduced. Determination of truth values is shown for simple predicates and expressions obtained from simple predicates. Applications of the given method for the description and solution of a number of problems on sets are examined.

UDC 681.3.01

MODEL OF ACCESS RIGHTS DELIMITATION IN DATA BASE CONTROL

[Abstract of article by Sharr, Yu.]

[Text] Two models of an access rights delimitation system are examined in a data base control system: a model of secrecy procedures and a model of an access rights delimitation system on a theoretical multiple basis.

UDC 681.3.068

SOFTWARE SYSTEM FOR AUTOMATION OF DIALOG SYSTEM PRODUCTION

[Abstract of article by Yermolayeva, L. G., Yefremov, A. N., Ryakina, L. M., and Ryakin, O. M.]

[Text] A system is proposed for the creation of dialog systems. It includes a dialog languages generator, which is described in detail, and a dialog monitor.

UDC 681.3.01

CIRCUIT-ORIENTED DATA BASE CONTROL SYSTEMS

[Abstract of article by Kazaritskiy, S. D.]

[Text] The author formulates the conditions and rules of construction of a data base model, using a relative pproach, which was widely used in the course of the creation of several versions of the relative data base control system, realized within the framework of the ADONIS plan.

UDC 681.3.01

ONE APPROACH TO ACCELERATION OF AUTOMATIC DATA BASE NORMALIZATION

[Abstract of article by Kazaritskiy, S. D.]

[Text] Methods of determining functional dependences of domains in normalization theory are examined. An approach to acceleration of procedures in determining functional dependences of relation domains.

UDC 681.32

POSSIBILITY OF MORE EFFECTIVE USE OF RESOURCES IN A YeS COMPUTER DISK OPERATING SYSTEM

[Abstract of article by Bindich, F.]

[Text] A system of dynamic priorities is proposed which increases the effectiveness of a multiprogramming system. The results of an experiment conducted with the system are presented.

UDC 681.3.01

SOME QUESTIONS OF DATA ORGANIZATION

[Abstract of article by Ovsyannikova, M. R.]

[Text] The author examines the task of selecting methods of data organizing on direct access storages as a function of the characteristics of the storages.

UDC 681.39

ALGORITHM FOR OBTAINING STANDARDS FOR AN AUTOMATED SYSTEM FOR MONITORING PULSE SHAPES

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

[Text] The author examines the task of developing mini-computer automated systems for monitoring radioelectronic equipment. Block diagrams are presented of algorithms which realize a statistical method of obtaining standards, and the results of their program realization with a BESM-4M computer in the FM-20-P system.

UDC 681.3

QUESTIONS OF FORMALIZING THE PRELIMINARY PLANNING OF CONTROL COMPUTER COMPLEXES

[Abstract of article by Bashmakov, I. A., and Kuznetsova, T. Ya.]

[Text] A list of tasks in the stage of preliminary planning is presented, a theoretical multiple description of the procedure is given in an unformalized arrangement, and a formalized description of the basic principles assumed in the preliminary planning procedure.

UDC 681.3.056

INTERNAL SORTING OF FILES CLOSE TO ORDERED

[Abstract of article by Golovnya, A. A.]

[Text] An algorithm is proposed for the sorting of files close to ordered, and a modification of it. The proposed algorithms assure substantial acceleration of the process of sorting of such files. Some of the algorithms can be used as universal algorithms of internal sorting.

UDC 681.326

APPROACHES TO FORMALIZATION OF PROBLEMS IN PRELIMINARY PLANNING DURING THE CREATION OF AUTOMATED PLANNING SYSTEMS

[Abstract of article by Bashmakov, I. A., Kuznetsova, T. Ya., and Narykov, V. S.]

[Text] The article examines questions about the development of the software for standardized description of various alternatives of organization of automated planning systems.

UDC 517.11

PROGRAM REALIZATION OF AN ITERATIVE METHOD OF DECOMPOSITION OF BOOLEAN FUNCTIONS

[Abstract of article by Tlas-Yako, E.]

[Text] An algorithm is proposed for an iterative method of decomposition of Boolean functions in the class of bracket formulas. The algorithm has been realized with the YeS-1022 computer in the PL/1 algorithmic language.

UDC 681.3.01

MAIN PROBLEMS AND THE CONCEPT OF ASSURING COMPLETENESS OF INFORMATION DATA BASES

[Abstract of article by Sharr, Yu.]

[Text] The general structure of the information data base system is described. The necessary elements of the description of that system are examined.

UDC 65.011.56

CONSTRUCTION OF A MATHEMATICAL MODEL OF THE SOFTWARE OF A DEVELOPING COMPLEX OF COMBINED AUTOMATED CONTROL SYSTEMS

[Abstract of article by Kuz'minov, A. Ye., and Polyanskiy, I. P.]

[Text] On the basis of the principles of combined functioning and development of a hierarchic automated control system a mathematical model of the organization of software has been formed.

[388-2174]

2174
CSO: 1863

ABSTRACTS FROM THE COLLECTION "PROCEEDINGS OF THE MOSCOW ORDER OF LENIN INSTITUTE OF ENERGY. MATHEMATICAL OPTIMIZATION AND SOFTWARE FOR COMPLEX SYSTEMS"

Moscow TRUDY MOSCKOVSKOGO ORDENA LENINA ENERGETICHESKOGO INSTITUTA MATEMATICHESKAYA OPTIMIZATSIYA I MATEMATICHESKOYE OBESPECHENIYE SLOZHNYKH SISTEM in Russian No 412, 1979 pp 153-163, 600 copies.

517.9

OPTIMIZATION OF THE MATHEMATICAL DESCRIPTION OF COMPLEX SYSTEMS

[Abstract of article by Barashkov, A. C.]

[Text] This article considers systems having main factors whose description is simple, but where the calculation of secondary factors discernibly complicates the description. Means for calculating the secondary factors are demonstrated using the example of a concrete system. General recommendations for the construction of such descriptions are given.

519.95

ENTITIES WITH VARIABLE STRUCTURE AND THE CLASS OF PROBLEMS THEIR STUDY PRESENTS

[Abstract of article by Bashmakov, I. A. and Platonov, A. S.]

[Text] This article considers issues in the formal description of entities with variable structure. A set-theoretic apparatus and mathematical logic are used to describe these entities. The description used made it possible to identify classes of problems arising in the study of these entities.

529.7.023

ON THE EXPERIMENTAL STUDY OF RESIDUAL VOLTAGE IN STRUCTURES HAVING A COMPLEX FORM

[Abstract of article by Blagonadezhin, V. L., Vorontsov, A. I., Baranov, A. V.]

[Text] This article considers the extension of the principles of classical break-down methods in the study of residual voltage in heterogeneous structures of complex form. Several recommendations for the measurement of surface deformations in the determination of residual voltage are given.

519.92

ON THE DECOMPOSITION AND SEPARATION OF n-ARY RELATIONS

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

[Text] This article formulates the existence conditions and methods of realization for certain non-trivial decompositions of n-ary relations. An evaluation of the minimal power of the set of values of the secondary variables necessary for realizing the decomposition is given for the trivial case.

519.92

ALGORITHMS FOR DECOMPOSITION OF LOGICAL FUNCTIONS AND n-ARY RELATIONS

[Abstract of article by Vashchenko, V. P. and Frolov, A. B.]

[Text] This article considers several algorithms for the generation of non-trivial decompositions of predicates and thus of n-ary relations. Transformations of closed sets of the truth values of predicates corresponding to the main operations performed on the relationships are studied.

534.1

NUMERICAL CONSTRUCTION OF REGIONS OF INSTABILITY FOR PARAMETRIC, MULTI-DIMENSIONAL EXCITABLE SYSTEMS

[Abstract of article by Vorob'yev, V. I.]

[Text] This article considers an algorithm for the construction of regions of instability of dynamic systems, the movement of which is described by systems of multi-dimensional linear differential equations. A number of means to optimize the computational program are suggested.

621.396

A GENERALIZATION OF THE QUADRATIC LOSS FUNCTION IN THE BAYSIAN PROBLEM OF DISCOVERY-MEASUREMENT

[Abstract of article by Gerasimov, N. N.]

[Text] This article considers the quadratic loss function, which in general is not symmetrical. A study of the characteristics of the function and

methodology for calculating its parameters are given.

618.322.518.6.001.2

DESIGN OF THE LOGICAL STRUCTURE FOR A DATA BASE

[Abstract of article by Gracheva, Ye. K. and Lukanina, V. I.]

[Text] This article gives a formalization of the problem of determining the logical structure of a data base. It is demonstrated that this problem reduces to the problem of classifying multidimensional entities.

519.95

DETERMINATION OF THE INDEX OF EFFICIENCY OF MULTI-CONSOLE SYSTEMS WITH RELATIVE PRIORITIES IN A TIME SHARING MODE

[Abstract of article by Dmitriyev, V. I. and Onishuk. V.]

[Text] This article considers a methodology for calculating average temporal characteristic functioning curves for multi-console systems with relative priorities. The methodology proposed makes it possible to calculate the characteristic curves of systems with arbitrary time sharing rules.

681.3

AN INFORMATION PROCESSING MODEL OF THE PRINCIPLES FOR CONSTRUCTION OF SOURCE AND TARGET LANGUAGES OF DIALOGUE SYSTEMS

[Abstract of article by Dmitriyev, V. I., Bashmakov, I. A. and Platonov, A. S.]

[Text] This article considers issues involving the construction of an information processing model (IM) representing the formal description of the functioning of a system being studied. Such a description is characterized as a process of data processing, as well as being a reflection of the actual features of the system being considered. The IM representation on exit from the computer is based on a set of graphic components used in the IM description.

533.6

A NUMERICAL ANALYSIS OF THE INFLUENCE OF DAMPING ON CRITICAL SPEEDS OF THE FLUTTER OF A PLATE

[Abstract of article by Zhinzher, N. I. and Nizovtsev, A. M.]

[Text] This article considers the necessity for taking account of the influence of internal damping in calculating the flutter of a plate. Numerical results from the calculation of the flutter of a retangular plate are given.

517.9

AN ASYMPTOTIC SOLUTION OF A BOUNDARY-VALUE PROBLEM WITH AN EXPRESSED LIMITING RANGE

[Abstract of article by Zibolen, E.]

[Text] This article considers the singularly perturbed boundary-value problem, whose limiting operator is degenerate. In this case, the range of the operator contains the identical null multiple point. An asymptotic solution is constructed for the problem using the method of realization developed by S. A. Lomov. It is assumed here that the non-null points of the range can lie on the imaginary axis.

681.322

A METHOD OF SYNTACTIC ANALYSIS OF THE DESIGN OF A PREDICATE LANGUAGE IN SYSTEMS FOR THE CONTROL OF DATA BASES

[Abstract of article by Kalinichenko, L. A. and Formina, N. I.]

[Text] This article considers the solution to the problem of the selection of a method of syntactic analysis applied to a translator of filters in a system for the integration of nonhomogeneous SIZIF (expansion unknown) data bases. The requirement for maximum speed of syntactic parsing led to a method based on the use of transition matrices.

517.946

CRITERIA FOR NON-TRIVIALITY OF SOBOLEV SPACES OF AN INFINITE ORDER OF MAGNITUDE (ABSTRACT CASE)

[Abstract of article by Klenina, L. I.]

[Text] This article considers Sobolev spaces of an infinite order of magnitude, corresponding to powers of the linear operator L. Criteria for the non-triviality of these spaces as a function of the characteristic curve of the range of operator L are studied. The cases where the operator L has only a continuous range and a purely point-like range are considered in detail.

681.3

SEMIOTIC SYSTEMS OF DESIGN MAKING

[Abstract of article by Yu. I. Klykov]

[Text] This article considers the basic functions of semiotic systems for decision making. Three basic modes of their operation are identified: Instruction, as a result of which a natural language system reflecting the

external world and laws of optimal behavior is formed in memory; solution, as a result of which the best strategy for behavior is constructed; and adaptation, implementing the realization of the strategy and correction of the model.

517.9

ON CERTAIN ISSUES IN THE THEORY OF ASYMPTOTIC INTEGRATION

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

[Text] This article considers the behavior of a periodic solution of a linear system of differential equations as this system moves toward an infinite order of magnitude. An asymptotic representation of the solution is constructed and the residual term is evaluated. Special conditions for orthogonality are derived for the analogous problem in the nonlinear case.

517.9

ON THE REDUCTION OF THE BOUNDARY VALUE PROBLEM TO THE CAUCHY PROBLEM FOR NONLINEAR SECOND-ORDER DIFFERENTIAL EQUATIONS

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

[Text] This article considers a nonlinear differential equation, describing functions of distribution of travelling carriers of charge in a system with a given distribution of stationary carriers. A method for reducing the boundary value problem to the Cauchy problem using the distinguishing characteristic of this equation is given.

681.322

A FORMAL APPARATUS FOR REPRESENTING PROCESSORS

[Abstract of article by Laslo, S.]

[Text] This article considers a formal apparatus for representing processors. Using the formalization given, a classification system based on the class of operators performed by the abstract processors is constructed.

517.9

INTERACTION OF A BUNDLE OF PARTICLES WITH A NONHOMOGENEOUS ANISOTROPIC PLASMA IN A WAVE GUIDE

[Abstract of article by Lebedev, A. K.]

[Text] This article considers a self-consistent problem concerning a

reflecting type of transformation of plasma waves in a nonhomogeneous plasma in a cylindrical wave guide. Increments of wave growth in the case of a positive gradient of plasma density are found.

517.9

ASYMPTOTIC INTEGRATION AND FOURIER'S METHOD

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

[Text] This article considers asymptotic solutions to singularly perturbed boundary value problem, obtained by a method of regularization. It is demonstrated that if the solution may be written as a Fourier series, then this series corresponds to the main term of the asymptotic. The features of the coefficients of regularization of the asymptotic expansion analogous to the features of the Fourier coefficients are given for the general case.

517.9

ON THE FIRST DERIVATIVES OF THE DIRICHLET PROBLEM IN A HALF-PLANE FOR AN ELLIPTICAL SECOND ORDER EQUATION WITH DISCONTINUOUS COEFFICIENTS

[Abstract of article by Lossiyevskaya, T. V.]

[Text] This article considers solutions to the Dirichlet problem for elliptical equations having discontinuous first derivatives. The asymtote of the derivatives of the solution close to the line of discontinuity are studied. The main terms of the asymptotic series are obtained and studied.

517.9

THE GENERALIZED ROBEN PROBLEM FOR THE CASE OF A MULTIPLY CONNECTED REGION

[Abstract of article by Markushevich, L. A.]

[Text] This article considers the boundary value problem for an elliptical equation which is a generalization of the classical Roben problem. For the formulated problem a variation method permits solution by a single value. The behavior of the solution close to the boundary is studied and the numerical method for solving the problem is justified.

517.9

A MEANS FOR CALCULATING AN ELECTRICAL FIELD ON A CHARGED SURFACE HAVING AXIAL SYMMETRY

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

[Text] This article considers a problem reducible to a numerical integration function, having a logarhythmic feature. For the problem cited, a

quadratic formula for the calculation of potential and axial component intensity of the electrical field on a charged surface with axial symmetry is suggested.

532

ON THE EVALUATION OF DEPTH OF OCCURRENCE AND THICKNESS OF AN ASTHENOSPHERIC LAYER UNDER FINLAND AND SCANDINAVIA

[Abstract of article by Novikov, V. L.]

[Text] This article considers a mathematical model of the asthenospheric layer under Finland and Scandinavia, which was constructed from data of the latest uplift of this region. An attempt was made to evaluate by computer calculation the indicated parameters of the asthenosphere and to determine the approximate form of its upper boundary. Incidental to this, evaluation of the viscosity and density of the asthenosphere and the viscosity of the crust were obtained.

681.3

A METHOD FOR GENERALIZATION OF SEMANTIC NETS

[Abstract of article by Osadchiyev, A. A.]

[Text] This article considers an operation for generalizing strategies given in the form of a sequence of situations described in the language of semantic nets. Structurally equivalent microstrategies are constructed for several metastrategies, and then the microstrategies are generalized into macrostrategies possible in the presence of certain limits for a class of decision making problems.

517.9

ON PERIODIC AND ALMOST PERIODIC SOLUTIONS TO WEAKLY LINEAR PARABOLIC EQUATIONS

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

[Text] This article considers weakly linear parabolic equation containing a nonlinear function which, in general, does not possess the feature of monotony. For a certain type of nonlinearity it is proved that the first boundary value problem in classes of periodic and almost periodic functions can be solved by a single value. An original a priori evaluation is obtained during solution.

534.1

STATISTICAL CHARACTERISTICS OF FIELDS OF DEFORMATIONS OF INTERACTING MICRO-HETEROGENEOUS HALF SPACES

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

[Text] This article considers the interaction of two microheterogeneous half spaces, under conditions of macroheterogeneous stress deformation. The problem is solved by the method of perturbations. In the first approximation this method is used to determine correlation functions of the deformations. In this context the elastic modules of the half spaces are considered as random functions of three spatial coordinates.

533.6

A GENERALIZATION OF AERODYNAMIC FORCES ACTING ON A FLUCTUATING PANEL IN A SUPERSONIC GAS FLOW

[Abstract of article by Simonov, B. P.]

[Text] This article considers the solution to the problem of determining generalized forces in the framework of classical potential theory of nonstationary flows. Results are compared to results obtained through use of a simplified aerodynamic theory.

517.946

ON ONE GENERALIZED QUASIANALYTIC CLASS OF FUNCTIONS

[Abstract of article by Chan Dyk Van]

[Text] This article considers classes of infinitely differentiable functions of one real variable, the derivatives of any order of which are integrable to a certain power. The necessary and sufficient conditions for the growth of integrals from functions and their derivatives providing quasianalyticalness are found. The conditions obtained are a generalization of classical results for the case of spaces of functions with an integral metric.

534.1

TOWARD THE CALCULATION OF FORCED OSCILLATION OF NONLINEAR STOCHASTIC SYSTEMS

[Abstract of article by Shcherbakov, A. N.]

[Text] This article considers the use of the method of moment functions for the calculation of nonlinear stochastic systems. The results of the calculation of a nonlinear system with one degree of freedom generated by normal white noise are given.

517.9

ON ONE ALGEBRAIC METHOD OF STUDYING DISCRETE SYSTEMS

[Abstract of article by Malov, K. M.]

[Text] This article considers systems consisting of a finite or countable set of elements. For the description of the system, it is proposed to identify the elements of the system and the elements of a certain field, and to represent the predicate describing the functioning of the system as theoretically functional polynomials on the field.

519.9

A BOUNDARY VALUE PROBLEM FOR ONE EQUATION OF MIXED TYPE

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

[Text] This article considers a boundary problem for an equation of the form:

$$1/x\,u'_t - u''_{xx} = f.$$

A generalized solution of the boundary problem for the class of functions which takes account of the condition of identity on the line $x = 0$ is obtained.

621.396

A METHODOLOGY FOR DESCRIBING GROUPS OF ENTITIES NON-DISTINGUISHABLE BY A MEASUREMENT SYSTEM

[Abstract of article by Batasova, V. S.]

[Text] This article considers the problem of determining the coordinates of entities of a measuring system, when it is not known which measurements from various meters apply to one entity. A generalization of a well known methodology for distinguishing groups of objects which are indistinguishable by the system in the case of measurement error is proposed.

621.396:51

BLOCKED MATRICES AND THEIR USE IN THE CALCULATION OF ELECTRIC CIRCUITS

[Abstract of article by Gayfullin, E. Sh. and Kurapov, S. V.]

[Text] This article considers operations on enumerated blocked matrices, describing electrical circuits. The relationship between subcircuits and blocks of the matrix by means of conductance is demonstrated, as is the performance of operations on the blocks using the method of subcircuits.

[391-9285]

9285
CSO: 1863

ABSTRACTS FROM 'DIGITAL DEVICES AND MICROPROCESSORS'

Riga TSIFROVYYE USTROYSTVA I MIKROPROTSESSORY. MIKROPROTSESSORNYYE SISTEMY I MIKROPROGRAMMIROVANIYE in Russian No 3, 1979 Appendix pp 1-6

UDC 681.32-181.48

REALIZATION OF CONTROL DEVICES AND SYSTEMS ON THE BASIS OF MICROPROCESSOR MEANS

[Abstract of article by Baums, A. K.]

[Text] Methods are evaluated for determining the base for realizing control devices and systems. An expanded graph diagram for selecting microprocessor means for control devices and systems is presented. Table 1; Illustrations 2; References 5.

UDC 681.324-181.48

ORGANIZATION OF DATA EXCHANGE BETWEEN MICROPROCESSOR DIGITAL COMPUTERS ACROSS PERIPHERAL INTERFACE

[Abstract of article by Vasarinsh, G. E., and Chipa, A. A.]

[Text] Possible variants of microprocessor conjugation are discussed. Byte and file data exchange procedures between microprocessors are examined, and a block diagram of algorithms is presented. Illustrations 3; References 1.

UDC 681.3-181.48:629.113

PROSPECTS OF USING MICROPROCESSORS FOR AUTOMATIC CONTROL SYSTEMS FOR AUTOMOBILE UNITS AND DEVICES

[Abstract of article by Andriyevichev, Yu. N., Kleimyonov, V. B., and Komarov, V. D.]

[Text] The article considers problems connected with the development of complex electronic automobile control systems. It describes an automobile

microcomputer based on the K580IK80 microprocessor which realizes the functions of an antiblocking brake control system, digital speedometer, system of travel speed control, and digital ignition system. Table 1; Illustrations 2; References 3.

UDC 681.3-181.48:629.113

REALIZING AN ANTIBLOCKING SYSTEM FOR AUTOMOBILE BRAKES

[Abstract of article by Andriyevichev, Yu. N., and Shtraikher, Ye. Ye.]

[Text] An antiblocking system realized on the basis of a microcomputer is a real time computer system which consists of a wheel speed sensor and a computer device which sends out commands to the actuator elements of the automobile braking system. The microcomputer can also perform other functions. The methodology suggested in the work makes it possible to formulate requirements to the microcomputer used for the automatic blocking system. It must be 12-digital; the program memory storage capacity needed to realize the algorithms of the automatic blocking system, digital speedometer and electron ignition is 490; the maximum branch of the algorithm is realized in 100 operations. Illustrations 3.

UDC 681.3-181.48

A MICROCONTROLLER FOR A TELEPHONE

[Abstract of article by Yermolov, V. T.]

[Text] The possibility of using the INTEL 4004 microprocessor system as a microcontroller for a telephone is examined. It is shown that the presence of a microcontroller substantially enhances the functional possibilities of a telephone and makes it possible to provide a number of additional functions. The article presents the structure of the microcontroller, its circulating with the telephone and subscriber line, and a brief description of the program for realizing the given set of functions. Illustrations 6; References 5.

UDC 681.32-181.48.001.57

MODELLING MICROPROCESSOR SYSTEMS WITH THE HELP OF FORTRAN IV.

[Abstract of article by Zaznova, N. Ye.]

[Text] The article describes a method of modelling microprocessor systems used mainly in setting up the mathematical software of systems with microprogram control. It also offers a simple method of organizing data exchange with the modelling system in the language of microcommand mnemocodes. References 5.

UDC 681.325.57-184.48

A MULTIPLICATION MICROPROCESSOR

[Abstract of article by Baums, A. K., and Erglis, U. Yu.]

[Text] Specialized fast multiplication devices are used extensively, for example in processors of large general-purpose computers or in processors for fast Fourier transformations. The article considers a multiplication processor on the basis of bipolar microprocessor sections, a multiplication microprocessor with a systems interface for inclusion in a multiprocessor system consisting of 61 large-scale integrated microcircuits of the Intel 3000 system which calculates the products of 16-digit mantissas in 6 cycles (1.5 microsecond) using square tables in the ready-only memory. The original arithmetic and some features of controlling the multiplication microprocessor are considered. The adopted solutions are close to the optimum for the given system of large-scale integrated microcircuit, which is oriented on the development of more universal systems. Tables 3; Illustrations 2; References 5.

UDC 681.326.35-531.761(088.8)

A TIMER SPACE GAGE

[Abstract of article by Korol'kov, V. D., Krasil'nikov, G. P., and Erglis, U. Yu.]

[Text] The article examines the specifics of building a timer space gage designed to be switched into a computer operating in real time. It presents the structure of such a device, built on integrated circuits with a low degree of integration. This material can be used for building a device of this type on the basis of microprocessor large-scale integrated circuits. Illustration 1.

UDC 681.327.28:681.27.2

A SPECIALIZED INPUT-OUTPUT DEVICE FOR LOADING CRYSTALS OF PROGRAMMED READ-ONLY MEMORIES

[Abstract of article by Tabuns, G. V.]

[Text] The article presents considerations regarding the feasibility of developing a specialized device for loading large-scale integrated circuits of semipermanent memory units. The place of the device in the class of input-output devices is defined, its structural diagram is given, and recommendations for the realization of the main units of the device are given. Tables 2; Illustration 1; References 9.

UDC 681.326.3'3.06-51

A STRUCTURAL-FUNCTIONAL MICROPROGRAMMING LANGUAGE AND SOME PROBLEMS OF ITS REALIZATION

[Abstract of article by Marin, A. V., and Skroubskii, V. I.]

[Text] The article examines the general characteristics of high-level relocatable microprogramming languages and presents a nonformal description of a structural-functional microprogramming language belonging to the given class of microprogramming languages. Also, the main problems have been determined that appear in building a translator from a structural-functional microprogramming language. Table 1; Illustrations 2; References 9.

UDC 681.3.06

A GENERALIZED METHOD OF ENCODING MICROCOMMANDS

[Abstract of article by Grunde, U. Ya.]

[Text] A generalization of a direct encoding algorithm is presented and the main stages in its realization are examined. It is shown that known encoding methods are special cases of the method of direct encoding. References 2.

UDC 681.327

TESTS FOR CHECKING SEMICONDUCTOR LARGE-SCALE INTEGRATED CIRCUITS FOR MAIN STORAGES

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

[Text] The article presents test sequences for checking different types of malfunctioning of large-scale integrated circuits for main storages and the results of analyses of new and many known tests for an ability to determine the main types of malfunctioning of semiconductor main storage large-scale integrated circuits. Tables 1; References 8.

UDC 681.327

TESTS FOR DISCOVERING MALFUNCTIONINGS OF A MAIN STORAGE LARGE-SCALE INTEGRATED CIRCUIT ADDRESS DECIPHERER

[Abstract of article by Gavrilov, A. A., and Gavrilov, V. A.]

[Text] The article presents test sequences for discovering malfunctionings in the structure of a main storage large-circuit integrated circuit

address decipherer and the results of analyses of known and new tests for the ability to discover constant malfunctionings in the address decipherer. Table 1; Illustrations 4; References 4.

[380-9681]

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CSO: 1863

METHODS OF MULTIDIMENSIONAL STATISTICAL ANALYSIS

Tartu METODY MNOGOMERNOGO STATISTICHESKOGO ANALIZA. TRUDY VYCHISLITEL'NOGO TSENTRA. TARTUSKIY GOSUDARSTVENNYY UNIVERSITET (Methods of Multidimensional Statistical Analysis. Works of the Computer Center. Tartu State University) in Russian No 44, 1980 p 111

[Table of contents from booklet edited by S. Koskal, Tartu State University, 500 copies, 111 pages)

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CSO: 1863

RESULTS OF SCIENCE AND TECHNOLOGY. TECHNICAL CYBERNETICS SERIES

Moscow ITOGI NAUKI I TEKHNIKI. SERIYA TEKHNICHESKAYA KIBERNETIKA in Russian Vol 11, 1979 pp 190-191

[Editor-in-Chief of VINITI information publication, Professor A. I. Mikhailov; chief editor of series, Professor I. A. Boloshin]

[Text] Contents

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CURRENT STATUS OF CYBERNETICS DISCUSSED

Moscow KIBERNETIKA: NEOGRANICHENNYYE VOZMOZHNOSTI I VOZMOZHNYYE OGRANICHENIYA. SOVREMENNOYE SOSTOYANIYE (Cybernetics: Unlimited Possibilities and Possible Limitations. Current Status) in Russian 1980 signed to press 11 Jan 80 pp 2, 3, 205-207

[Annotation, table of contents and excerpts from collection of articles, Izdatel'stvo "Nauka", 23,200 copies, 208 pages]

[Excerpts] Based on an analysis of the evolution of cybernetics, these articles by native and foreign scholars evaluate the views of the so-called "desperate cyberneticists," who were convinced of the unlimited possibilities of cybernetics and computers, and who considered it possible to substitute cybernetics for all other concrete and abstract sciences. Some results of the evolution of cybernetics over more than a quarter of a century are summed up.

Thirty Years Later (In lieu of a foreword)

This collection of articles by Soviet and foreign scholars, "Cybernetics. Current Status," is the second of three books associated by a common title, "Cybernetics: Unlimited Possibilities and Possible Limitations."

The first book, "Cybernetics. Results of Development," consists primarily of articles reflecting the view of cybernetics that was dominant in the fifties and sixties. They cover the essence of the discussions of that time and present some forecasts made by scholars at the outset of the development of the new science.

The third book, "Cybernetics. Prospects for the Future," discusses the probable directions of the development of cybernetics. It is composed of articles on the problem of "artificial intelligence" and the role of cybernetics in solving major problems associated not only with the visible, but also with the distant future.

The collection, "Cybernetics. Current Status," sums up, as it were, the results of the development of cybernetics during the past 30 years.

Contents

About the Authors and Publications

Leon Brillyuen (1890-1969), member of the U.S. National Academy of Sciences, physicist, known in particular for his works on the interrelation of information theory and thermodynamics.

His article was published as a paper in the Polish journal PROBLEMY (1974, No. 11, 12). Translated from English.

Berg, Aksel' Ivanovich (1893-1979), member of the USSR Academy of Sciences. Specialist in radio engineering and radio electronics. Works in cybernetics and its practical applications.

Biryukov, Boris Vladimirovich, doctor of philosophical sciences, specialist in mathematical logic, author of works on the philosophical questions of cybernetics.

His article was first published in the collection "Budushcheye nauki" [The Future of Science] (Moscow: "Znaniye", 1973).

Buslenko, Nikolay Panteleymonovich (1922-1977), corresponding member of the USSR Academy of Sciences, mathematician, specialist in the theory of complex systems and machine modeling.

Buslenko, Vladimir Nikolayevich, candidate of technical sciences, specialist on computer software and automated control systems.

His article was first published in the collection "Budushcheye nauki" [The Future of Science] (Moscow: "Znaniye", 1973).

Karl Khammer, director of UNIVAC's department of computer equipment, president of the American Society of Cybernetics.

His article is a paper, read in August, 1974, at the exposition of equipment and instruments for automated control systems. It was first published in INFORMATION MATERIALS: CYBERNETICS, 1975, issue 4 (86). Translated from English.

Samarskiy, Aleksandr Andreyevich, member of the USSR Academy of Sciences, specialist in mathematical physics, computer and applied mathematics.

Popov, Yuriy Petrovich, candidate of physical and mathematical sciences, author of works on the development and application of computational methods for solving problems in magnetic hydrodynamics and plasma physics.

His article was first published in the International Annual "Nauka i chelovechestvo" [Science and Humanity] (Moscow: "Znaniye", 1975).

Konrad Fialkovskiy, doctor of technical sciences, director of the Institute of Scientific, Technical and Economic Information of the PNR [Polish People's Republic], Polish fantasy writer.

His article was first published in the journal PROBLEMY (1971, No. 12). Translated from Polish.

Kabulov, Vasil Kabulovich, member of the Academy of Sciences of the Uzbek SSR. He is primarily concerned with algorithmic methods in cybernetics and development of automated control systems.

His article was first published in the collection "Budushcheye nauki" (Moscow: "Znaniye", 1977).

Frants Lezer, doctor of philosophical sciences, professor at the Berlin Institute imeni Humboldt (GDR).

His article was first published in the collection "Budushcheye nauki" (Moscow: "Znaniye", 1973).

Pekelis, Viktor Davydovich, member of the USSR Union of Writers.

His article was published in the collection "Kibernetika ozhidayemaya i kibernetika neozhidannaya" [Cybernetics: The Expected and the Unexpected] (Moscow, "Nauka", 1968).

Yanush Migdal'skiy, doctor of technical sciences, associate at a technical institute (PNR).

His article was first published in the journal PROBLEMY (1972, No. 8). Translated from Polish.

Ryshard Gavronskiy, doctor of technical sciences, director of the Institute of Bionics of the Polish Academy of Sciences.

His article was first published in the journal PROBLEMY (1974, No. 9). Translated form Polish.

Zaripov, Rudol'f Khafizovich, candidate of physical and mathematical sciences, specialist in modeling of music.

This is the first publication of his article.

I. Grekova, member of the USSR Union of Writers.

Her article was first published in the journal NOVYY MIR (1973, No. 7).

[384-8545]

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CYBERNETICS. UNLIMITED POSSIBILITIES AND POSSIBLE LIMITATIONS. RESULTS OF DEVELOPMENT

Moscow KIBERNETIKA: NEOGRANICHENNYYE VOZMOZHNOSTI I VOZMOZHNYYE OGRANICHENIYA. ITOGI RAZVITIYA in Russian 1979 pp 2, 194-199

[Editorial Board: Academician A. I. Berg, Corresponding Member, USSR Academy of Sciences; A. G. Spirkin; Dr. of Philosophy B. V. Biryukov; Editor-Compiler V. D. Pekelis]

[Abstract of the book]

[Text] The articles by leading scientists in different fields examine key problems of cybernetics: Can machines think and feel? Are they capable of creativity? What are the similarities and differences between a living creature and a cybernetic device?, etc. The results of developments in cybernetics over the last quarter of a century are summed up.

About the Authors and Publications

Kolmogorov, Andrei Nikolayevich, member, USSR Academy of Sciences.

The article is an edited transcript of a paper, "Automata and Life," delivered April 6, 1961, at a methodological seminar of the Mechanico-Mathematical Department of Moscow State University. It was first published in the magazine "Tekhnika - Molodyozhi" (Nos 10, 11, 1961) as the beginning of a "Discussion of Problems of Cybernetics Today." It also appeared in the collections, "The Possible and Impossible in Cybernetics" (USSR Academy of Sciences Press, Moscow, 1963), and "Expected and Unexpected Cybernetics" (Nauka, Moscow, 1968).

Ivakhnenko, Aleksei Grigoryevich, corresponding member, Academy of Sciences of the Ukrainian SSR.

The article was first published in "Nedelya" (No 5, 1962). It appeared in the collections, "The Possible and Impossible in Cybernetics" (AN SSSR, Moscow, 1963), and "Expected and Unexpected Cybernetics" (Nauka, Moscow, 1968).

William Ross Ashby, American biologist and cybernetician.

The article is a digest of a paper presented at a conference on intelligent machines in California. It first appeared in the USSR in the journal "Zarubezhnaya radioelektronika" (No 3, 1962), translated from "Proceedings of the Western Joint Computer," May, 1961. It appeared in the collections "The Possible and Impossible in Cybernetics" and "Expected and Unexpected Cybernetics."

Norbert Wiener (1895-1964), American mathematician, the "father of cybernetics".

The article, "On Learning and Self-Reproducing Machines," was first published in the magazine "Tekhnika - Molodyozhi" (No 4, 1962) in abridged translation of chapters of the same title in second edition of Wiener's book "Cybernetics" which appeared in the USA in 1961. The article appeared in the collections "The Possible and Impossible in Cybernetics" and "Expected and Unexpected Cybernetics."

Artobolevskii, Ivan Ivanovich (1905-1977), member, USSR Academy of Sciences. Founder of the Soviet school of machine mechanics.

Kobrinskii, Aron Yefimovich, dr. of technical sciences, specialist in the field of manipulators and robots.

The article was first published in the magazine "Tekhnika - Molodyozhi" (No 2, 1962). It appeared in the collections "The Possible and Impossible in Cybernetics" and "Expected and Unexpected Cybernetics."

Todor Pavlov (1890-1977), honorary president of the Bulgarian Academy of Sciences, historian and philosopher.

The article was first published as a letter to the editors of "Literaturnaya gazeta" August 30, 1962. It appeared in the collection "The Possible and Impossible in Cybernetics."

Joseph Wood Crutch, professor at Columbia University, USA, writer.

The article was first published in the magazine "Saturday Review" (1965). It appeared in the publication "Expected and Unexpected Cybernetics."

Gansovskii, Sever Feliksovich, science-fiction writer, member of USSR Writers Union.

The article was first published in the weekly "Literaturnaya Rossia" (No. 51, 1967). It appeared in the collection "Expected and Unexpected Cybernetics."

Albert Ducroc, professor, director of the French Electronics and Cybernetics Society, president of the National Federation of Automation and Cybernetics.

Louis Couffinialle, French mathematician, professor, former president of the International Cybernetics Association.

The article was first published in the international yearbook, "Science and Humanity" (Znaniye, Moscow, 1963). It appeared in the collection "Expected and Unexpected Cybernetics."

Glushkov, Viktor Mikhailovich, member, USSR Academy of Sciences, Director of the Cybernetics Institute of the Ukrainian Academy of Sciences.

The article was first published in the yearbook, "The Future of Science" (Znaniye, Moscow, 1966).

Amosov, Nikolai Mikhailovich, corresponding member, USSR Academy of Medical Sciences, Ukrainian Academy of Sciences.

The article was first published in the newspaper "Izvestiya" (Jan 12, 1962). It appeared in the collection "The Possible and Impossible in Cybernetics."

Botvinnik, Mikhail Moiseiyevich, dr. of technical sciences, ex-world chess champion.

The article was first published in the newspaper "Komsomolskaya pravda" (Jan 3, 1961). It appeared in the collection "The Possible and Impossible in Cybernetics." It was printed in full in the collection "Expected and Unexpected Cybernetics."

Pekelis, Viktor Davydovich, writer-publicist, member of the USSR Writers Union.

The article was first printed in the magazine "Molodaya gvardia" (No. 9, 1963). It appeared in the collection, "The Possible and Impossible in Cybernetics."

Arab-Ogly, Edvard Arturovish, candidate of philosophy, author of studies on problems of social modelling.

The article was first printed in the collection "Kybernetika ve spolecenskych vedach" (Prague, 1965). Translated from the Czech. It appeared in the collection, "Expected and Unexpected Cybernetics."

Arthur Lee Samuel, consultant director of the research department of the American company IBM.

The article was first printed in the magazine "New Scientist," Feb 17, 1964. Translated from the English. It appeared in the collection "Expected and Unexpected Cybernetics."

Dorodnitsyn, Anatolii Alekseyevich, member, USSR Academy of Sciences, Director of the Academy's Computer Center.

The article was first printed in the newspaper "Izvestiya" June 23, 1966. It appeared in the collection "Expected and Unexpected Cybernetics."

Michael Stone, chief programmer of a British firm.

Malcolm Warner, research worker at Brinell University (England).

The article was first printed in the journal "New Scientist" (1969, 42, No. 647). Translated from the English.

Stanislaw Lem, Polish science-fiction writer.

The article was first published in the book, "Summa technologiae" (Cracow, 1967). It was printed in the weekly "Literaturnaya Rossia" (No. 51, 1967). Translated from the Polish. It appeared in the collection "Expected and Unexpected Cybernetics."

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ABSTRACTS FROM JOURNAL 'PUBLICATIONS OF THE MOSCOW INSTITUTE OF POWER ENGINEERING'

Moscow TRUDY MOSKOVSKOGO ORDENA LENINA ENERGETICHESKOGO INSTITUTA. VOPROSY PROYEKTIROVANIYA I RASCHETA USTROYSTV AVTOMATIKI, VYCHISLITEL'NOY TEKHNIKI I RADIOELEKTRONIKI in Russian No 431, 1979 pp 99-107

UDC 621.396:519.2

ADAPTIVE FILTRATION OF DISCRETE PROCESSES

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

[Text] An algorithm for the adaptive filtration of communications with unknown statistical characteristics is examined here. The derivation of the algorithm is based on maximizing the probability relationship by using Pontryagin's principle of the maximum. Limitations on the unknown parameters and an evaluation of the communications is employed in the process of maximization. The non-Gaussian nature of the combined aposterior distribution and of those parameters which describe its statistical characteristics is taken into account in the synthesis of the adaptive filter.

UDC 621.396.621.59

SEVERAL PROBLEMS IN THE CONSTRUCTION OF DIGITAL RECEIVERS FOR PRECISELY KNOWN BINARY SIGNALS

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

[Text] This article examines a receiver which is a digital model of an optimal (with regard to Kotel'nikov's criterion) receiver for precisely known binary signals. Both the deterioration of the receiver's noise stability, caused by the limited dischargeability of the arithmetical devices, and its high-speed operation in two variant designs based on non-recursive digital filters with fixed decimal points are analyzed here.

UDC 621.396.969.18

EVALUATION OF TARGET PHASE COORDINATES IN PHASE AND DIFFERENCE FREQUENCY DIRECTION FINDING

[Abstract of article by Svetlov, Ye. L., Tikhonov, V. P.]

[Text] This article examines the problem of simultaneously processing radar speed and goniometric information in order to calculate the target's phase coordinate vector, given different versions in the design of the goniometric channel. Observability conditions are discussed. The problem of quasi-optimal filtration is formulated and the accuracy of quasi-optimal estimates is determined. Two types of direction finders are compared.

UDC 681.319

AN ALGORITHM FOR ELIMINATING ANOMALOUS ERRORS IN A RESERVED SYSTEM

[Abstract of article by Korshunov, A. B.]

[Text] This article examines an algorithm for eliminating catastrophic errors in a measuring system containing two positional meters and one rate meter. The algorithm is based on the comparison of the difference sign with the sign of an increase in the sum of readings of the two identical meters over the value, extrapolated one step, of the readings of the same two meters. By means of statistical simulation, the exponents of the algorithm were obtained.

UDC 621.396.962.2:621.391.8

THE EFFECT OF PASSIVE INTERFERENCE ON THE OPERATION OF DUAL FREQUENCY RANGE-ONLY RADAR

[Abstract of article by Razgonyaev, Yu. V.]

[Text] This article examines the effect of passive interference with symmetrical energy distribution on the operation of dual frequency radar, in which the phase method of ranging is used. The noiseproof feature of two different radar configuration is compared under approximately similar limiting conditions. Recommendations are made regarding the use of the devices which were examined and the choice of their parameters.

UDC 621.391.26

THE POSSIBILITY OF REDUCING TRANSIENT RESPONSE TIME IN AN INFORMATION SYSTEM WITH MONITORED FEEDBACK

[Abstract of article by Bystrov, S. T.]

[Text] An information system with monitored feedback is examined here for the purpose of reducing the time required for signal processing. This processing contains a parametric element, into which is fed the pumping oscillations, which depend on the system's output signal. The system's differential equation is derived and solved. It has been shown that transient response time in such a system is reduced significantly. A description of the experiment is given.

UDC 621.372.54

SYNTHESIS OF IMPROVED HIGH-ORDER ACTIVE RC-FILTERS

[Abstract of article by Grebenko, Yu. A., Savkov, N. N.]

[Text] This article examines an algorithm for the structural synthesis of high-order active filters based on identical sections of the first and second orders. Rearrangement of the filter's parameters (cut-off frequency, central frequency, pass band, etc.) while the frequency characteristics remain the same is guaranteed by the synchronic rearrangement of the parameters of the identical sections. Examples of the production of fourth- and sixth-order band filters of the Butterworth and Chebyshev type are given.

UDC 621.372.8:621.315.61

A CORRELOMETER ON DIELECTRIC WAVEGUIDES

[Abstract of article by Yakukhin, S. D.]

[Text] This article examines the performance of an autocorrelative function gauge for a complex envelope of nanosecond pulses with a frequency of 36HHz; the gauge is used in dielectric waveguides and is capable of operating in single-pulse conditions. A basic feature of this device is the waveguide interferometer with delay circuits of various lengths intended for multiple reproduction of the pulse. Input and output of the delay circuits are joined in the space-coupling section.

UDC 621.397.61

THE FORMATION OF A CONTOUR IMAGE SIGNAL BY MODULATING THE DIAMETER OF AN ANALYZING APERTURE

[Abstract of article by Pasechnyy, N. N.]

[Text] This article examines the possibilities of transforming a television image into an electric signal by means of a dynamic analyzing aperture, whose diameter is modulated by a high-frequency periodic function. It has been shown that in this case it is possible to obtain two simultaneous signals from one light-signal converter: the normal video signal and a contour image signal. Possible methods for the mutual separation of these signals have been determined.

UDC 621.396.96

SPECTRAL CHARACTERISTICS OF A SIGNAL REFLECTED OFF AN UNEVEN SURFACE

[Abstract of article by Baskakov, A. I., Golubkov, B. G.]

[Text] This article examines the spectral characteristics of a signal reflected from an uneven surface: bifrequency spectral density, instantaneous energy spectrum, and mid-power spectrum. The effect of the degree of surface unevenness, the effect of the transmitter's antenna radiation pattern, and the effect of the reverse surface dispersion pattern are all taken into account in the reflections that were obtained. In this instance the antenna radiation pattern approximated a Gaussian curve.

UDC 621.396.962.34

AN OPTIMAL ANGULAR DISCRIMINATOR IN THE EVENT OF PASSIVE INTERFERENCE

[Abstract of article by Zhutyaeva, T. S.]

[Text] This article examines the structural synthesis of an optimal angular discriminator using the method of maximal probability under conditions characterized by passive interference. The possibility of using this discriminator in a single-pulse summation-difference direction-finder has been demonstrated. In such an application the frequency characteristics of the filters in the summation and difference channels must agree with the spectrum of the useful signal and reject the passive interference.

UDC 621.373.12.001

EXTERNAL SYNCHRONIZATION OF A SELF-MAINTAINED CIRCUIT WITH AN ACOUSTIC SURFACE WAVE DELAY LINE

[Abstract of article by Ogurtsov, V. I.]

[Text] This article, using the method of slowly varying wave amplitudes, examines a self-maintained circuit with an acoustic surface wave delay line in a feed-back circuit under conditions of external harmonic influence acting on the fundamental tone. Given the assumption that the reserve of energy from self-oscillation is small and that there is little external force, the shortened differential equations of such a circuit were obtained. The stability of these equations is analyzed.

UDC 538.3:535.42

AN APPROXIMATE METHOD FOR CALCULATING THE DISPERSION PATTERN ON A RADIALLY HETEROGENEOUS CYLINDER

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

[Text] This article examines a combined numerical and asymptotic method for calculating the dispersion pattern of an E-polarized plane wave on a radially heterogeneous cylinder. The method is based on the asymptotic resolution of the radial equation and summation of series in the asymptotic mode using Fourier's algorithm of rapid conversion. The results of the calculations for a metallic cylinder and a radially heterogeneous cylinder are given.

UDC 681.327.2:861.326.74.06

ASSESSMENT OF THE RELIABILITY OF METALLIC OXIDE SEMICONDUCTOR MEMORY UNITS

[Abstract of article by Borodin, G. A., Yegorova, N. I.]

[Text] This article examines the causes, widely known in the literature, for the failure of metallic oxide semiconductor memory units. It is shown that the errors occurring during catastrophic failure of the memory micro-circuits are of an assymetrical and grouped nature. A method for quantitatively determining reliability that includes both catastrophic and degradation failures of the microcircuits is proposed. It is recommended that a program control method be used for increasing the operation reliability of MOS memory units.

UDC 621.375.1

A THERMOSTATIC LOW FREQUENCY AMPLIFIER

[Abstract of article by Frolov, M. A., Bubenichek, A. A.]

[Text] This article examines existing models of low frequency amplifiers and their shortcomings. There is introduced a functional model of such an amplifier, which has none of the indicated deficiencies, and an analysis of its performance is given. The principal electrical diagram and design formulas are given.

UDC 681.327.66

USEFUL SIGNAL DISCRIMINATION IN THE TWO-WIRE FERRITE MEMORY UNIT OF A 2.5D SYSTEM

[Abstract of article by Dikarev, N. I., Kovalenko, S. M.]

[Text] This article examines the problems involved in distinguishing the useful signal in a 2.5D 2W-type main memory against a background of "pedestal"-type noise. The article examines and compares models for the suppression of such noise; these models contain an analog key based on a diode bridge and field transistor. The article assesses the duration time required for the key-switching process of each of the models that are examined here.

UDC 681.3.068/069

TEST SIGNAL SELECTION FOR THE OPTIMAL IDENTIFICATION OF LINEAR DYNAMIC OBJECTS

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

[Text] This article examines the problems involved in finding an optimal test signal for actively identifying linear dynamic objects. The duration of the experiment and the energy of the input signal were limited; interference was white noise. It is assumed that the pattern is precisely known with the parameters. It has been shown that in the selection of an informational matrix as the criterion for identification or tracking, the solution of a system of differential equations is the optimal signal.

UDC 621.396

SYNTHESIS OF RECOGNIZORS FOR DISCRETE INFORMATION UNDER CONDITIONS OF PULSE INTERFERENCE

[Abstract of article by Vekhov, M. Yu.]

[Text] This article examines the problem of finding an optimal algorithm for the recognition of precisely known signals under conditions of pulse interference. It has been shown that an optimal algorithm permits the unambiguous recognition of signals when the pattern of interference pulses can be described by a deterministic function with random parameters.

UDC 681.3.068/069

PROGRAMMED SYSTEMS FOR AUTOMATIZATION IN THE DESIGN OF AUTOMATIC CONTROL SYSTEMS

[Abstract of article by Artyukhov, O. I., Plyusnin, S. A.]

[Text] This article examines general problems in constructing and developing specialized computer software for time and frequency research in automatic control systems; the software is designed for domestically produced computers of M-6000/SM-1.2 type. The article gives a brief description of the special features and limitations imposed on the systems that are being studied with the aid of the given software.

UDC 621.317.725.083.5.92.00[illegible].5

A METHOD FOR CORRECTING SYSTEMATIC ERRORS IN DIGITAL MEASURING CONVERTERS

[Abstract of article by Pichugin, A. F., Kotov, V. L.]

[Text] This article examines a method for correcting digital measuring converter error by feeding into the converter signals of sample measurements; this method does not require a time interval for converter correction.

UDC 621.398.727.6:621.398.725.3

THE ORGANIZATION OF THE MAGNETIC DISK STORAGE SYSTEM OF A HIGH-RELIABILITY REAL TIME COMPUTER COMPLEX

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

[Text] This article examines the combined encoding of data in a system consisting of several magnetic disks intended to protect the system from the failure of one or two accumulators. Such a method ensures economy in terms of equipment outlay, at the expense of reduced operating speed, in comparison with the doubling of the same sequence.

UDC 681.335.851.3/088.8

A PULSE ANALOG COMPUTING DEVICE FOR EXTRACTING THE SQUARE ROOT

[Article of article by Mayorov, V. G.]

[Text] This article examines a computing device, built with the use of alternating current integrating amplifiers. Because of the use of such amplifiers, operating amplifier drift is automatically tuned out. This device may be generally coupled with other sections of the computer. The results of error estimates are given, and the specifications for individual sections are indicated. An experimental check of the device confirmed the read-out that was obtained and gave the following results:

$\delta_{base} = 0.1\%$ $\delta_{add} = 0.4\%$ $\Delta t=40°C.$

UDC 681.32

ONE SYSTEM OF DATA BASE CONTROL

[Abstract of article by Kazaritskiy, S. D., Kulikova, S. A., Ovsyannikova, M. R., Sokurskaya, I. Yu., Feoktistova, G. A.]

[Text] This article examines the methodology for the development and use of ADONIS data base control system, which belongs to the class of systems having their own language and which is based on the use of relational data models. The methodology which is used for developing this system permits the creation of a system with practically unlimited functional possibilities.

UDC 371.694.011.56:681.32

A MONITORING SYSTEM FOR AUTOMATED INSTRUCTION

[Abstract of article by Ladanov, V. I.]

[Text] This article examines one approach to designing specialized program software with a broad range of possibilities for use in the setting up of various methods of instruction. These possibilities derive from the fact that the system is operationally adjusted to the specified mode of instruction. This adjustment is carried out in two stages: selection of the program module to be carried out from the given aggregate; and selection from the aggregate of data sets that set which has to serve as input for the given module.

UDC 621.375.024

ANALYSIS OF THE ACCURACY OF CURRENT REFLECTORS

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

[Text] This article examines the speed and critical accuracy of current reflectors in transistors. Circuits containing two and three transistors were examined. It has been shown that the accuracy of the circuits is determined basically by the nonlinearity of the transistor characteristics or by the difference of their nonlinearities. The results of experiments are given. Recommendations for increasing operating speed are made.

CSO: 1863

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