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AND
AUTOMATION TECHNOLOGY
(FOUO 7/80)

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USSR Report

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

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ES AND SM COMPUTER EQUIPMENT AND THEIR APPLICATION

Hierarchical Distributed Information System for Data Bank Management in SM EVM M-4030 Multicomputer Complexes (IRIS)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE in Russian 1979

[TsNIIITEIpriborostroyeniya catalog data sheet, order no 603-21]

[Text] The system is intended for the management of centralized data banks (TsBD) using the M-4030 process control computer complex and to provide for its operation as part of the M-4030 multicomputer complex of the SM EVM system, and is used in information retrieval systems, systems for processing statistical data, financial systems, personnel systems, systems of operational accounting and planning, recording control systems, automated systems for the control of technological processes, and systems for the collection and processing of experimental and research data.

The system provides for real-time operation and telecommunication access. Access to data banks created under IRIS control can be made in batch as well as in interactive modes. The IRIS system can accommodate communication with the user through a specialized language that approximates natural language. The system also allows user programs written in M-4030 assembler, SM EVM macroassembler, FORTRAN, and COBOL languages.

IRIS consists of three interconnected components: IRIS/BD is the core system and provides for managing data banks in the M-4030 (M-4030-1); IRIS/TO provides for telecommunication access to the centralized data bank through terminals connected to the M-4030, as well as via terminals of the SM EVM system; IRIS/KM is a collection of programming interfaces supporting a user's work with the centralized data bank in the M-4030 multicomputer complexes (M-4030-1) of the SM EVM.

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The SM-1 Computer Complexes

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE in Russian 1979

[TsNIIITEIpriborostroyeniya catalog data sheet, order no 603-75]

[Text] The SM-1 computing complexes are intended for use in automated systems for the control of aggregates, technological processes and production, in experimental research complexes, for the initial processing of test results, and of data from geological explorations and from medical-biological studies, in information retrieval systems, and so forth.

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The SM-1 computer complexes are assembled around the A131-10 (SM-1P) processor according to purchaser specifications by using aggregate modules from the system of small computers (SM EVM) and adding, as required, peripheral devices from the list of equipment that is part of the M-6000/M-7000 modernized modular system of computer technology.

The SM-1 computer complex is program-compatible with the M-7000 and has one-sided compatibility at the program transfer level with the M-6000, as well as full compatibility with these systems in input-output interfacing.

A new component design method is used in the SM-1. The aggregate modules are built either as a stand-alone integral unit, complete in design, with independent power supply and built-in cooling system, or as a nonfinished design (a unit of elements assembled on printed circuit boards or as part of a plug-in unit), which can be built into another stand-alone integral unit (another aggregate module), where it has to be provided with space, power, and cooling. The stand-alone integral unit can be mounted in a standard rack (where, in this case, no additional structural work, calculations, assembly, power, and so forth are needed) or can be placed on a table, shelf, pedestal, and so forth. Along with the small size, the following are provided by the SM-1: High productivity; outstanding application characteristics: suitability for control and diagnostics, automatic rebooting of the system following shutdown, initial loading of programs and system start-up; a problem-oriented architecture: suitability to expand the command system through either a standard assortment of additional commands or special user commands.

It is possible to assemble local and territorially distributed multicomputer complexes around the SM-1. Transmission of information within such complexes, as well as between complexes and terminals, can be implemented via telephone, telegraph, and specialized lines of communication.

Compatibility is provided with the YeS EVM unified system of computers, with the CAMAC system, and with the domestically produced aggregate systems ASET, ASKR, ASPI, KTS LIUS, and others.

Central Processing Units of the SM-1, the A131-10 Processor

The processor is designed as a stand-alone integrated unit, which can be used as a table-top unit (one of the variants of the device) or mounted in a standard SM EVM rack with other integrated units.

As a stand-alone integrated unit, it contains the processor itself, including the microprogramming memory of the processor and channel, and a panel: a main memory control unit, providing access to 16K words of memory; up to 4 main memories with a total capacity of 16K words; up to 10 interface units for peripheral devices, using the 2K interface; power supply and cooling.

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Technical Data

Control principle	Microprogramming
Control memory:	
Word size, bits	18
Memory capacity, words	4,096
Access time, microseconds	0.3
Number of working registers addressable in the programs	5
Number of registers addressable in the microprograms	30
Register word size, bits	16
System of interrupts	Multilevel
Time for executing an addition (register-memory), microseconds	2.5
Channel for direct memory access (built into the processor):	
Control principle	Multiprogramming
Maximum speed of data transfer in the burst mode, 1000s of words per second	250
Speed of data transfer for simultaneous operation of processor and channel, 1000s of words per second	100
Main memory:	
Word size, bits, composed as follows:	18
Data bits	16
Control bits	2
Maximum memory capacity, words	32K
Duration of an access cycle, microseconds	1.2
Maximum number of peripheral devices that can be connected with single-level addressing	55
Dimensions, mm	482 x 310 x 788

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A-211-15 Main Memory (OZU)

The main memory is included in the design of the A131-10 processor.

Technical Data

Capacity, words	4,096
Word size, bits	18
Duration of access cycle, microseconds	1.2
Fetch time, microseconds	0.55
Dimensions, mm	367 x 367 x 21

A151-6 Input-Output Pad (SVV)

The purpose of the pad is to increase the number of peripheral devices that can be connected to the processor. Up to three input-output pads can be connected to the processor.

Each input-output pad has 16 outputs via the 2K-interface, but for each of the input-output pads to be connected, one of the 2K-interface outputs in the processor is used. The maximum number of outputs using the 2K-interface in the SM-1 (at the first level) is 55.

The input-output pad is designed as a stand-alone integrated unit, which can be used as a table-top unit or placed in a standard SM EVM rack with other integrated units.

Dimensions are 482 x 310 x 635 mm.

A211-19 Main Memory Device (UOP)

The main memory devices can be used to expand the main memory capacity of the SM-1 computer complex to up to 32K words.

It is designed in the form of a stand-alone integrated unit, which contains memory units, a control unit, cooling, and power supply.

The interface unit for connecting to the processor is included in the processor itself.

Technical Data

Memory capacity, words	16,384
Word size, bits	18

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Duration of access cycle, microseconds	1.2
Fetch time, microseconds	0.6
Dimensions, mm	482 x 221 x 755

A221-10 Permanent Memory Device (UPP)

The permanent memory device can be used to expand memory capacity to 32K words, and to store permanent programs and constants. Addressing the cells of the permanent memory is done just as for the main memory. If a permanent memory is used as part of the SM-1 complex, it is assigned addresses from 16K to 32K.

The permanent memory device is designed in the form of a stand-alone integrated unit containing memory units, a control unit, cooling, and power supply.

The interface unit for connecting to the processor is located in the processor itself.

Technical Data

Memory capacity, words	16,384
Word size, bits	18
Duration of access cycle, microseconds	1.2
Fetch time, microseconds	0.16
Dimensions, mm	482 x 221 x 575

Input-Output and External Memory Devices

Among the peripheral devices of the SM-1 are the following: External memory devices using magnetic disks--fixed and variable; external memory devices using magnetic tape--reel and cassette; sequential and parallel printing devices; alphanumeric and graphic displays; standard modules for communicating with the controlled plant; and external and internal communication modules.

All external devices of the SM-1 differ from analogous ones in the M-6000/M-7000 system by being smaller and having higher reliability and wider functional capability.

All peripheral devices designed as part of the M-6000/M-7000 modernized modular system of computer technology can be used with the SM-1 complex.

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Software for the SM-1

The software for the SM-1 is designed by using the modular principle, which makes possible the design of programming systems corresponding to the modes of work required and the functions of a given equipment configuration.

Among the software for the SM-1 are the following: Operating systems (single-processor) for operating in: real time, batch mode, and time-share; program libraries: basic subroutines, programs for real-time operation, numerical analysis programs, data base sort-merge programs, statistical information programs, graphic display programs, and programs for the graphic designer; problem-oriented programming module packages: application programs for handling tasks of collecting and processing information in systems for the control of technological processes, application programs for the processing of graphic information, programs for laying out multicomputer systems, program modules for generating multiprogram dialog systems for operation in real time, program modules for working with data bases, and program modules for processing text information; a system for program preparation; service and control-diagnostic programs.

The following programming languages can be used: MNYEMOKOD [mnemonic code] M-6000, MNYEMOKOD M-7000, MAKROYAZYK [macrolanguage], FORTRAN-II, FORTRAN-IV, ALGOL-60 dialect, and BASIC.

Software is provided according to the specifications of the user, either as a specified system or in the form of a collection of programming modules, from which the user can assemble his own programming system as required.

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The SM 2103 and SM 2104 Processors
of the SM-3 and SM-4 Control Computer Complexes

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE in Russian 1979

[TsNIIITEIpriborostroyeniya catalog data sheet, order no 603-81]

[Text] These processors are the central components of the process control computer complexes SM-3 and SM-4 (Figures 1 and 2) and can be used for executing program instructions, servicing requests from external devices, and providing operational communication between operator and the control complex. By using the processor, the operator can: Stop the execution of a program, load instructions and data, check the content of external device registers and that of memory cells and universal registers, initiate the execution of any program that is in memory, organize a step-by-step execution of a program, and perform the generation of the initial loader using a punched tape operating system from the integral permanent memory of the microprogram control processor (only for the SM-3).

The tasks of the processor also include the detection of errors in instructions related to illegal use of reserve instructions or incorrect

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Figure 1. The SM 2103 Processor of the SM-3 Process Control Computer Complex

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Figure 2. The SM 2104 Processor of the SM-4 Process Control Computer Complex

addressing of registers (by using a nonexisting address or using an address that violates an integer limit). Any detection of errors initiates switching to an appropriate service program. The processor also monitors analogously for overflow conditions and power failures, in which case it switches to an appropriate program for servicing error situations.

For real-time operations, the processors contain circuits for receiving and processing timing signals from an external source (timer).

The SM 2104 differs from the SM 2103 processor by having a higher operating speed and an arithmetic expander, which provides for machine multiplication and division with fixed-point and floating-point arithmetic, even further increasing the overall speed of program execution. Addition of a memory dispatcher permits the expansion of memory to 124K words.

The processor contains eight general-purpose registers, which can be used as accumulators (in the case when the results from an operation remain in the register), index registers (in this case, the contents of the register are added to the contents of a memory cell), address pointer (in this case, the contents are the address of the operand), table pointers, lists, and so forth, and pointers to memory locations for the temporary storage of data (stack). The specific use of the general-purpose registers depends on the address range selected.

A multilevel-stack principle of interrupts is used in the SM-3 and SM-4 process control computer complexes. The number of interrupt levels is only limited by the depth of the stack in memory and, for all practical purposes, can be of arbitrary size.

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A specific priority is assigned to each peripheral device that is connected to the common bus. There are five priority levels, one external to the processor and four programmed (using the 4 interrogate lines ZP4 through ZP7), each of which has its own interrogate line for interrupts (from all devices of this level) and its own interrupt-enable line.

At one of the interrupt levels, the device that is physically connected closer to the processor has a higher priority.

The processor is constructed in the form of a stand-alone integrated unit around a standard chassis that is assembled from special aluminum shapes. The chassis carries a face panel, an operator panel, a cassette interface unit, a cassette processor unit, a power supply, and a cooling unit.

The processor is installed in the rack on slides, to facilitate ease of removal for preventive maintenance and repair.

The operator panel consists of a printed circuit board, on which are mounted switches, light diodes, and logic elements, and is covered by a decorative panel. Control keys protrude through cutouts in this decorative panel. Also installed on the operator panel is a switch permitting turning power on and off, which also serves to disable the functional keys of the operator panel.

Technical Data for the SM 2103 and SM 2104

	SM 2103	SM 2104
Processor type	Parallel	
Control	Microprogramming	
Representation of arithmetic operands	Fixed point in supplementary code	Fixed point in supplementary code, and floating point
Word size of arithmetic operands, bits:		
Single precision	16	
Double precision	32	
Range of numbers that can be represented using single precision:		
With sign	From -32,768 to +32,767	
Without sign	From 0 to 65,535	
Word size for logic operands, bits	1, 8, 16	

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	SM 2103	SM 2104
Maximum time for executing commands, microseconds:		
"Register-to-register"	5.0	1.2
"Register-to-memory"	7.0	2.5
"Memory-to-memory"	9.3	3.9
Multiplication (fixed point)	Programmed execution	10.2
Division (fixed point)	Programmed execution	13.0
Addition (floating point)	Programmed execution	22.0
Multiplication (floating point)	Programmed execution	35.0
Addressing system	12 types (direct, indirect, reference, indexed, with automatic incrementing, and so forth)	
Addressibility	Zero-address, one-address, and two-address commands	
Interrupt system	Priority	Multilevel
Number of general-purpose registers	8	
AC power supply:		
Voltage, V	220 +10% -15%	
Frequency, Hz	50 ± 1	
Maximum power required, watts	400	500
Dimensions of processor	482.6 x 785 x 265.9	483 x 620 x 267
Maximum weight of devices, kg	40	

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The SM-2 Computer Complex

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE in Russian 1979

[TsNIIITEIpriborostroyeniya catalog data sheet, order no 603-84]

[Text] The system is designed for use in complicated automated systems for the control of technological processes and in systems of automated scientific experiments requiring large productivity and fast response; at the upper levels of hierarchical systems of control of complex assemblies, factories, shops and enterprises; in data processing centers for systems of mass servicing; in automated systems for the processing from geophysical, oceanographic, and other explorations; and in automated systems for the processing of results from testing complicated equipment. It can be used for patients in intensive care and for the processing of medical data, as a complex commutator of communications, and for the execution of engineering and other calculations.

Basis of the SM-2 complexes is the A131-11 processor (SM-2P). The A131-11 processor differs from the A131-10 processor (SM-1P) by higher productivity, an expanded system of commands (including floating-point operation), and developed system capabilities.

Computer complexes can be assembled around two processors with two channels of direct memory-access, working with a common main memory of up to 128K words and either common or separate peripheral devices. In dual-processor SM-2 complexes, all communications among the devices of the computer complex are radial, which provides high speed for the system built around them.

The same design layout is used in the SM-2 as in the SM-1. Any arrangement of modules can be done in the form of a so-called stand-alone integrated unit, which is self-contained and has a built-in power supply and cooling

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system, or in the form of a semifinished product (unit of elements, built up on printed circuit boards and forming a plug-in unit), which, in turn, can be installed in a stand-alone integrated unit (another assembly of modules), which provides space, power, and cooling. A stand-alone integrated unit can be mounted in a standard rack, be a table-top unit, or mounted in brackets. Design layout, assembly, and servicing of SM-2 complexes are relatively simple.

The SM-2 computer complex has full programming compatibility with the M-7000 system and one-sided compatibility at the program transfer level with the M-6000, as well as full compatibility with these systems by using input-output interfaces.

The SM-2 complexes are laid out in accordance with user specifications from aggregates of the SM EVM modules and using, when necessary, peripheral devices from the M-6000/M-7000 modernized modular system of computer technology. All peripheral devices terminated with a 2K interface can be connected to the SM-2, as can all peripheral interfaces adopted for the SM EVM.

Local and territorially distributed multicomputer complexes can be laid out around the SM-2 (as well as SM-2 together with SM-1). Transfer of information in distributed complexes as well as among complexes and terminals can be made by using telephone, telegraph, and specialized lines of communication.

The system is compatible with the YeS EVM, the CAMAC system, and domestically produced aggregate systems ASET, ASKR, ASPI, ITS LIUS, KTS LIUS, and others.

A131-11 Processor, the Central Processing Unit of the SM-2

The A131-11 processor, built as a stand-alone unit with an engineering panel, consists of the processor proper, a control memory, a power supply, and a cooling system. Also provided is space for installing an eight-channel commutator (KMR-8), which connects the processor with the main memory device and the input-output pad.

The A131-11 processor is mounted in a standard SM EVM rack along with other aggregate modules.

Technical Data

Control	Microprogramming
Control memory:	
Word size, bits	36
Capacity of memory, words	4,096
Duration of access cycle, nanoseconds	300
Number of working registers addressable in the programs	6

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Number of working registers addressable in the microprograms		17
Word size of registers, bits		16; 32
System of interrupts		Multilevel
Time required to execute a register-to-memory operation, microseconds:		
For fixed-point operation:	Addition	2.2
	Multiplication	10
	Division	17
For floating-point operation:	Addition	18-40
	Multiplication	23
	Division	40
Capacity of the main memory, words		32K (minimum) 128K (maximum)
Maximum number of peripheral devices that can be connected using single-level addressing		56
Maximum number of peripheral devices for two levels of addressing (when using the multiplexer A714-5 interface expander)		1,764
Dimensions, mm		482 x 310 x 799

A211-18 Main Memory Device (UOP)

The main memory device was designed as a stand-alone integrated unit, which contains the main memory unit, power supply, and cooling system, and provides space for the installation of a four-channel commutator (KMR-4), which is used to tie in with the A131-11 processors and the direct memory-access channels.

Technical Data

Capacity, words	32K
Word size, bits	18
Duration of access cycle, microseconds	1.0
Fetch time, microseconds	0.5
Dimensions, mm	482.6 x 310.2 x 755

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A491-6 Input-Output Pad (SVV)

The pad is used in connecting peripheral devices to the A131-11 processor.

It is produced as a stand-alone integrated unit, which contains the pad itself, power supply, and cooling system, as well as space for installing up to 16 interface units (16 output ports using the 2K interface) and the KMR-4 commutator, which is used to connect the input-output pad to the processors and the direct memory-access channels.

The dimensions of the device are 482.6 x 354.8 x 693 mm.

A152-6 Direct Memory-Access Channel (KPDP)

The purpose of this unit is the rapid exchange of information between the main memory and peripheral devices.

The direct memory-access channel can handle a maximum of 48 peripheral devices connected via the input-output pad and two peripheral devices, which can be connected directly to the channel via a 2K interface. The channel can simultaneously service up to four input-output devices connected via the input-output pad, or a single input-output device connected directly to the channel. Control information is transmitted to the channel via the special BIf-77 unit, which can be connected to the output via the 2K interface of that or of another computer complex. Control of the channel is possible from two directions.

The direct memory-access channel provides for the following maximum speeds in the exchange of information:

In servicing devices connected via an input-output pad:	
In exchanging entire words, 1000s of words per second	350
When exchanging a byte at a time, in 1000s of bytes per second	450
In servicing devices connected directly to the channel:	
In exchanging words, in 1000s of words per second	700
In exchanging a byte at a time, 1000s of bytes per second	1,000
Dimensions, mm	482.6 x 221.5 x 755

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The channel is constructed as a stand-alone integrated unit that contains the direct memory-access channel proper, power supply, cooling system, and space for installing a KMR-8 commutator, which can be used to connect the channel with the main memory device or input-output pad modules.

Eight-Channel (KMR-8) and Four-Channel (KMR-4) Commutators

These are intended to provide intrasystem communication among SM-2 computer complex devices. By using the distributed commutator in the computer complex, it is possible to obtain full matrix commutation (radial communication) for each processor and channel with every main memory device and input-output pad.

Dimensions, mm:

KMR-4	165 x 278 x 210
KMR-8	194.5 x 278 x 210

The KMR-8 is mounted with the processor or channel, while the KMR-4 is assembled with the main memory device or input-output pad.

Commutators do not have their own power supplies and obtain power from modules into which they are incorporated.

Input-Output Devices and External Memory

Among the peripheral devices of the SM-2 (and SM-1) computer complexes are the following: External memory devices using magnetic disks, both fixed and variable; external memory devices using magnetic tape, both reel and cassette; sequential and parallel printing devices; alphanumeric and graphic displays; aggregate modules for communication with the controlled system; modules for intrasystem and external communication.

All peripheral devices of the SM-2 system differ from analogous devices in the M-6000/M-7000 system by having smaller dimensions, greater reliability, and broader functional applicability.

It is possible to use all peripheral devices that form part of the M-6000/M-7000 modernized modular system of computer technology in the SM-2 complexes.

Software for the SM-2

Software for the SM-2 computer complex was developed using the aggregate modular principle, which makes it possible to design programming systems corresponding to the requirements of work and functions to be carried out by the particular equipment configuration.

Among the SM-2 software are the following: Operational systems (single- or dual-processor configurations) for real-time operation, batch processing,

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and time-share operations; program libraries: basic subroutines, programs for real-time operation, programs for numerical analysis, programs for sorting-merging of information bases, programs for processing statistical information, programs for graphic displays, and programs for graphic designers; problem-oriented packages of programming modules: application programs for layout in collection and information processing schemes for technological process control systems, application programs for processing graphic information, programs for layout of distributed multicomputer systems, programming modules for generating dialog for multiproblem systems operating in real time, programming modules for operation with data bases, and programming modules for processing text information; a system for program preparation; and servicing and control-diagnostic programs.

The following programming languages are used: MNEMOKOD (mnemnonic code) M-6000; MNEMOKOD M-7000; MAKROYAZYK; FORTRAN-II; FORTRAN-IV; ALGOL-60 dialect; and BASIC.

Software is provided according to user specification in the form of specified programming systems or as an assortment of programming modules, from which the user can assemble the required programming system.

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The SM-3 (SM 1301) Process Control Computer Complex

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE in Russian 1979

[TsNIIITEIpriborostroyeniya catalog data sheet, order no 603-90]

[Text] The SM-3 process control computer complexes (Figure 1) are part of the system of small computers. The developed architecture of the complexes, the wide selection of peripheral devices and devices for communicating with the system to be controlled, developed within the framework of the SM EVM, and orientation of the software to the solution of problems in real time make it possible to use the SM-3 process control computer complex for the creation of the following: Automation systems for scientific research and experiments; control systems for technological processes; systems for the collection, preparation, processing of data, and numerical control of technological processes; automation systems for planning and design work; information-measurement systems; systems for the execution of scientific-technical and complex engineering calculations; satellite subsystems in multicomputer hierarchical system working under the control of highly productive process control computer complexes of the M-4030, M-4030-1 or YeS EVM types; systems for commutation of channels and messages; and systems for the field of servicing, transport, and so forth.

The areas of application can be expanded in view of the possibility of bringing into agreement the interfaces of the SM-3 process control computer complex and the 2K interface type of the YeS EVM, CAMAC, and others.

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[Photo Not Reproduced]

Figure 1. The SM-3 (SM 1301) Process Control Computer Complex

The SM-3 complexes are built around SM 2103 processors, which have a main memory of up to 28K words and peripheral devices.

All architectural peculiarities of the SM-3 process control computer complex are also present in the SM-4, while at the same time the latter possesses additional capabilities. The SM-3 and SM-4 complexes have a common assortment of peripheral devices and are program-compatible with the M-400 process control computer complex, that is, all programs developed for the M-400 can be executed on an SM-3 or an SM-4.

The architecture of the SM-3 complexes is determined by the system of commands and interrupts selected and by the organization of interactions between the devices in the complex.

The SM-3 process control computer complexes use a single-bus structure in the system input-output interface, in which all devices (processor, main memory, and peripheral devices) are connected to the single information transfer bus, called the common bus (OSh). Use of a standard asynchronous common bus channel makes it possible to have a common communication algorithm for all devices and unified connecting equipment.

The processor uses the established set of interface signals for communicating with memory and peripheral devices. The latter use the same set of

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signals when communicating with the processor, memory, or other peripheral devices connected to the common bus.

Among peripheral device interfaces are registers that act as sources and receivers of information.

The single-bus interface structure assures the use of a common scheme of addressing registers of peripheral devices and of cells in the main memory.

In accordance with the architecture of the complex, each register of a device is assigned its own address, which differs from that of other registers of peripheral devices connected to the common bus. This address is analogous to the address of a memory cell.

The structure of a system with a common bus allows one to consider the registers of peripheral devices as active cells of the main memory and makes it possible for the processor to address them by using address instructions, thus making unnecessary any special input-output instructions. A total of 4K words have been set aside for addressing registers of external devices.

The merit of the adopted scheme for addressing peripheral devices lies in the fact that the processor can operate directly with data in registers of these devices, without preliminary transfer of data into memory or into its registers, and make use of the entire repertoire of instructions and all possible ranges of addresses. Data can also be transferred from one buffer register to another via the common bus, bypassing the central processor (its registers) entirely. Because of this, a number of interrupts are obviated and the general productivity of the processor is increased.

The common bus is used by the processor and all peripheral devices in a time-multiplex mode in accordance with a system of priorities assigned to the devices. A priority scheduler in the processor (a system for controlling priorities of interrupts) determines what device should use the common bus at any one time.

Exchange of information among devices using the common bus is done asynchronously. Two devices are active for any operation of the common bus, acting as master and slave. The master controls the operation of the common bus during exchange of data with another device, the slave. The process of device interaction using the master-slave principle is flexible: The common channel dynamically passes into the control of other masters, which are connected to it.

In principle, every device of the complex, except the main memory, can become the master of the bus. Communication among the devices on the common bus is interlocking. When a control request signal is transmitted by the master, a response has to be received from the slave, following which the information exchange takes place. If a slave responds with a permissive signal to a request from a device, but the device does not, in turn, issue

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a signal of acknowledgement of the selection, then the permission is cancelled. On the other hand, if there is no response signal from a slave, the master assigns the error to the common bus.

The common bus interface is based on a multiconductor high-frequency trunk for transmitting information, consisting of a large number of conducting lines; 56 lines of the set are signal lines and form the heart of the interface. The various types of information in the system are: Data, addresses, commands, and information about the state of the central and peripheral devices. Control signals are transmitted over these 56 functional lines of the common bus.

By using the existing hardware and programs, the following basic SM-3 process control computer complexes are planned: SM 1301.03, SM 1301.04, SM 1301.05, SM 1302, and SM 1303.

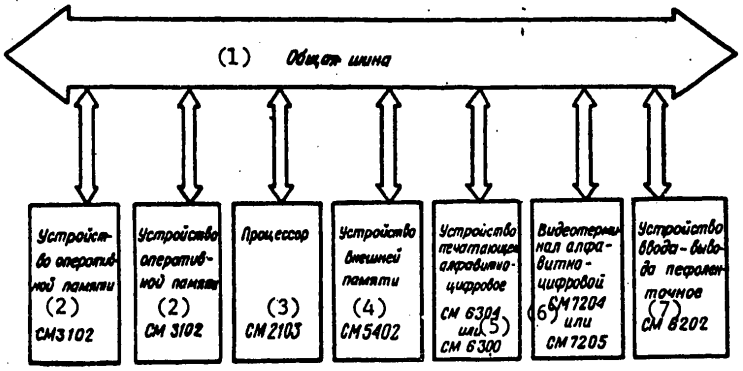

Figure 2. Schematic Diagram of the SM-3 (SM 1301) Process Control Computer Complex

Key:

1. Common bus
2. Main memory device--SM 3102
3. Processor--SM 2103
4. External memory device--SM 5402
5. Alphanumeric printing device--SM 6304 or SM 6300
6. Alphanumeric graphics terminal--SM 7204 or SM 7205
7. Punched-tape input-output device--SM 6202

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Figure 2 shows a block diagram of the complex for the SM 1301.05 variant.

The above-described complexes can be expanded.

Up to 20 devices may be connected to the common bus interface, for which the overall length of the bus should not exceed 15 meters. If more than 20 devices are to be connected or if the permissible length of the common bus is to be increased, it is necessary to use an additional device, the so-called interface expander (RIF), which amplifies the signals on the common bus. By using an interface expander, the number of devices that can be connected to the common bus is architectural unlimited.

Devices that can be connected to the complex can be divided into three groups.

The first group encompasses those devices of the SM EVM system that are self-contained. Devices in this group can be mounted at any available location in the racks of the complex or in a supplementary rack and can be connected to the complex by appropriate cables.

The second group contains those devices whose controller is designed as two component units laid out in such fashion that they can be connected to the standard assembly of the cassette interface unit (BKI) of the processor or to the system expander unit (BRS).

Space for mounting up to three of these devices is available in the cassette interface unit of the SM-3 processor. If more than three of these devices are to be connected, it is necessary to use the system expander unit, which holds one or two cassette interface units.

The third group includes devices which, for common bus interface communication, use more than two component units and are not self-sufficient. Such devices can be mounted in the system expander unit.

The system expander unit (BRS) is used for connecting additional devices to the terminals of the SM-3. This unit exists in three versions. One version of the BRS consisting of a stand-alone integrated unit (AKB) with power supply and cooling systems is used for interconnecting devices of the third group. The second BRS version, made up of stand-alone integrated units with power supply and cooling and a cassette interface unit, is used for connecting up to six devices of the second group. This BRS can be used to mount devices from the third group in any open location. The third BRS version consisting of stand-alone integrated units with power supply, cooling, and two cassette interface units is used for connecting up to 12 devices of the second group.

The following design elements are used in SM-3 complexes: Racks, stand-alone integrated units, cassette units, and component units. Racks are used for mounting integrated power distribution units. Integrated units can be

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in the form of table-top, floor-mounted, or of a type that can be built into a rack. The ones that can be built in are mounted on slides in racks. Cassette units are used for mounting component units and are, in turn, located in integrated units. These component units represent standard replacement elements and carry the microcircuits and discrete components.

The foundation of the component base of the complex is the TTLs, which are microcircuits of the expanded K115 series. In order to obtain high-speed logic chains and to economize on equipment, use is also made of the IMS circuits of the K131 and K599 series, which are in layout, electrically, and logically compatible with the K155 series. Microcircuits of the K559 series are used as trunkline components.

The grounding system has to provide a ground circuit with a resistance of less than 1 ohm to any flow of current.

The software for the SM-3 process control computer complex includes means for the preparation, debugging, and development of software for the execution of programs in the time-share mode and in real time, for teleprocessing of data, and for the organization and management of data bases.

The software consists of operating systems, application program packages for various purposes, programming systems using machine source language and problem-oriented languages, including FORTRAN IV, BASIC, COBOL, and others, as well as test programs for checking the functioning of devices that form part of the complex.

Depending on the system medium, operating systems are subdivided into punched tape and disk systems. Depending on the purpose of the operating system, they are also divided into general-purpose systems, real-time systems, and time-sharing systems.

Included in the program is a general-purpose punched-tape operating system (PLOS SM) and a general-purpose disk operating system (DOS SM).

PLOS SM is an assembler-language program package on punched tape that provides for preparation of user programs and system programs: Editing of source text, with provision for changes and additions; output of the entire program text in edited form or parts of it to punched tape; debugging of machine programs by running certain parts and checking for expected results at various points; loading the initial load from punched tape into memory; dumping to punched tape or printer the contents of all or some parts of memory in symbolic code; output to punched tape in absolute binary format the contents of the entire or an indicated portion of memory; and asynchronous servicing of input-output.

To implement these functions, the following system programs were developed: A mnemonic assembler language translator (AS SM); the initial load program (NZAGR-SM); the absolute loader program (AZAGR-SM); the text editor program (RT-SM); the debugger program (OTL-SM); the input-output dispatcher program

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(DVV-SM); standard programs that perform floating-point operations, compute transcendental functions, operate on double-precision words, and translate strings into the KOI-7 code and in reverse.

The DOS SM represents a further development of the PLOS SM and is oriented to the single-user mode of work; it is constructed using the modular principle and contains a large assortment of system programs. Beyond the standard assortment of system programs, there are a number of service programs.

The monitor program is the core of the DOS SM and provides for the following: Access to system programs and user programs; execution of data transfer during input-output operations and control of the external memory; processing of errors, and so forth. Also part of the DOS SM are the following: A translator from the macroassembler language, which provides for translation of programs written in macroassembler language, conditional translation, with the ability to partition programs, and for expanding the assortment of assembler commands; a translator from the FORTRAN-IV language providing for translation of programs written in FORTRAN-IV, input-output with direct access, execution of mixed-type operations, precise determination of error locations and establishment of reverse communication with the source program, ability to process signs by using logic variables of 1-byte length; the assembler program, which provides for the transfer of each machine module and the assignment of absolute addresses and creation of a map and a load module; the librarian program, which provides for the creation, change, erasure, and printing of the library content; the debugger program, which helps in the debugging of assembled programs; the editor program, which provides for text editing; and the file management program, which carries out operations involving files.

Technical Data

Processor type	Parallel
System of numeration	Binary
Structure of communication	Single-bus, asynchronous; using a standard system for addressing cells of the main memory and peripheral device registers
Representation of arithmetic operands	Using fixed-point representation, with sign in a supplementary code
Range of representation for arithmetic operands	From -32,768 to +32,767

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Word size of arithmetic operands, bits:	
With fixed-point notation	8, 16 (machine operation)
With floating-point notation	32, 48 (processed by programs)
Word size of logic operands, bits	1, 8, 16
System of addressing	Direct, indirect, referenced, absolute, immediate, indexed, with automatic incrementing and automatic decrementing (12 types altogether)
Address types	No-address, single-address, and dual-address instructions
System of commands	Includes 65 instructions, providing in accordance with the forms of address for the execution of more than 400 different types of operations on words, bytes, and bits
Number of general-purpose registers	8
System of interrupts	Priority, 5-level, with unlimited number of sublevels at each level; controls the sequence of using the processor by all devices of the complex and provides for its operation in real time in a multiprogram mode for a large number of external interrupts
System for servicing interrupts	Automatic, with retention of the command counter content and of the processor status word in the equipment stack
Maximum time required to execute commands, microseconds:	
Register-to-register	5.0
Register-to-memory	7.0
Memory-to-memory	10.0
Transitions	4.0
Subroutine calling and return from subroutines	10.0

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Size of main memory, words	28K
Organization of main memory	Nonpaged
Addressible unit of main memory	Byte, word
Access time to main memory, microseconds per word	1.2
Fetch time, microseconds per word	0.65
Duration of a single common bus cycle, microseconds	0.75 (Common bus cycle is the period during which the given devices form the BUSY signal on the common bus for transmission (reception) of a byte in (from) the buffer register of the executing device)
Maximum time to respond to an external interrupt, microseconds:	
Using a direct access channel	6.0
Using a programmable channel, and including the time to save the contents of the command counter of the register holding the status word and to initiate a new program	10.0 plus time to execute the commands

The maximum number of devices that can be connected to the common-bus interface is 20, but when using additional devices for expanding the interface, the number is architecturally unlimited.

The minimum capacity of the interface is as follows:

Using the channel external to the processor, in 1000s of words per second	At least 700
Using a programmable channel, in 1000s of words per second	At least 30
AC power supply:	
Voltage, B	220/380 $^{+10\%}_{-15\%}$
Frequency, Hz	50 $\pm$ 1
Power required, KVA	2.9

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Area occupied by complex, m^2	At least 15
Area occupied by auxiliary equipment, m^2	At least 10

The SM-3 complexes are to be used with the temperature of the surrounding air at 20 ± 5°C, relative humidity of the air 65 ± 15%, and atmospheric pressure from 630 to 800 mm of mercury.

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UDC 681.51:09:519.713

ON THE METHOD OF MONITORING AN AUTOMATIC MESSAGE-SWITCHING CENTER

Leningrad K VOPROSCU U METODE KONTROLYA AVTOMATIZIROVANNOGO TSENTRA KOMMUTATSII SOOBSHCHENIY in Russian 1979, [manuscript deposited at TsNIITEIpriborostroyeniya 27 Jul 79, No 1128]

KAZACHENKO, YU. M., Leningrad Electrotechnical Institute of Communications

[From REFERATIVNYY ZHURNAL. TEKHNICHESKAYA KIBERNETIKA No 12, 1979 Abstract No 12.81.318 DEP Author's Abstract]

[Text] General problems of designing a subsystem for the control of a communications network are considered. The importance of the measurement and monitoring subsystem to the implementation of control functions is demonstrated. General requirements for monitoring and measuring apparatus designed for automated message-switching centers are formulated. On using the "Pogoda" [Weather] data transmission network as an example, the design principles of monitoring and measurement subsystems are examined, and the expediency of developing a monitoring and measurement package for the switching centers, with the object of streamlining the functioning of the entire network, is demonstrated. Main findings of the investigation of the "Pogoda" network based on the use of the developed monitoring and measurement package are presented. References: 7
[208-1386]

UDC 681.51:007.5:681.325

SIMULATION OF THE DIRECT PRODUCT OF MATRICES BY METHODS OF PICTORIAL LOGIC

Krasnodar MODELIROVANIYE PRYAMOGO PROIZVEDENIYA MATRITS METODAMI KARTINNOY LOGIKI in Russian, 1979, 10 pp [Manuscript deposited at VINITI 29 Aug 79, No 3170-79 Dep]

IVANOV, V. N., PROKHOROV, V. P. and YAKOVENKO, N. A., Kuban' University

[From REFERATIVNYY ZHURNAL TEKHNICHESKAYA KIBERNETIKA No 12, 1979 Abstract No 12.81.360]

[Text] An optical method for the realization of the direct (Kronecker) product of two square matrices within the framework of Boolean logic is presented. An optical system consisting of a light source, a collimator, two matrix transparencies aligned in succession along the line of travel

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of the light, commutators forming the necessary information on the transparencies, and a multi-element photo-receiver matrix is described. A description is presented of the general structure of the matrix transparencies, which serve to obtain at the system's output the Kronecker product of any input matrices. Estimates of the operating speed and functioning capacity of the system are given, and the possible domains of application for the solution of specific problems of computer technology are identified. The possibility of using the system described above as an optical addressing device (decoder) is considered, and in this connection a detailed comparative analysis of various types of optical decoders is presented. References: 9
[208-1386]

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UDC 62-50: 519

DISTRIBUTED MICROPROCESSOR CONTROL

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 1, 1980 pp 14-16

[Article by G. G. Iordan, doctor of technical sciences, N. M. Kurnosov, M. G. Kozlov and V. V. Pevzner, candidates of technical sciences: "Distributed Microprocessor Control -- New Principle in Design Organization of ASU TP [Automated Technological Processes Control System]]

[Excerpts] At present, BIS [Large Integrated Circuits] are being used to create microcomputers which, while inferior to the usual computers in productivity, memory size and software, have other higher technical-economic characteristics. The use of microcomputers expanded the area of application of digital methods for data processing greatly. However, the use of universal microcomputers for solving technological process control problems, especially automatic control problems, is unprofitable due to the fact that they are overloaded with numerous interface circuits and peripheral devices -- either entirely unnecessary or not essential to the process of operating the technical automation facilities. At the same time, universal microcomputers do not have devices available for joining them to analog sensors, actuating mechanisms and the operator-technologist.

In this connection, in creating technical automation facilities, it is more efficient to orient oneself on built-in specialized computers made, like microcomputers, of microprocessor sets of BIS but, due to minimizing technical equipment and the lack of "luxuries," considerably less costly, smaller and lighter and, what is especially important, are more reliable. With this approach, there is a good prospect of changing over to microprocessing equipment even for the most important ASU TP systems, for example, automatic control systems. Such programmed automation devices with a "computer" organization, designed for automatic control of technological processes and called "remikont" No "S"* in

*The name "remikont" No "S" was suggested by the NIIteplopribor and is used in the technical documentation for these products.

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the following regulating microprocessor controllers has become one of the basic components of future ASU TP technical facilities.

The effect of BIS microprocessors on the development of automation facilities was found to be so great that it not only changed the concept of the apparatus design, but it also affected the principle of organization of the system of the ASU TP and, in particular, led to the idea of distributed control characterized by a wide use of digital microprocessor devices, each one of which processes a limited volume of data.

Special Features of Modern Control Systems

At present, two approaches to the design of technological process control systems are widely used.

In the first approach, the orientation was taken primarily on analog technical devices, used independently or jointly in a device system, organized according to a decentralized principle [2]. In the other approach, it is proposed to use considerable control centralization based on computers.

Compared to a modern centralized control system, operating in the NTsU [Direct Digital Control] mode, the distributed ASU TP has two inherent basic advantages: considerably greater viability and efficient utilization of cable communications. This is due to the nature of the distributed control: the dispersal of the computer capacity of the system among many microprocessor devices, as well as in the space occupied by the facility being controlled.

Moreover, a distributed system creates premises for using "intellectual" terminals which implement a wide collection, long-term storage, convenient presentation and efficient documentation of the data, characterize the parameters of the technological process, the condition of the equipment and the technical-economic indicators of the system. Finally, a very important circumstance is the expected reduction in the time in putting the control systems in operation [5], which becomes possible due to the decentralization not only of the apparatus, but also of the software that will permit debugging the systems in parallel in both directions and implement stage-by-stage assimilation of the technical facilities.

The indicated advantages of the distributed ASU TP are also preserved in comparison to the hierarchic system made of combined analog and digital technical facilities.

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DEVELOPMENT OF MEASURING-COMPUTER COMPLEXES

Moscow PRIBORY I SISTEMY PRIBOROSTROYENIYE in Russian No 1, 1980 pp 17-19

[Article by E. I. Tsvetkov, deputy director of the VNIIEP [All-Union Scientific Research Institute of Electric Measuring Devices] on scientific work, doctor of technical sciences]

[Excerpt] At present, the "Soyuzelektropribor" VO [All-Union Association] completed and is carrying out the following investigations and developments: the creation and organization of the production of four IVK [Measuring-Computer Complex] -- for automating scientific investigations (IVK-1, IVK-7 and IVK-8) and for diagnosing conditions of machines and mechanisms with internal combustion piston engines (K736); 12 IVK are being developed for the automation of metrological tests (K740) and (K743), thermal strength tests (K742), scientific experiments, stand tests, etc. They will utilize SM-3, SM-4, "Elektronika-60" and "Iskra-126" computers.

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AUTOMATED COMPLEXES FOR TESTING EQUIPMENT

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 1, 1980 pp 19-21

[Article by V. G. Manuylov, A. A. Khrizolitov, candidates of technical sciences, V. A. Strokov, doctor of technical sciences]

[Excerpts] One urgent direction in developing facilities for testing the strength of materials and components is the creation of automated complexes (AK) that include the testing machine and a computer system (VS).

The functional possibilities of AK are determined by its being equipped with apparatus and software, as well as the design of the VS. The necessity of taking these factors into account in designing the AK is related to the fact that the complex must have a certain "flexibility" that guarantees a high utilization coefficient of the test machine, as well as of the VS servicing it. Yet, the AK should be relatively inexpensive and simple in order to provide mass testing under conditions of plant quality control in accordance with regulated methods. At the same time, it is necessary that the AK be able to carry out testing according to complicated programs that, in a number of cases, could not be done without using computers [1] .

The purpose of the investigations is the creation of an AK that meets the indicated requirements. At the first stage, the problem was posed of developing and preparing for series production automated testing machines with VS designed on the basis of programmed microcomputers. The second stage includes measures for changing the VS over to microprocessors with "rigid" programs. Some results of the work on the first stage are discussed in this article.

The following may be considered the basic results of the work.

1. A method was created for selecting a UVM [Control Computer] type depending upon the type of test machine (the object module) and the kind of test made on it.

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2. It was shown that to automate testing in accordance with regulated methods, a medium speed ($\tau < 3 \times 10^{-3}$ seconds) UVM may be used, in particular the 15VSM-5 minicomputer, which is the least expensive and is capable of automating series manufactured testing machines.

3. Program algorithms were developed for two kinds of tests that are capable of serving as a basis for creating AK using UVM microprocessors with a "rigid" program.

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ABSTRACTS OF ARTICLES IN PRIBORY I SISTEMY UPRAVLENIYA

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 1, 1980 p 46

[Excerpts] UDC 62-50-192: 62-50.003.1

Influence of reliability on efficiency of ASU TP [Automated System of Control of Technological Processes]. Yastrchenetskiy, M. A.; Plotkin, V. A. PRIBORY I SISTEMY UPRAVLENIYA, 1980, No 1.

The influence of environment, repair personnel, higher management organs, operating conditions, etc. on the reliability of the ASU TP are considered. A detailed description is given of the methodology of analyzing the relationship between the reliability and efficiency, including the breaking down of the functioning purpose into composite and simple functions and the breaking down of economic efficiency indicators into technological and informational consideration of several special cases. Two illustrations, bibliography contains nine titles.

UDC (62-50-192: 62-50.003.1) 001

Analyses of efficiency of ASU TP with emergency protection subsystems. Volik, B. G.; Lubkov, N. V.; Zlobinskiy, V. I. PRIBORY I SISTEMY UPRAVLENIYA 1980, No 1.

Method is described for evaluating reliability and efficiency indicators of an ASU TP with emergency protection subsystems (PAZ), based on statistical simulations of the working capacity conditions of the system. Simple, emergency and chain reaction failures were considered. Models of single components and combinations of the latter by duplication and by the majority arrangement were made. An example is given of indicators for a steam generating installation and an evaluation of the optimal monitoring frequency for information channels of the PAZ. Six illustrations, two tables, bibliography contains two titles.

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Some problems of Maintenance of ASU TP. Lerner, V. Yu.; Shishonok, N. A.; Karaul'shchikov, V. P. PRIBORY I SISTEMY UPRAVLENIYA, 1980, No 1.

Maintenance of an ASU TP is described as a totality of function monitoring, technical servicing, all types of repairs, procurement of spare components, recruiting repair and operating personnel, and gathering and processing data. Components for assuring maintenance at various stages of creating ASU TP are discussed.

UDC 389.64:681.2: 62-52

Metrological reliability of measuring of ASU TP systems. Gol'drin, V. M.; Blokha, A. V. PRIBORY I SYSTEMY UPRAVLENIYA, 1980, No 1.

Specific investigations are considered of the reliability of measuring systems (IS) for an ASU TP in cases of concealed metrological failures, with the determination of special features of the investigations for local and multichannel IS. Experimental characteristics of the metrological reliability of multichannel IS, used in ASU for power units are described. One illustration, bibliography contains three titles.

UDC (62-50-192).001

Analysis of reliability of an ASU TP at the design stage. Genis, Ya. G. PRIBORY I SISTEMY UPRAVLENIYA, 1980, No 1.

Maintenance and reliability rating of ASU TP functions are analyzed. Recommendations are given on selecting equipment, organizing the monitoring and diagnostic systems, technical servicing, preparation of software and data files. Bibliography contains six titles.

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HOLOGRAPHIC DATA RETRIEVAL SYSTEM WITH INVERTED FILE ORGANIZATION

Moscow NAUCHNO-TEKHNICHESKAYA INFORMATSIYA. SERIYA 2. INFORMATSIONYYE PROTSESSY I SISTEMY in Russian No 1, 1980 pp 8-12 manuscript received 7 Dec 78

[Article by V. M. Zakhavchenko]

[Text] Recent years have been characterized by a rapid development of optical systems for transmitting and processing data. The start of this period coincides chronologically with the appearance of coherent radiation of optical range sources (lasers) and, on their bases, the realization of holography and information theory methods.

The interest of specialists in this area is due to the fact that the data transit capacity of optical communications channels is much greater than the transit capacity of modern electronic device channels. Moreover, optical systems make it possible to process data in parallel over many channels. For the usual lens, the number of optical channels passed is equal to the number of picture points being resolved and exceeds several millions.

One of the most important directions in developing optical systems for data processing is the use of coherent optics and optical holography methods in IPS [Data Retrieval System].

Existing IPS using computers made it possible to automate the data retrieval process; however, their mass use is being delayed by the high cost of the equipment and the insufficiently high productivity.

Holographic IPS (GIPS) make possible a sharp reduction in the retrieval time and make automated data retrieval more accessible to the user.

Practically all known holographic IPS use direct file organization. The technical base of these GIPS has a hybrid nature and is designed on the basis of a combination of a holographic memory and an electronic processor that executes the operation of comparing retrieval instructions (PP) with retrieval images of documents (POD) [1, 2].

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The possible use of the holographic technique for retrieval in inverted organization files has been investigated less extensively although, as shown by studies, such file organization makes it possible to implement a purely optical data retrieval process and realize all the advantages of optical data processing systems more fully.

In holographic IPS with inverted file organization, the ordinal numbers of all file documents are brought into a mutual one-to-one correspondence with coordinates (number of line and column)of elements of some retrieval matrix, so that a certain document corresponds to each cell of the matrix. For each descriptor used in the IPS dictionary, a retrieval matrix is composed containing data in the binary form on the presence of the given descriptor in the retrieval images of the documents.

An example of the realization of such matrices is superpositioned punched cards, in whose cells holes are punched if the retrieval images of corresponding documents contain the given descriptor.

Matrices in holographic IPS are recorded on microholograms (0.5 to 2mm in diameter). A block of such microholograms is placed on a plate. The total number of microholograms on a photographic plate is equal to the number of descriptors in the dictionary used. The number of data bits recorded on each microhologram is equal to the number of documents in the retrieval file. The product of these numbers determines the total number of data bits recorded on the plate. Since the possible recording density at present is about 10^8 bits/cm^2, a retrieval file of 10^6 POD can be recorded in a 10^4 descriptor dictionary on a 1dm^2 plate. Taking into account the recording reliability and data restoration requirements, this number should be reduced to 10^5 POD per 1dm^2.

A criterion of correspondence between PP and POD with a partial input of PP into POD is used for the retrieval. To each i-th PP descriptor is assigned a weighted coefficient n_i, corresponding to the relative importance of the given descriptor in the interrogation. The sum S of the weighted coefficients of coinciding descriptors in PP and POD is maximal, if all descriptors in PP are in the retrieval image of the document.

In this case

$$S = \sum_{1}^{N} n_i.$$

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where N -- number of descriptor in PP. The document in considered to be relevant, i.e., corresponding to the interrogation, if for it

$$S \left| \sum_{1}^{N} n_i > k, \right.$$

where k -- relevancy threshold which can have a value from 0 to 1.

An arrangement shown in Fig. 1 is used for realizing the described correspondence criterion.

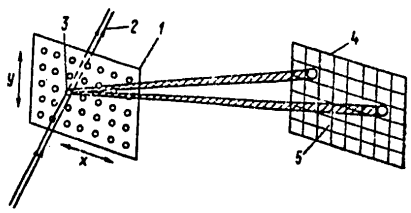

Fig. 1. Schematic diagram of retrieval.
1. Block of retrieval holograms
2. Laser beam
3. Microhologram
4. Light-sensitive material
5. Coordinate grid

In the retrieval process microholograms (3), corresponding to descriptors PP are restored in sequence by moving the block of retrieval holograms (1) with respect to laser beam (2). The images of the retrieval matrices recorded on them are projected on the surface of the light-sensitive material (4) with the coordinate grid (5) plotted on it.

Exposure E_i of each matrix is proportional to weighted coefficient n_i corresponding to descriptor PP. $E_i = en_i$ where e -- exposure corresponding to weighted coefficient n - 1. The total exposure of the coordinate grid cell is equal to e.S. The maximum cell exposure is

$$E_{max} = e \sum_{1}^{N} n_i.$$

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To establish the signal recording threshold level, corresponding to the relevancy threshold, an optical signal discrimination is used taking into account the nonlinearity of the light characteristic of the recording medium. For this purpose, materials with sharply nonlinear characteristics are used as a light-sensitive medium, for example, high contrast photoemulsions (such as "Mikrat-300").

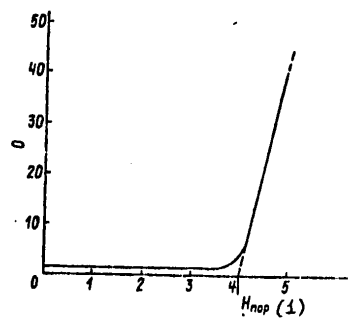

Fig. 2. Relationship between nontransparency O of "Mikrat-300" emulsion and value of exposure H (in relative units) (λ = 0.63 microns).

1. $H_{пор}$

Fig. 2. shows the relationship between nontransparency coefficient O and the value of exposure H. The curve has a region of initial insensitivity up to some threshold value $H_{пор}$ of the exposure. From $H_{пор}$ follows a section of approximately linear relationship after which the curve goes out to a platean. The signal will be recorded by the photoemulsion if $eS > H_{пор}$. Although curve O(H) does not have a clearly expressed breaking point $H_{пор}$, the threshold signal level $O(H_{пор})$ can be easily determined visually. If the retrieval requires high precision of tracking the threshold level, then the initial section of curve O(H) may be easily corrected when processing the film. If

$$e = H_{пор} \Big/ k \sum_{1}^{N} n_i,$$

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is selected, the condition for signal recording has the form:

$$H_{\text{пор}} \cdot S \Big/ k \sum_{1}^{N} n_i > H_{\text{пор}}$$

or

$$S \Big/ \sum_{1}^{N} n_i > k,$$

which coincides with the selected correspondence criterion.

Before interrogation (PP) is introduced into the system, the value of

$$k \sum_{1}^{N} n_i,$$

is calculated, then, the power of the laser beam is changed inversely proportionately to this value by an attenuator and power meter. Thus, the values of the total exposure with respect to the threshold sensitivity level of the light-sensitive material are normalized. The number of descriptors in the interrogations is in no way limited. The weighted coefficients of each descriptor in the retrieval are established by a proportional change in the exposure time. Documents with a relevancy coefficient higher than the established threshold are recorded in the output plane as a result of the retrieval. The relevancy coefficients can be evaluated more precisely by changing the value of the output signal within the limits of the linear section of the light characteristic of the emulsion. The document relevancy coefficient can be evaluated visually to an accuracy of up to several percent. Fig. 3a shows a photograph obtained in the output plane of the retrieval device when the relevancy threshold is k = 0.8; Fig. 3b shows results of the retrieval for the same interrogation, but with a relevancy coefficient k = 0.9.

Besides retrieval according to the considered correspondence criterion, the holographic system makes it possible to retrieve by the fact that the POD contains all PP which corresponds to retrieval in accordance with mutually exclusive formal-logic criteria (year of issue, author's name, type of material, etc.). In this case, the retrieval matrices are written in an additional binary code. The coordinate grid cells, corresponding to the POD not containing the given descriptor, light up when restored in the process of retrieval. With sequential restoration of all PP descriptor matrices only those cells remain unlit which correspond to the POD that contain all PP descriptors. The result of retrieval by the condition that the POD contains all PP is shown in

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Fig. 4. The principle of such retrieval is similar to that used in data retrieval systems using superpositioned punched cards.

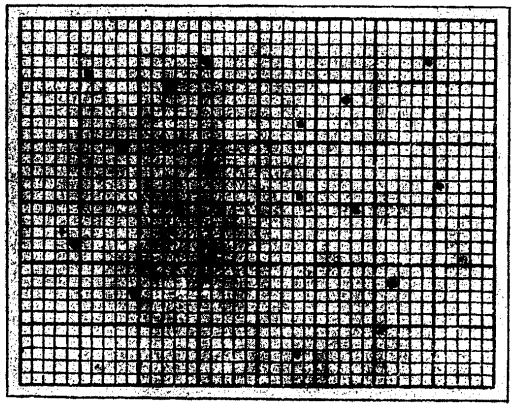

Fig. 3a. Retrieval results with relevancy threshold k = 0.8.

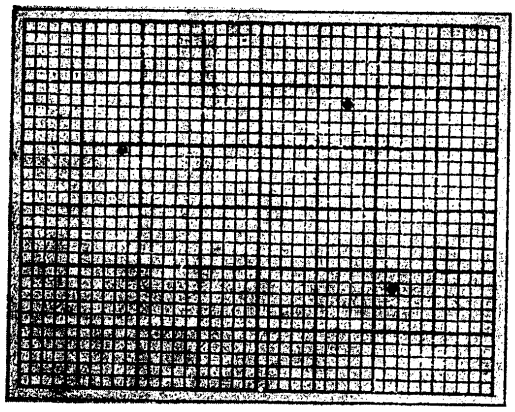

Fig. 3b. Retrieval results with relevancy coefficient k = 0.9.

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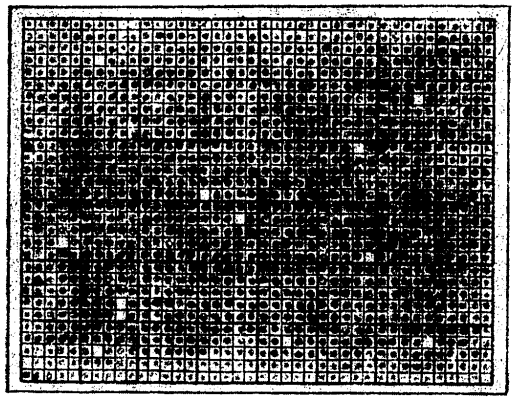

Fig. 4. Example of retrieval using condition that POD contains all PP.

The arrangement for implementing the described retrieval methods is shown in Fig. 5.

Fig. 5 includes the following components: a laser, deflector, hologram matrix and a photoreceiver. Also included are a channel for setting the relevancy threshold, a channel for introducing weighted descriptor coefficients and a visual monitoring channel. The arrangement can simultaneously process a file of up to 10^5 documents without changing the matrix. The retrieval time is several milliseconds and is determined basically by the time of introducing and recording the data.

Addresses and abstracts of relevant documents are given out in the following stage of retrieval. For this purpose, each holographic retrieval unit is provided with a holographic plate with a matrix of microhologram abstracts. On each microhologram the data of one document and its brieg abstract is recorded. The disposition of the holograms in the matrix is similar to the initial distribution of the file documents in the coordinate plane.

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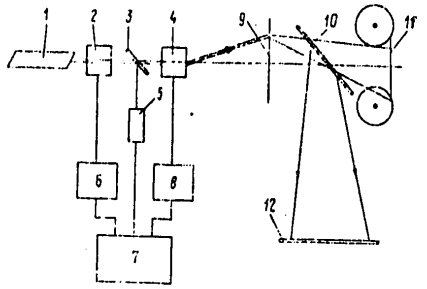

Fig. 5. Arrangement of retrieval device

1. Laser
2. Light flux attenuator
3. Semitransparent mirror
4. Deflector
5. Photoreceiver
6. Attenuator control unit (relevancy threshold)
7. Control unit
8. Deflector control unit (introduction of descriptors)
9. Hologram matrix
10. Semitransparent mirror
11. Light-sensitive material
12. Screen

When abstracts of relevant documents are read out, holograms are restored whose coordinates coincide with the coordinates of the light signals obtained as a result of the retrieval (Fig. 6). It should be noted that a similar principle was used in the American "Microcite" system operating with superposed punched cards [3].

The restored images are recorded on a microfilm and read out off the screen visually. The final result of the retrieval is a microfilm with abstracts of relevant documents and their addresses in the basic storage unit.

The entire retrieval process can be done on a simplified version of the arrangement with the manual movement of the hologram unit. In this case, retrieval without changing the unit takes one minute.

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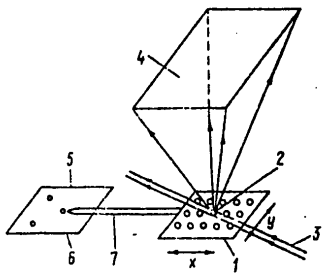

Fig. 6. Arrangement for read-out of relevant document abstracts

1. Movable microhologram unit
2. Restored hologram
3. Laser beam
4. Screen
5. Film with results of retrieval
6. Signal indicating coordinates of the relevant document
7. Sight, rigidly connected to the microhologram unit

A retrieval file of 10^6 documents can be placed on several tens of holographic units and can be multiplied easily by existing methods of copying holograms [1]. The retrieval is done directly by the user without the need for long training.

Due to the elimination of all intermediate links between the user and the IPS, as well as the short retrieval time, a dialog mode of retrieval is possible with consequent correction of the interrogation.

The cost of a simplest retrieval device is not high because the described holographic IPS may be placed at the working position of the subscriber in the form of a desk version with a compact file of several million documents.

A holographic IPS with an inverted file organization may also be made of "hybrid" electronic-optical circuits usually used in holographic IPS. In this case, light signals restored from the holograms are projected not on light-sensitive material, but on a photodiode matrix. Electric signals from the photodiodes are sent to an electronic processor which does the logic processing of the data. Addresses of the documents found are shown on the display screen or are printed. The

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system, of course, is not as good as the purely optical system in such parameters as speed of retrieval, complexity and cost; however, it provides high functional possibilities and a more flexible interaction between the user and the IPS due to convenience in data input and output, as well as changing the algorithm of the retrieval.

On the basis of the described method, it is possible to create not only a document, but also a factographic IPS. The apparatus base is the same. Thus, an experimental file for system investigation was prepared from RZh [Abstract Journal] VNIITI [All-Union Institute of Scientific and Technical Information]. The retrieval in this file was made according to formal-logic criteria by PP being fully contained in the POD, while retrieval by relevancy was made by PP being partially contained in the POD with weighted coefficients and and a relevancy threshold. It should be noted that such a file is very convenient for introduction into a holographic IPS. The abstracts of monthly issues of all RZh are recorded in one holographic unit. This unit together with the address unit make up a finished retrieval file for holographic IPS, a copy of which may be sent to users, as well as the RZh itself. The cost of the file copy (for example, on a thermoplastic) is many times lower than that printed on paper. Of course, providing each user with a holographic apparatus presents certain difficulties but, in its time, a similar problem did not interfere with the development of microfilming equipment. A holographic retrieval device is not much more complicated than the common read-out device and offers the user possibilities that are only available at present in an automated IPS equipped with a computer.

Among the shortcomings of the system is the difficulty of making changes in an already recorded data file (unlike in the computer system). When a part of the file has to be corrected, it is necessary to rerecord the entire hologram unit. For this reason, it is most expedient to use holographic IPS with inverted file organization for data retrieval in constantly supplemented, but rarely corrected files. In most cases, such files are document files supplemented by various periodic and nonperiodic issues and a considerable number of photocartographic files.

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UDC 681.322:519.76

REALIZATION OF APPLICATION PROGRAMS ON YES COMPUTERS

REALIZATSIYA PRIKLADNYKH PROGRAMM NA YES EVM in Russian, Preprint No 171, Computer Center of the Siberian Affiliate of the USSR Academy of Sciences 1979 18 pp

KOTOK, V. P., MIKHAYLOV, A. M., TARTAKOVSKIY, A. V., TUMARKINA, B. L. and SHIRMAN, YU. YA.

[From REFERATIVNYY ZHURNAL, AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 1, 1980 Abstract No 1 B104 by T. M. Kuznetsova]

[Text] Application programs realized in high-level languages (PL/1, FORTRAN) for computers in the YeS series are described. The coding system and a block diagram of a program for processing the results of sports contests and evaluating the performance of players are presented. A program for computing the heat-balance components as part of the determination of the need for field irrigation is described. An interpreter of the "Promin'" language for small computers with FORTRAN programming system and the algorithmic training language MAG-1 designed for beginner programmers are described.
[212-1386]

UDC 681.326.7

THE "MIR-1"--M-220 TRANSLATOR HARDWARE AS AN EXPANSION OF MICROPROGRAMMED CONTROL BY THE "MIR-1" COMPUTER

TRUDY FIZICHESKOGO INSTITUTA AN SSSR in Russian Vol 112, 1979 pp 92-96

PELIPENKO, V. I.

[From REFERATIVNYY ZHURNAL. AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 1, 1980 Abstract No 1 B193]

[Text] An interpreting-type translator for interfacing small and large computers, as exemplified by the "Mir"-series and M-220 computers, has been developed. The translator is realized by the structually fixed method on the basis of microprogrammed control of "Mir"-type computers. The developed interfacing system has made it possible to adjust programs for the BESM-4, M-220, and M-222 computers without utilizing their own time, as well as to control all the peripherals of the M-220 type computers on the basis of the "Mir" computer language and to transmit information via cable from the "Mir" computer to the M-220 computer.
References: 8
[212-1386]

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UDC 681.518:519.878

LOGICAL AND PHYSICAL ORGANIZATION OF ISK DATA BASE

Dubna OB'YEDINENNYY INSTITUT YADERNYKH ISSLEDOVANIY. SOOBSHCHENIYA in Russian No R10-12445, 1979 7 pp

GOVORUN, N. N., MAL'TSEVA, S. M., NIKITINA, V. I. and TENTYUKOVA, G. N.

[From REFERATIVNYY ZHURNAL. TEKHNICHESKAYA KIBERNETIKA No 12, 1979 Abstract No 12.81.651]

[Text] The organizational principles of the data base of the ISK system are considered from the point of view of the applied programmer and the user of the system (logic organization). The procedure for the organization of data in the storage medium (physical organization) also is considered. The control system for the ISK data base is designed to operate with documents of the card-file type and is realized on a BESM-6 computer. The system contains two types of structures: tree and network. The structure of the document, representing the fundamental unit of the data base, is discussed, as are the relations among the recordings of different logic files. The system employs the organization of the document file on the basis of the method of shaping partially inverted lists. The ISK system is geared for use in information retrieval systems, and it has been realized in the personnel management problem of the ASU [automated control system] of the United Institute of Nuclear Research, and it may be used in other problems of ASU with card-file type documents. [208-1386]

UDC 681.51:681.3:658.518

AUTOMATION OF GEOMETRICAL MODELING WITH THE AID OF THE FAP-KF LANGUAGE

VESTNIK MASHINOSTROYENIYA in Russian No 10, 1979 pp 66-69

GORELIK, A. G. and BURAKOVA, V. YA.

[From REFERATIVNYY ZHURNAL. TEKHNICHESKAYA KIBERNETIKA No 12, 1979 Abstract No 12.81.373 by T. M. Kuznetsova]

[Text] The formalized apparatus of geometrical modeling (FAP-KF), representing a batch of programs written in FORTRAN, is proposed as an automatic programming system. With respect to its users, FAP-KF operates as an autonomous geometrically oriented language representing a complementation of FORTRAN by geometrical variables and operations. The

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language is geared to the automation of geometrical calculations and engineering-graphic operations. The apparatus of FAP-KF is used to simulate the kinematics of mechanisms and to compute the closing links of dimensional circuits, and it is also used as a programming language in the design of geometrical units of automatic design systems, in the development of algorithms and programs for the solution of complex geometrical problems for the coding and computation of the canonical parameters of structural components and elements. The FAP-KF contains about 200 geometrical operations for the determination of geometrical objects. A sample program for compiling the technological chart for the twin-row cutting of shaped blanks from a strip, written with the aid of FAP-KF, is presented. Figures 3.
[208-1386]

UDC 681.51:007.5

EFFECTIVE CODING OF HATCHED IMAGES FOR AUTOMATIC INSERTION INTO A COMPUTER

Kiev OTBOR I PEREDACHA INFORMATSII in Russian No 58, 1979 pp 29-33

KISELEV, V. M. and ROMANOV, V. P.

[From REFERATIVNYY ZHURNAL. TEKHNICHESKAYA KIBERNETIKA No 12, 1979 Abstract No 12.81.352]

[Text] An algorithm for effective coding of hatched images for automatic insertion into a computer is proposed. The need to investigate the structural and statistical properties of complex graphic patterns with the object of their economical description and optimization of the computer resources (memory capacity, computer time) expended on their processing is substantiated. Figures 1; references 7.
[208-1386]

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AUTOMATION OF THE FORMATION OF THE INPUT MATRICES OF ECONOMIC-MATHEMATICAL MODELS OF OPTIMIZATION OF BRANCH STRUCTURE OF OUTPUT BY MEANS OF A YeS COMPUTER

IZVESTIYA VUZOV. TEKHNOLOGIYA LEGKOY PROMYSHLENNOSTI Vol 22 No 3, 1979 pp 7-11

MISHKOVSKIY, N. T. and KLYUKOVKIN, V. N.

[From REFERATIVNYY SBORNIK, ORGANIZATSIYA UPRAVLENIYA No 11, 1979 Abstract No 11.67.124 Author's abstract]

[Text] Facilities for solving problems of linear programming with the aid of YeS computers are indicated. Their advantages are briefly described, the techniques for the solution of optimization problems based on the use of these facilities (program packages) are demonstrated, and the attendant disadvantages, consisting in the fact that these program batches do not assure obtaining the matrix of the model from the problem-related documents in a form suitable for solution, is pointed out. This disadvantage--the large number of branches of light industry in the Ukrainian SSR for which the optimization calculations have to be performed, as well as the large size of the matrix of economic-mathematical models (EMM) for the optimization of the branch structure of production--requires refinements in the techniques for the solution of optimization problems. These refinements are viewed by the authors as consisting in the automation of the formation of the model matrices from the problem-related documents on magnetic carriers. A corresponding program for the formation of such matrices is proposed. The program is based on specially developed specific constraints on the model and on the characteristics of the documents used for matrix-formation. A table termed "section" represents the form of the description of the constraints and documents of the problem. The principal means of performing matrix-formation from documents is the indexes of economic-mathematical models, present in the form of codes in the documents. A standard terminology for matrix variables, based on the operation of the matrix-forming program, is proposed. This standard terminology is convenient for the analysis of the obtained solution of economic-mathematical models and provides a graphic idea of the structure and dimensions of the matrices of such models.
[191-1386]

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UDC 681.51.09:519.878

INVESTIGATION OF A SYSTEM FOR DIAGNOSTICS OF DIRECT-ACCESS MEMORY UNITS OF THE SEMICONDUCTOR TYPE

TRUDY MOSKOVSKOGO ENERGETICHESKOGO INSTITUTA in Russian No 419, 1979 pp 94-97

OGNEV, I. V., ROZANOV, YU. A., SARYCHEV, K. F. and ISAYEV, O. V.

[From REFERATIVNYY ZHURNAL. TEKHNICKESKAYA KIBERNETIKA No 12, 1979 Abstract No 12.81.271 by T. M. Kuznetsova]

[Text] The problem is investigated of the diagnostics of semiconductor of direct-access memory units (DAMU) of increased reliability with the accuracy of a microcircuit. The operating algorithm of the diagnostic device is examined, and the constraints imposed on the DAMU structure by the diagnostic system are considered. If the diagnostic algorithm is to reveal the number of the failed microcircuit without identifying the type of the failed element, the microcircuits of the discharge shaper, the mode shaper, and the readout amplifier should all be made from elements of the same type. In this connection, functionally different elements belonging in a microcircuit should be connected to an identical number of DAMU discharges. It is shown that information on the prehistory of DAMU virtually does not affect the accuracy of the diagnosis, and hence the expediency of using that information for the subsequent identification of incorrect memory microcircuits can be decided upon following an analysis of the time of passage of the monitoring test through the DAMU. It is pointed out that the structural design algorithm of DAMU should allow for constraints on DAMU structure such so as to make possible diagnostics with the accuracy of a microcircuit in accordance with the proposed algorithm. Figures 1; references 1.
[208-1386]

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UDC 681.3.06

CERTAIN PROBLEMS OF INFORMATION CODING IN A DATA BASE

Moscow VOPROSY INFORMATSIONNOY TEORII I PRAKTIKI in Russian No 41, 1979 pp 61-67

DENISENKO, A. V.

[From REFERATIVNYY ZHURNAL. INFORMATIKA No 1, 1980 Abstract No 1 I209 by V. L.]

[Text] The possibilities for enhancing the effectiveness and achieving correctness of the coding of information in data bases are examined. These possibilities may be taken into account in the development of fundamentally new agreements about data coding. The DKOI code (analogue of EBCDIC) may be retained for writting prorams. References 8. [212-1386]

UDC 681.518:519.878

THE "ORIYENTIR" AUTOMATED SCIENTIFIC AND TECHNICAL INFORMATION SYSTEM

AVTOMATIZIROVANNAYA SISTEMS NAUCHNO-TEKHNICHESKOY INFORMATSII "ORIYENTIR" in Russian, Preprint No 3, Institute of Electric Welding, UkrSSR Academy of Sciences 1979, 27 pp

BERNADSKIY, V. N. and GRIGOROVICH, T. N.

[From REFERATIVNYY ZHURNAL. TEKHNICHESKAYA KIBERNETIKA No 12, 1979 Abstract No 12.81.656]

[Text] The basic principles of the design and functioning of the ORIYENTIR automatic technical and scientific information system developed at the Institute of Electric Welding imeni Ye. O. Paton, UkrSSRAcademy of Sciences, are considered. The system serves to perform optimized information searches of REFERATIVNYY ZHURNAL "SVARKA" [Welding] reaching as far back as the year 1961 to the present. The search produces a list of the numbers of abstracts in "SVARKA" pertaining to the topic researched. [208-1386]

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AUTOMATED DESIGN

Moscow PRIBORY I SYSTEMY UPRAVLENIYA in Russian No 2, 1980 pp 34

[Article by V. V. Adamchik and A. A. Konoplyanik, engineers and A. G. Rakovich, candidate in technical sciences: The "Conductor-3 system of automated design of devices"]

[Excerpts] Technical specifications of the "Conductor-3" system

Computer models which can be used.....YeS-1020, YeS-1022, YeS-1035
Operating system.....DOS/YeS
Minimum size of working memory in K Bytes..... 256
Basic programming language..... FORTRAN-IV
Minimum sizes of processed components in mm
  length.....50
  Width.....30
Maximum number of processed apertures..... 500
Limiting diameters of processed apertures in mm..... 25-10
Average time in min
  origination of input data (coding and punching)..... 30
  Solution of problem on the computer..... 10
Drafting of plans on the graph constructor..... 30

In distinction from the previously developed systems "Conductor-1" and "Conductor-2" for automated design of drilling devices, the "Conductor-3" system, based on a third generation computer, can work in a complex not only with the drafting-graphic automaton "Itekan-2M" but also with other graph constructors "Itekan-4," YeS-7054 and YeS-7051, the maximum number of apertures processed in the conductor has been increased to 500. The main distinguishing feature of the "Conductor-3" system is the structure of the library of design elements on which automated synthesis of a design is based.

The use of the "Conductor-3" system yields a mean savings of about 50 rubles from the development of one design (with design and engineering documentation). Thus, if as many as 100-150 pieces of equipment are designed in a year it becomes expedient to install the system.

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The use of the system in the economy leads to an 8-10fold lowering in expenditure on design.

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NUMBER OF SERVICING PERSONNEL

Moscow PRIBORY I SYSTEMY UPRAVLENIYA in Russian No 2, 1980 p 6

[Article by N. A. Shishonok, V. Yu. Lerner, Candidates in Technical Sciences, V. P. Karaul'shchikov, L. A. Artik, Engineers: "Calculation of the number of repair and operating personnel for an ASU TP(automated system of control of technological process)]

[Excerpt] The determination of a rational number of repair and operating personnel (REP) for an ASU of a TP (Automated Control System for a Technical Project) is one of the problems of providing for the technical operation of systems and is performed with the purpose of obtaining initial information for drawing up a staffing schedule.

This article presents the basic content of a methodology developed to calculate the number of REP.

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UDC (658.152.1:658.012.011.56).003.1

THE PROBLEM OF "OLD" EQUIPMENT IN EVALUATING ECONOMIC EFFICIENCY OF ASU

Moscow PRIBORY I SYSTEMY UPRAVLENIYA in Russian No 1, 1980 p 40

[Article by E. L. Itskovich, doctor of technical sciences, V. N. Livshitz, doctor of economic sciences]

[Excerpt] The introduction of an ASU [Automatic Control System] is usually tied to the freeing of a part of the existing equipment which, at this time, may be only partially amortized, since it did not complete its full service life. Thus, when an ASU is introduced for an individual technological unit, its analog regulators become unnecessary, and the entire monitoring and control panel with tens of indicating and recording devices is replaced. When introducing an operational ASU for production control, for example, some individual units (machine tools, assemblies) may become unnecessary due to higher productivity and, because of better coordinations and better operating regularity of production sections, a number of intermediate capacities becomes unnecessary.

Two situations are possible in this case: the freed equipment may be used at another place at the same enterprise in this industry (with the same or new efficiency of utilization), and when it is not suitable for use at other facilities it must be scrapped.

The question arises -- how to calculate the cost of the freed unamortized equipment when evaluating the effectiveness of of introducing ASU and how will it be reflected (and should it) in the cost indicators utilized in evaluating the effectiveness of ASU (capital investments, operating costs)?

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UDC 681.2 "71": 621.31

POWER INSTRUMENT MAKING DEVELOPMENT

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 1, 1980 pp 1-3

[Article by K. N. Rudnev, Minister of the USSR Ministry of Instrument Making and Automatic Control Systems Facilities]

[Excerpts] A qualitatively important new stage in raising the automation standard of power facilities was the use of computers to process great masses of measurement and other data, forming power unit control instructions and solving most important dispatcher problems. For this purpose, it was necessary to create special control computers (UVK) capable of receiving measurement data directly from the controlled facility and to solve this or another control problem in real time. The first such UVK were produced by our industry in 1960-1961 ("Dnepr," UM-1NKh) and then, on the basis of experience in utilizing them, a modular complex of computer facilities (ASVT) was created, a number of whose models (M-6000, M-60, M-40, M-4030) found fairly high application in power engineering. In recent years, the UVK-ASVT were replaced by a new generation of computers with higher technical-economic indicators and the facilities of an international system of mini-computers, the SM-computers. A continuity is provided with the models of the ASVT complex in these computers.

The TsNIIKA [State Central Scientific Research Institute of Comprehensive Automation], in cooperation with the VGPITYeEP [expansion unknown] "Teploproyekt" (Moscow), NPO [Scientific Production Association] "Elva" (Tbilisi) and NPO "Impul's" imeni 25th Party Congress, developed the "Kompleks-ASVT" data-computer system, the central part of which is a data-computer complex (IVK) with data and computer subsystems based on ASVT M-60 and M-6000. This system is in operation at the Zaporozhskaya and other GRES (State regional electric power station). It is designed to control 250 to 800 megawatt units.

AES automation requires a number of special technical facilities and automation devices. These include special temperature and power

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detection sensors, devices for monitoring the neutron flow, systems for controlling and protecting the reactor, apparatus for radiation monitoring and systems for intrareactor monitoring (VRK).

The IVK is the basic means for gathering, processing and presenting data on the power unit as a whole. The "Uran-V2" system was developed by the TsNIIKA using two computers: the SM-2 and the M-60. The data are displayed by two pairs of the "Orion" systems on colored electron beam screens. About 1000 analog and 4000 to 5000 discrete signals are introduced into the IVK. To increase reliability, a part of the analog signals are introduced into the IVK twice.

The development of remote signaling, remote control and remote measurement facilities began in the first five-year plan period and even then were used by the dispatcher service of Mosenergo [Moscow Regional Administration of Power Management] and other associations. In the thirties, these were relay-contact devices. Modern telemechanics devices were a modular complex of telemechanics equipment (ASTT). In the Eighth Five-Year Plan period, these facilities of the second generation are made of discrete components (TM-500), while in the Ninth Five-Year Plan period, the third generation ASTT was made with integrated circuits (TM-511). In the Tenth Five-Year Plan period, the second phase of this system will be created using built-in microcomputers (UVTK-501).

Over 100 type TM-500 systems are being successfully operated at many power systems. Since 1974, the "Promavtomatika" Plant (Zhitomir) has series manufactured complexes of the third generation TM-512 being used at a number of power associations. Among them the following united dispatcher administrations should be specially noted: the Urals (Sverdlovsk), Central Asia (Tashkent), Kazakhstan (Alma-Ata) and Central Volga (Kuybyshev).

In its time, the TM-500 complex made it possible to take a great step in organizing dispatcher control following the change from single-channel remote measurement and relay-contact remote signaling. TM-511 and TM-512 complexes made it possible to increase considerably the volume of gathered and processed data raising the quality indicators at the same time.

The introduction of the TM-512 complex preceded the equipping of the TsDU [Central Dispatcher Control] of the USSR power system with TM-511 complexes where they, together with the type TA-100 remote automatic complex, form a special design system named "Telekomplex" for gathering and processing data.

In 1979, the "Promavtomatika" Plant began manufacturing the type UVTK-501 remote control computer with programmed type units, containing built-in microcomputers. This complex is being called upon to change the structure and practice of designing dispatcher control systems.

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The principal distinction of the new complex is the possibility of organizing data exchange between installations of monitored points without the participation of the control points. This permits the building of data networks of any desired design and an increase in the reliability of the data exchange systems by an adaptive search for bypass routes in cases where the basic communications channels fail.

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EXISTING SUBSYSTEM FOR AUTOMATIC COMPILATION OF INFORMATION PUBLICATIONS

Moscow VOPROSY INFORMATSIONNOY TEORII I PRAKTIKI in Russian No 39, 1979 pp 8-19

CHERNYY, A. I., DUGANOVA, I. S. and SHTURMAN, YA. P.

[From REFERATIVNYY ZHURNAL. INFORMATIKA No 1, 1980 Abstract No 1 I97 by V. Bobrova]

[Text] The system for automatic preparation of documents (API) as part of the ASSISTENT information-measuring system is designed for various types of information publications published by the All-Union Institute of Scientific and Technical Information (VINITI). The principal reference publications are the SI [current-awareness information--"Signal'naya Informatsiya] bulletins and the RZh ["Referativnyy Zhurnal"] editions. Similarities and differences in the structure of SI bulletins pertaining to various series are considered. The composite volumes and editions of RZh VINITI that are automatically compiled are described. The facilities of the API system are described: the computer package (at present two Minsk-32 type computers and an YeS-1050 type computer), the photo-typesetting package (the Digiset 50T-1 press of the Hell company [German Federal Republic]); and the facilities for data setup prior to loading into the computer. The results of the functioning of the API system are discussed. Currently the capacity of the system exceeds 10,000 author's sheets annually, i.e. it accounts for nearly 25 percent of the total volume of the principal reference publications of the VINITI. The development of API has enabled the VINITI to commence the preparation and publication of data bases on magnetic tape. In measure with the improvements in that system the quality of the reference publications prepared with its aid is improving. References 17.
[212-1386]

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EXCERPTS FROM THE JOURNAL "AVTOMETRIYA"

Novosibirsk AVTOMETRIYA in Russian No 4, 1979, pp 3, 13, 14, 21; 22, 29; 41, 54, 55; 133

COMPUTER INFORMATION SEARCH SYSTEM BASED ON A CATALOG OF COMPLETE MASS SPECTRA

[Excerpts from article by B. G. Derendyayev, V. A. Koptyug, K. S. Lebedev, O. N. Sharapova, Novosibirsk]

[Excerpts] Mass-spectrometry, along with other physical methods, occupies an important place in the structural analysis of organic compounds. However, the daily use of this method for establishing the composition of substances being studied involves certain difficulties, since the spectro-structural correlations in mass spectrometry are not expressed in nearly so clear a form as, for example, they are in nuclear magnetic resonance spectroscopy.

The above considerations led to the establishment (in the NIOKh (Novosibirsk Institute of Organic Chemistry) of the Siberian Division of the Soviet Academy of Sciences) of an information search system (IPS) [2] based on a catalog of 8-peak mass-spectra, the experimental use of which yielded sufficiently good results. However, the eight most intense peaks far from always adequately characterize the spectral and corresponding structural features of a compound being studied. This is particularly significant in the use of the IPS for the solution of problems in identifying the structural blocks of complex organic compounds.

The search system is realized in the symbolic coding language and in FORTRAN for the "Minsk-32" computer. The system's operation time for POISK-1 is not longer than 1 minute.

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AUTOMATED PROCESSING OF DATA FROM MASS-SPECTROMETRY EXPERIMENTS USING THE "MINSK-32" COMPUTER IN A HIGH RESOLUTION MODE

[Excerpts from article by V. G. Derendyayev, S. A. Nekhoroshev, L. M. Pokrovskiy, Novosibirsk]

[Excerpts] Our paper describes the development of a system based on the "Minsk-32" computer, capable at a given stage, of processing the results of a high resolution mass-spectrometry experiment.

The experimental use of an automated system for processing the data of a mass-spectrometry experiment based on the "Minsk-32" computer which took place in the Novosibirsk Institute of Organic Chemistry of the Siberian Division of the Soviet Academy of Sciences, demonstrated the system to be sufficiently reliable and highly productive in the solution of problems in high-resolution mass-spectrometry. When perfluokerosine is used as a standard substance, the system permits the processing of the spectrum of a compound with a molecular weight of up to 800 m/e. Error in determining the exact value of m/e, as a rule, does not exceed $\pm$20 millionths of a m/e.

The software of the system is written in the symbolic coding language of the "Minsk-32" computer and in FORTRAN.

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THE TELEVISION 1000-CHANNEL PHOTON COUNTER FOR THE RECORDING OF ULTRA-WEAK LIGHT FLUXES

[Excerpts from article by N. I. Balega, S. V. Markelov, V. B. Nebelitskiy, N. N. Somov, T. A. Somova, O. I. Spiridonova, A. F. Fomenko, L. N. Fomenko, G. S. Chepurnykh, Nizhnyy Arkhyz, Stavropol'skiy)

[Excerpts] A description is given below of the television-type 1000-channel photon counter for receiving the spectra of weak astronomical objects created in the SAO (Special Astrophysical Observatory) of the Soviet Academy of Sciences.

The three stage EOP (image-converter tube) UM-92 is the intensifier of eight flux in the set-up. A high sensitivity transmitting television supersilicon tube which acts as a spatial recorder and one frame buffer, storing all the scintillations arising on the EOP screen during a frame is used as a scanning light-receiving device in the set-up. The image from the luminescent screen of the EOP is transferred to the photocathode television tube using the "Aurora" lens. The control computer in the system is the "Elektronika-100I" ("E-100I") mini-computer, which also linked with the external MOZU,

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(expansion unknown)) fulfills the function of collecting and initially processing the data. The center for the representation of the collected information in the system is the UGD43-1 device for the representation of graphic and alphanumeric information.

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Alekseyev, V. A., Belomestnykh, V. N., V'yukhin, V. N., Prokopenko, V. I., Kasperovich, A. N., Litvinov, N. V., Solonenko, V. I., Shalaginov, Yu. V., Yunoshev, V. P. A highspeed system of computer input of one dimensional optical images. "Avtometriya," 1974, No 3.

ADAPTIVE METHODS OF IMPROVING THE QUALITY OF OPTICAL IMAGES

[Excerpts from article by P. A. Bakut, I. N. Troitskiy, O. I. Kharitonova, Moscow]

[Excerpts] The purpose of this study is to outline a way to use the general theory of statistical resolution for the creation of adaptive algorithms and the synthesis of concrete algorithms which will work under actual practical conditions.

AN OPTIMIZATION APPROACH TO THE COMPUTER SYNTHESIS OF HOLOGRAPHIC THREE-DIMENSIONAL FILTERS

[Excerpts from article by M. A. Golub, V. A. Soyfer, Kuybyshev]

[Excerpt] The M4030 computer was used. The holograms were recorded through a linkage with a computer microfilm apparatus using a standard electronic ray tube and a 35 mm camera. The parameters of the correlation function were chosen so that 8 correlation intervals fell within the range of the field. The three-dimensional filter depicted in Fig. 2 was used for an initial approximation. Optimization was achieved with 15 iterations; the time to perform one iteration was about 5 minutes.

Yefimov, V. M., Livshits, Z. A., Nesterov, A. A., Orlov, A. P., Plyasov, V. M., Reznik, A. L. On one approach to the problem of computer synthesis of holograms. In bk: Issues in the construction of systems for the collection and processing of data. Novosibirsk, pub. IAiE Sib. Div. Sov. Acad. Sci., 1973, pp 64-69.

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INTERFACING OF A COMPUTER WITH A GRAPHIC DISPLAY MEMORY

[Excerpt from article by L. G. Kaminskiy, S. V. Klimenko, A. A. Lebedev, Yu. V. Mikaylov, Serpukhov]

[Excerpt] In this study we describe a software-hardware system for the interface "display-computer" [1] developed taking account of the requirements for using the display in on-line experiments in high energy physics [2]. We used the graphic display with memory "Tektronix-611" connected to the HP-2100 small computer.

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UDC 622.013:66:65.011.56:681.31

STATE OF AND MAIN TRENDS OF IMPROVEMENTS IN THE ORGANIZATION OF THE DEVELOPMENT OF THE SECTOR INDUSTRY AUTOMATED CONTROL SYSTEM-CHEMISTRY ON THE BASIS OF SPECIALIZATION AND COORDINATION OF PROJECTS

Moscow ORGANIZATSIYA INFORMATSII I UPRAVLENIYA V GORNOKHIMICHESKOY PROMYSHLENNOSTI in Russian 1979

(Manuscript deposited at ONIITEKHIM in Cherkassy 26 Jul 79 No 2987/79 Dep. 1979) pp 14-24

KOPOLEV, V. V., YAKUSHKIN, V. P. and MAZNEV, N. A.

[From REFERATIVNYY SBORNIK, ORGANIZATSIYA UPRAVLENIYA No 11, 1979 Abstract No 11.67.133 DEP]

[Text] The structure of the sector (Otrasl') automated control system of the chemical industry (ASU-Chem) is examined and the methodological, technical, and organizational compatibility of ASUs at different levels is demonstrated. The findings of an analysis of the state of the organization, development, and introduction of ASU-Chem are presented, and the principal ways of improving the organization of the development of an ASU are outlined, such as centralization and coordination of projects for the processing of statistical and accounting reports, the publication of these projects, the determination of the basic ASU VPO [Automated Control System for All-Union Associations] package, and the development of standard design decisions. Other streamlining techniques include the organization of activities of the sector computer center as a time-shared center. A possible scheme for coordinating the organizations dealing with the development and introduction of standard design decisions and a tentative structure of the facilities at the sector computer center are described. The reliability of the computer center facilities is assured through their duplication. The use of a computer package consisting of two YeS 1033 computers is proposed as a means of solving problems in the batch mode. The solution of problems in the time-sharing mode is assured with a computer package consisting of an IBM-360 50 and an IBM-370 155 with a ramified system of peripherals (terminals, displays). Processing of the operative information is performed with the aid of the "Realite-20" complex. Input-data setup is carried out with the aid of the SPD-9000. References 4.
[191-1386]

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UDC 658.012.011.56

IMPROVEMENTS IN THE PLANNING OF THE INTRODUCTION OF MEANS OF COMPUTER TECHNIQUES FOR CONTROL OF TECHNOLOGY PROCESSES

Moscow KOMPLEKSNOYE SOVERSHENSTVOVANIYE UPRAVLENIYA S ISPOL'ZOVANIYEM VYCHISLITEL'NOY TEKHNIKI in Russian 1979 pp 72-77

KOKUSHKIN, F. V.

[From REFERATIVNYY SBORNIK, ORGANIZATSIYA UPRAVLENIYA No 12, 1979 Abstract No 12.67.117 by Yu. P. D.]

[Text] During the Eight Five-Year Plan Period 170 ASUTP [Automated system of control of technological processes] were developed and put into operation. As more experience was gained in the design, introduction, and use of these systems in the national economy, as well as the appearance of a complex of hardware of the ASVT (modular system of computer technology) made it possible substantially to increase the tempo of work in this field. As a result, during 1971-1975 more than 500 systems were put into operation. A still broader use of SVT [systems of computer technology] for this purpose is scheduled during the current Five-Year Plan period, during which the construction of 1300 ASUTP is planned. The fast rate of development of this demain of application of SVT is caused by a number of factors; in particular, the development of an ASUTP, as a rule, markedly enhances the operating efficiency of technological facilities without requiring substantial capital investments in their modernization, thus assuring recoupment of the related expenditures within 1.5-2 years in most cases; moreover, present-day development of industry is largely oriented toward creating large-capacity units operating at near-critical modes and carrying out a large number of technological operations each. All this greatly complicates and sometimes even renders impossible effective management of these units. It should also be considered that in a large number of cases the development of ASUTP results in improving the socio-psychological working conditions in industry. As shown by analysis of actual expenditures on the development and introduction of ASUTP, the expenditures on implementation amount to at least 300 thousand rubles per system, and in many cases are several times as high. Thus, at present the expenditures on the development of ASUTP for the national economy as a whole exceed 100 million rubles annually. However, the principal plan indicator used in the existing system of plan indicators is the number of the constructed and activated ASUTP. The use of such an indicator greatly complicates the development of planning standards as well as of plans, particularly of five-year and long-range plans. In this connection, scarcity of some or other types of resources may arise during the plan-implementation stage. The lack or only partial delivery of facilities, cable products for communication lines, etc., results in

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a marked deterioration of efficiency of the system, and in some cases it prevents operation of the system. This problem can be solved on by substructing plans on indicators reflecting the volumetric-quantitative characteristics of the complexity of management of the technological object for which an ASUTP is to be developed. It appears expedient to introduce the indicator "Nominal Information Capacity" in order to improve the planning of expenditures on the development and introduction of ASUTP at the level of the national economy as a whole. This indicator would represent the sum of two indicators: the information capacity required to control the technological object, and the information capacity characterizing the functional sophistication of the ASUTP. The scale for evaluating the first indicator would be based on the volume of computational capacity needed to control the technological object (plant, facility) with a continuous nature of technological process, absence of logic control, and not more than 100 controllable parameters. Further, taking at unity the volume of calculations needed to control that object, the complexity of the control process needed for larger and more complex objects is determined by means of an expertise. Another important aspect of enhancing the effectiveness of the introduction of SVT in technological process control is the improvement in the quality of the newly developed ASUTP and the increase in their economic effectiveness. One way of solving this problem is the development and use of standard solutions in ASUTP design, as well as the expansion of subscriber systems.
[191-1386]

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COMPUTER EXHIBITS AT THE USSR VDNKH (Exhibition of Achievements of the National Economy, USSR)

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 1, 1980, front cover, captions inside front cover.

[Text] Exhibits at the international exhibition "Type ES and SM computers and their applications.

1. ASU TP [Automated System for Control of Technological Process) for rolled stock production using UVK SM-2 computer.

2. Measuring-computing IVK-1 complex using SM-3 computer in a nuclear research system.

3. ASU [Automatic Control System] for data processing at the 1980 Olympic Games in Moscow using UVK SM-2 computer.

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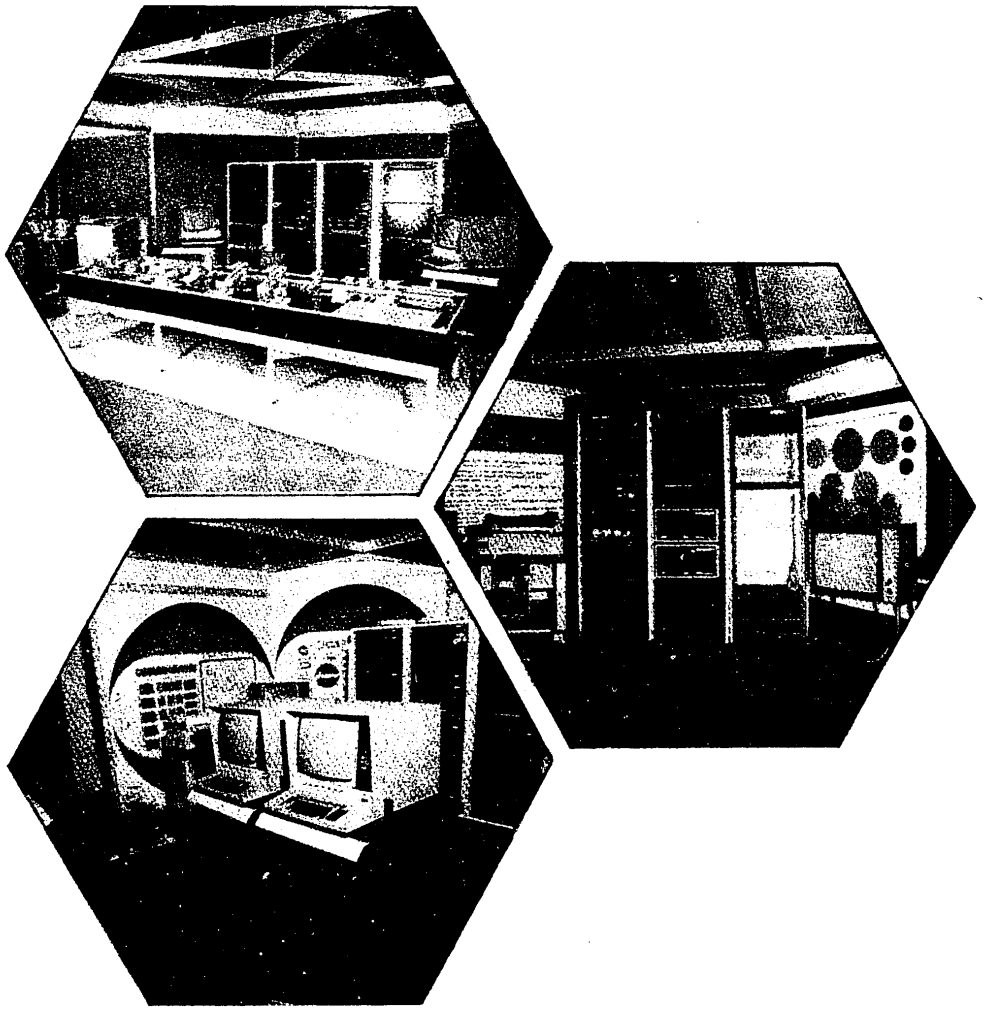

Computer exhibits at the USSR VDNKh.
[209-2291]

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NEW AUTOMATION DEVICES

Moscow PRIBORY I SYSTEMY UPRAVLENIYA in Russian No 2, 1980, pp 40-41

[Article by S. B. Abramov, candidate in economic sciences: "Devices for mechanization and automation of computing jobs"]

[Text] In the "Computer Technology" pavilion of the USSR VDNKh (Exhibition of the Achievements of the National Economy) in March-April 1979, there was an exhibition on the theme "Devices for mechanization and automation of computing jobs," demonstrating the newest devices of domestic third generation computers and organizational technology.

This article gives a short description of the exhibits which stand out because of their newness or because of interesting design-technological solutions

One type of device of computer technology for individual use which is used in practice in all spheres of the national economy are electronic keyboard computers (EKVM). represented at the exhibit by the "Iskra-2100," "Iskra-2101" and "Iskra-2210" machines.

The portable EKVM "Iskra-2100" is designed to perform the four arithmetic operations and also operations with constants. The source information is input from the digital keyboard by hand. The results of the calculation are output on CRT's. The principle of microprogram control of operations realized in the EKVM as well as the presence of microcircuits of a moderate degree of integration insure high effectiveness and simplicity of solution to accounting-statistical and economic planning problems in the divisions of the enterprises.

The off-line RI-7801 type data recorder provides for the recording, collection and origination of alphanumeric data on a mini-cassette, editing it on a CRT screen, initial processing, output in print and on a communication link. The recorder consists of two structurally closed devices: one for the processing and origination of data (UOPD) and one for the recording and transmission of data (URPD). The UOPD consists of a microprogram processor, a keyboard unit, blocks for representing symbolic information, a double cassette storage device on magnetic tape (KVML) and a power supply; the URDP consists of a printing unit, data transmission apparatus and an electric power supply.

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The set-up, editing of data and its representation on the CRT screen of the type 23LK13B are performed manually from the two keyboards of the recorder, an alphanumeric one and one for control and editing. The data from the RI-7801 recorder is transferred to the computer by a separate, non-multiplex two line communication channel at a distance of up to 10 km.

The KNML uses a mini-cassette of the MK60 type, the capacity of one of its magnetic tapes is 75,000 characters.

The recorder performs arithmetic operations, computation of percentages, isolation of integers, changing of the sign of a number, accumulation, and also the logical operations ("Greater than," Less than").

Technical Specifications of the RI-7801

Number of KNML's (cassette accumulator on magnetic tape).....	2
Rate of exchange of data from KNML character/s.....	180
Length of a line of a document in characters, not longer than.....	105
Number of graphs in a line of a document.....	16
Length of a program for processing a line of a document in characters not longer than.....	58
Rate of printout on a paper medium in character/s.....	10
Rate of modulation in a communication link in baud.....	1200, 2400

The electronic book-keeping machine (EFBM) "Iskra-554" is used for the solution of problems related to the drawing up of complex multigraphic and multiline documents. It contains a working memory store with a capacity of up to 8 K bytes, an alphanumeric printing device with sheets connected in front, a decimal digital and control keyboard, and a panel for indicating the reason the machine has stopped.

The machine is produced in various configurations and can be modified in several ways. The different possible structural and functional capacities of the machine make possible the processing of different types of documentation (invoices, bills of lading), checks on and updating of source information, and also of the complex processing and composition of compiled and accounting documents. Depending on the configuration of the machine, the "Iskra-554" can be fitted with devices for recording and reading out data from magnetic cards, and also readout and output of data on punched tape; cassette accumulators on magnetic tape, magnetic discs with replaceable cassettes, and high speed printing devices of a matrix type.

The source data is input from an alphanumeric and digital keyboard, punched tape, magnetic cards or disc and the program from an alphanumeric keyboard in the symbols of a problem oriented language. Information from the EFBM can be output to punched tape, magnetic tape and other output devices.

The machine performs arithmetic operations, calculates percentage, and percentile relationships, logical operations on data etc.

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Program and data compatibilities of all models of configurations of the machine make possible the creation of multimachine complexes for the mechanization and automation of computational and recording tasks at various levels of management of enterprises.

Color series videoterminals of the EP-3 type are used in information-inquiry systems and in systemsfor the collection and origination of data for collective use and provide representation on a CRT screen of alphanumeric information, its editing, color highlighting, light pen, transmission along separate and switching telephone communication links, and production of hard copy from the screen by means of a printing mechanism.

The videoterminal contains the following devices:

a group linkage (UGS) with the APD (data transmission device), responsible for the linkage of the EP-3 terminal with the APD by means of an S3 bond, the creation and breaking of the telephone connections with the computer, the identification, reception and output of bytes;

the expansion, necessary for the organization of long-distance connections between the UGS and 16 devices for representation by means of a radial method of connection along a single coaxial cable;

representation of the types VT-1600-1 and VT-1600-2, providing recording, deleting, shifting (right and left), representation in alphanumeric and mathematical symbols (98 items) on a CRT screen with a capacity of 1600 characters (80 x 20);

The representation devices can be connected to the printing mechanism, the duplicating color or black and white television indicator or the duplicating keyboard.

The system for teleprocessing of data, consisting of the videoterminal of the 7P-3 type, a multiplexer for transmission of data and the APD, possess great flexibility and make possible the realization of local group, long distance individual and group configurations of the system.

A system for the origination of data of the type R810 on magnetic disc intended for manual (keyboard) input of data from primary documents to removable magnetic discs of an accumulator, usable in the punched tape computing complexes M-5000, M-5010 and modifications of them. The use of the system increases the productivity of the origination of data by 25-30% in comparison with origination by perforators because of the greater degree of automation of the process of transferring the data to the medium and rate of performing the operations of duplication, skipping and padding of leading zeroes and the simplicity of correcting distorted data; increases the effectiveness of origination and input into the complex of data by eliminating need for procedures and the corresponding equipment for perforation, control and input of data from the punched cards and also leads to a significant saving of machine time.

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Technical Specifications of the R810 System

Capacity of working memory in K bytes	8
Number of:	
simultaneously operating panels	8
modes of operation	7
format programs	200
Maximum length of record in characters	224
Hours of run-time per fault	320
Power used, in KVA	1.8
Power supply voltage, in Vt	380/220

The data teleprocessing system of the type STD is used in the creation of ASUP (Automated Control Systems of Enterprises) when production is of individual products, ASU (Automated Control Systems) for NII's (Scientific Research Institutes), in information-inquiry systems etc.

The basic STD consists of controlling computational complexes (UVK) of the M-4030 and M-4030-1 types fulfilling the function of processing and managing the bilateral exchange of information with terminal equipment; devices for the management of data transmission of the A1571 type, acting as a linkage of the UVK with communication lines; linkages of the A7234 type, increasing the number of communication channels; videoterminal of the A5447 type used for reception, representation on the CRT screen with a capacity of 54 x 20 characters, editing and input of alphanumeric information.

The technical devices of the system may be enhanced by the use of asynchronic modems (ES-8006) and documentation apparatus (e.g., high-speed printers of the DZM-180 type).

The CTD uses as software:

a data teleprocessing supervisor, taking care of reception, processing and output of information from the terminals to the logical level, buffering of information, communication between the systems' programs and the users' programs for transmission of data and analysis of error situations;

packages of applied programs consisting of real-time control systems, organizing (managing) work with the terminals;

software for the conversational mode; systems of integrated data processing.

On the basis of this software the user can generate his own programs, relating to the configuration of his system.

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Technical Specifications of the Data Teleprocessing System of the STD Type

Linkage with computer.....Multiplexer channel
Throughput in K byte/s..... 20
Number of channels (in conjunction with A7234)..... 32
Coding of characters in transmission by:
telegraph channels..... MTK-2M
telephone channels..... KOl-7
Distance of transmission along individual telephone channels in km with transmission speeds:
with a fourband circuit diagram 200-9600 bit/c..... 25-7
with a two-bands circuit diagram 200-9600 bit/c..... 10-4
Distance of transmission along individual telegraph channels with speed of transmission 50 and 100 bit/c per km respectively..... 15 and 8
Linkages with the terminals..... S2 bond

The computer complex M-5100 according to structure and element base belongs to the class of small third-generation computers and is oriented toward the processing of statistical, economic and other business information.

Computer centers, automatic accounting stations and ASU's of enterprises can be organized on the basis of this complex.

The M-5100 complex can be used independently as well as as a component of multimachine systems for:

the solution of accounting, statistical and economic planning problems characterized by large amounts of initial and resulting information, varying data formats and comparatively simple, but time-consuming algorithms of computations (calculation of labor and salary, material costs, finished products etc.)

the solution of problems in the initial processing of information (ordering, arithmetic processing, storage, dumping, conversion, recoding etc.)

The solution of these problems on the M-5100 complex is simpler, cheaper and more effective than on all-purpose computers, since the internal structure and software of the complex have been designed for just this purpose. The complex has a block structure, permitting variation in the make-up of peripheral equipment, adapting it to the concrete requirements of the user. The hardware and software make possible simultaneous operation of peripheral equipment, batch mode of information processing, time sharing and transmission of information along communication channels.

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The M-5100 complex is logically compatible with all models of the M-5000 complexes in terms of user programs and data media. It uses as an element basis the impulse-potential microcircuits of the K155 and K131 series.

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'INSTRUMENTS AND CONTROL SYSTEMS' JOURNAL SPONSORS CONFERENCE

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 2, 1980, p 43

[Article: "Oral issue of a magazine in Odessa"]

[Excerpts] The oral issuing of a magazine is a widely used editorial form of communication with readers, making it possible not only to tell the audience who has gathered about the work of the editorial staff, the basic themes with which it is concerned, its prospects and plans for publication, but also to allow the participating specialists to hear a series of reports by leading scientists of the sector on the most important, interesting, and critical trends in the development of instrument building.

Such an issue of our journal was organized on 16 Oct 1979 in Odessa by the oblast management of the NTO (Scientific Technical Society) of the instrument industry imeni Academician S. I. Vavilov and the House of Technology NTO with the cooperation of the leaders of the Odessa Polytechnical Institute (OPI). The oral issue in the House of Technology was attended by workers of the associations, enterprises, organizations and VUZ's of the city--members of the NTO of the Instrument Industry, Machine Industry, and RES (Regional Power Station) imeni A. S. Popov. One hundred and ten people in all participated in the issue--leaders of the enterprises and divisions, leading engineers, scientific researchers, graduate students and students.

Questions relating to the construction of effective computing systems based on the hardware and software of the SMEVM (System of Small Computers) was the subject of a paper by Candidate in Technological Sciences Ye. A. Dubovik (Institute of electronic control machines--INEUM Moscow). Noting that the principle features of the work of SMEVM in various automated systems have been determined by the necessity for solving functional problems in real time, the author demonstrated the possibilities for effective use of flexible computing devices and SM computers in the design and construction of various systems.

The third paper, on the use of the 580IK80 microprocessor for the control and analysis of BIS (Large-scale integrated microcircuits) was given by scientific researcher of the Scientific-research Center for Electronic

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Computer Technology (NITsEVT, Moscow), V. K. Popolutov. He gave information about contemporary trends and tendencies in the development of domestic and foreign microprocessor technology, software methods and apparatuses for automated design of microprocessor systems and elucidated several issues in the use of BIS microprocessors. The author described the operational control apparatus, MPBIS, its structural outline, technological characteristics and its complex of control programs.

In the fourth paper, scientific researcher of NITsEVT, B. I. Makovoz told of the BIS microprocessor complex of series 583--an eight bit extension of the capacity of the BIS complex, constructed according to the I^2L technology which provides a high degree of integration, requires little power and has an adequate speed of operation. The latter feature allows the use of the complex for the construction of microcomputers, mini-computers and computers of low and moderate speeds of operation. Microprogrammed control makes it possible to build a computing device designed to follow an arbitrary system of commands.

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ASU'S IN FISHING

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 2, 1980 p 42

[Article by Yu. M. Samoylov, senior editor, Soviet Division of the International Exhibit "Inrybprom-80": An ASU (Automated Control System) serving fishermen"]

[Excerpts] From August 14-28, 1980 in Leningrad there will be an international specialized exhibit "Means of catching and processing fish and products of the sea and the breeding of aquatic bioresources"--"Inrybprom-80."

In the "Automated systems of control of the processes of production in the fishing industry" section, it will be shown how under contemporary conditions using an ASU, effective control of the complex fishing economy of our country can be achieved.

The most important problems in the development of the sector are solved by the Sector Automated System of Control (OASU) of the USSR Ministry of the Fishing Economy. It serves the specialists at the ministry, all-union fishing industry associations and organs for management of the fishing economy of the union republics. The OASU interacts with the automated system "Raw-material base," whose task is to study and predict the state of biological resources of the Pacific Ocean.

In the process of its operation the OASU relies on 23 ASU's of the production associations and individual enterprises of the fishing economy.

Aside from the ASU's designed for control of the production and economic activity of the enterprises and associations, Automated Systems of Control for the fleet of the small industry (ASUFP) function in the sector. These systems make it possible to conduct searches for commercial concentrations of fish, predict their distribution and possible use, keep accounts of the catch of fish and output of products, calculate a rational placement of vessels and the supplies they require.

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The material and technical basis of the ASU's in operation in the sector consists of 27 computer subdivisions, equipped with third generation computers and forming together with the coastal radiocenters of the sector, a single net for the processing of information. For the functioning of the ASUFP, the sector allocates nine shipboard computer centers connected to the coastal radiocenters.

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CONTROL OF ENGINEERING AND ORGANIZATIONAL SYSTEMS BY USING COMPUTER TECHNOLOGY

Moscow UPRAVLENIYE TEKHNICHESKIMI I ORGANIZATSIONNYMI SISTEMAMI S PRIMENENIYEM VYCHISLITEL'NOY TEKHNIKI in Russian 1979 signed to press 10 Oct 79 pp 1-232

[Excerpts from the book edited by Ya. Z. Tsipkin, Izdatel'stvo "Nauka", 1,850 copies, 231 pages]

[1]

Order of Lenin Institute of Control Problems, USSR Academy of Sciences, Ministry of Instrument Building, Automation Equipment and Control Systems of the USSR.

[2]

UDC 62-50

The collection is devoted to the software and hardware of automatic and man-machine control and the use of modern computer technology. Applications in industry, economics and health are considered.

Intended for specialists in the field of the methodology of development and introduction of automated control systems of different levels.

Editor in Chief Corresponding Member of the USSR Academy of Sciences Ya. Z. Tsipkin

[3]

THE PROBLEM OF DETERMINING OPTIMUM CONTROL OF THE DECARBONIZATION PROCESS, G. M. Aleshchenko and L. V. Obolenskaya.

Problems of controlling production processes are acquiring special significance with regard to the increase of requirements on product quality. One of the central problems of controlling the steel-smelting process is that of determining those oxygen blast conditions of the converter bath in which metal with given impurity content must be produced.

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Colleagues of MISiS (Moscow Order of the Red Banner of Labor Institute of Steel and Alloys) and IPU (Institute of Control Problems of the USSR Academy of Sciences suggested a mathematical model of the decarbonized process, distinguished from the known models by the fact that the process was regarded as a system with distributed paramters.

[9]

USING MACHINE DESIGN METHODS TO CALCULATE CONTINUOUS CONTROL SYSTEMS, L. F. Antoshchuk and S. N. Klimachev.

[10-11]

A complex of programs which automatically perform separate stages of design or which create maximum convenience for human performance of them must be developed to automate the process of designing the structures of control systems. Such a program complex is the developed system for automation of design of continuous control systems, which has been named RADIUS (Calculation of Dynamic Control Systems).

The system is designed to automate solution of analysis problems (calculation of stability, reliability and transient processes), optimization and synthesis of the structures of continuous multiunit object control systems.

The following main requirements are taken into account when developing the RADIUS system: 1) a flexible module structure; 2) the use of FORTRAN-IV as the base language; 3) the presence of programs to make various calculations encountered in design practice; 4) simplicity and convenience of the input language; 5) the capability of the user recording his own procedures; 6) wide capabilities for retrieving the results of calculations; and 7) the presence of macrodefinition.

The main operational unit of the RADIUS system is the assignment. Each assignment is recorded in the assignment control language and consists of individual items. Each item of the assignment is announced by the corresponding control operator or control card. There are seven types of control operators:

1) RADIUS is the first assignment operator;

2) PARAM precedes the assignment of values of the block parameters;

3) STRUCT announces description of the block diagram of the investigated control system;

4) COMPUTE determines the type of calculation;

5) OUTPUT announces description of the circuit for retrieval of the results of calculations;

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6) RUN gives instructions to make the calculations;

7) END is the final assignment operator.

All the control operators are identified by symbols // in the first two columns of the punch card.

[12]

A language similar to that for modelling of System 4 of the ICL Company is used to describe the block diagrams of the control systems [2].

[14]

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[15]

A MODEL FOR EVALUATING THE RELIABILITY OF INFORMATION WHEN IT IS PROCESSED ON A COMPUTER, V. A. Vertlib and V. M. Veytsman.

Postulation of the Problem

The problem of evaluating the reliability of information is significant not only to determine the quality of the message at the system output, but also to compare different methods of increasing reliability to select the most suitable one for a specific situation.

A model which takes into account the information features of the processing system and the messages arriving at the system input and which permits one to determine both the reliability characteristics of the output message and the time parameters of processing the input message, is considered in the paper.

[25]

In constructing the model and calculating it by means of reliability and time characteristics of real information processing, one can reach the following conclusions.

1. The model takes into account the important properties of real processes such as the possibility of interruptions of the process, the presence of checking which separates distorted messages to messages for which

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algorithmic correction is possible and messages for which it is impossible; and the possibility of using repetition of processing and algorithmic correction along with correction.

2. Analytical expressions are found which permit one to estimate the time and reliability characteristics of information processing and to compare different methods of increasing reliability on the basis of these evaluations.

3. Methods of determining processing parameters are shown for a specific example.

[29]

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CONTROL OF PROGRAM BLOCKS DURING FUNCTIONING OF A UNIVERSAL MODELLING SYSTEM, V. B. Voronkov and V. S. Shirokolava

[33]

DYNAMIC OPTIMIZATION OF CONTROL OF A PRODUCTION PROCESS, G. G. Gorvits, V. M. Dozortsev and A. M. Shafir

One of the possible approaches to optimization of dynamic systems under conditions of real-time uncertainty is suggested in the article. The considered class of dynamic systems is characterized by such a long "lifetime" that it can be regarded as essentially infinite. This class includes numerous control objects with continuous production process, including blast, cementation and other furnaces, paper-making machines and so on.

[37]

The described algorithm was used to construct an automatic control system (SAU) of the clinker annealing process in a cementation furnace. The control object is characterized by the presence of a control input (delivery of the fuel which heats the furnace), unobserved input disturbances and an output (the temperature in the furnace). The control expenses are assumed equal to the cost of the gas delivered to the furnace, while the losses due to reduction of quality is regarded as proportional to the square of heating the furnace to a given critical temperature. The automatic clinker annealing control system has been introduced in industry.

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[38]

ENGINEERING AND PSYCHOLOGICAL DESIGN OF INFORMATION DISPLAY SYSTEMS, Ye. F. Gorskiy and V. N. Yanushkin.

The purpose of engineering and psychological design (IPP) is to increase the functioning efficiency of production control systems and organization of the activity of its central link--the operator-technician. This design

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is essentially design of human activity (in the broadest sense). The specifics of the IPP methods consist in the fact that the postulated problem can be competently solved only if methods of psychology, ergonomics and engineering aesthetics--disciplines which study in a complex manner the different aspects of human functioning in the production sphere--are used.

The structure of the operator's mental activity when solving operational problems is being studied in our laboratory in development of the theoretical and methodical bases of engineering and psychological design. Methods of active information support of the activity accomplished with reference to the mental image of the control process are being developed. The results of these investigations are the basis for the developed design and that adopted by customers, operator's positions (RMO) and information display systems (SOI) for the operators of the central control console of the ASU [Automated control system] of the Sebryakovo Cement Plant. The TsPU [Central Control Desk] design includes the positions of three operators (the raw material department, the clinker annealing department and the cement grinding department), equipped with television units and displays for information exchange with the digital computer and a time-sharing display board. The problems which concern development of only the console SOI and specifically SOI for the clinker annealing process are considered in the given article.

[42]

ON TUNING COMPLEX SYSTEMS, V. V. Guchuk.

We shall call a system whose tuning quality indicator (PKN) is functionally dependent on the tuned parameters, a complex tuned system. The problems of tuning complex systems have been widely disseminated in practice. Study of tuning processes (PN) has become especially timely with regard to development of a new class of man-machine dialogue systems for analysis of complex signals [1]. Experimental investigation of human-operator tuning of an image formation system by different features of the shape of images typical for dynamic spectrograms in the analysis systems named above is of interest in this regard. The experiments were conducted by the scheme shown in Figure 1. The tuned system (a model set up on an AVM [Analog computer]) formed the images presented to the operator on the cathode-ray tube display screen with sufficiently long afterglow. Several of these images are shown in Figure 2. The operator's taks consisted in finding the values of the tuned parameters C_i at which the humpiness of curve 2, a and the squatness of the dome 2, b were emphasized to the maximum and at which the inner ring descended to the maximum with respect to the outer ring 2, c and so on.

[48]

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[49]

USING A SINGLE FORMULA IN BINARY CODING, S. I. Zhegalov.

[55]

The outlined algorithms can also be used to decode packet codes. The results of computer modelling of a single special algorithm for decoding orthogonal packet codes obtained from the R-algorithm during transmission through a channel with white Gaussian noise are presented in the table.

[56]

SYSTEM FOR DYNAMIC MODELLING OF LOGIC CIRCUITS, Yu. S. Zatuliveter and I. L. Medvedev

The given system is designed for program modelling of large (on the order of hundreds and thousands of components) discrete devices, carried out at the stage of developing logic circuits. It is assumed that a modern component base (IS [Integrated circuit], SIS [Small integrated circuit] and BIS [Large integrated circuit]) of standard series is used as the components. Modelling reduces the deadlines for development of complex circuits, permits checking of them by simulating different operating modes and, finally, permits one to obtain reliable documentation in a form suitable for automated processes of physical implementation.

Much attention was devoted to provision of maximum simplicity in using the system, which is provided by construction of an effective specialized logic circuit modelling language (YaMLS), easily accessible to developers of logic circuits. The given language permits encoding of the circuit with developed hierarchical system of connections, which permits separation of a large circuit into fragments, simultaneous processing of them and modelling with subsequent automatic assembly of these fragments.

The system has autonomy since not only the circuit can be encoded, but the library of basic series of IS can be created and supplemented by means of the input language (YaMLS) alone.

[62]

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The software has been realized in FORTRAN-IV language. The system was used in development of a parallel-action digital computer.

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[63]

THE PROBLEM OF FINDING THE OPTIMUM TRAVEL TRAJECTORY OF A LIFT TRUCK ON THE DECK OF A SHIP, V. N. Lebedev and I. N. Marakanov.

The Maritime Fleet of the USSR is now equipped with large-capacity transport ships with horizontal loading. Loading is accomplished on these ships by means of lift trucks which deliver cargo from the dock directly to the cargo decks. One of the main sources of increasing the economic effectiveness of ship operation is to reduce the idle time in ports. To do this, one can first determine the best sequence of loading cargo on the ship and second one can reduce the time expended by lift trucks for cargo transport. Therefore, when developing an ASU [Automatic control system] for cargo operations, solution of the problem of developing the technique of loading operations and the related problem of finding the optimum travel trajectories of the lift trucks occupies an important position.

The problem of determining the optimum travel trajectory of the lift truck along the deck of the ship from the beginning initial point to the unloading point determined according to the cargo plan is solved. The solution is given for the most general case when the real dimensions of the lift truck and the presence of forbidden zones--previously loaded cargo, ramps, pillars and other deck superstructures--on the deck are taken into account.

[69]

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CASCADE PROCEDURES OF PACKET-BLOCK CODING, E. M. Mamedli and V. V. Ovchinnikov.

One of the effective methods of increasing the reliability of data transmission between computer systems is the use of cascade codes [1], realized relatively simply on the computer. The characteristics of the data transmission system can be further improved if packet codes, decoded by some sequential decoding algorithm or a Viterbi algorithm, is used as the internal codes of the cascade code [2]. Cascade procedures of packet-block encoding which developed the ideas of [1-3] are considered in the paper.

[74]

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AUTOMATION OF DOCUMENT FORMAT DESIGN, O. A. Mamikonova.

One of the most massive and laborious problems arising in development of automated control systems is document format design. This manual work now occupies a significant part of developers' time and is carried out manually on the basis of their practical experience and engineering intuition. The natural desire to develop software which permits automation of document format development naturally arises in this regard. This software should play the role of a tool which formalizes the structure of formats based on data received from the developer, on the names of individual elements of the document and on the limitations which the form should satisfy.

[79]

A program is written and outlined on the basis of the described algorithm. The words contained in the headline of the document with all possible versions, the templates for all the columns and also the number of columns and words in each column are entered into the machine.

The program designs the document format and prints it out with indication of the templates of all the variables. If the given format does not satisfy the user from the viewpoint of the selected versions and the user is able to change the limitations on the width of the corresponding columns, the program recalculates and issues a new, more satisfactory version.

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DETECTION AND CORRECTION OF SYNTACTICAL ERRORS IN ANALYSIS OF LR(k)-GRAMMARS, V. N. Popolitov.

Development of syntactically oriented translation systems (SOTR) requires the presence of formal description of the input language which ensures construction of efficiently operating syntactical analysis (SA) circuits [1].

[83]

Confirmation. The proposed method permits effective determination and neutralization of the minimum-length error construction in the input line during operation of a LR(k)-type syntactical analyzer.

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MODEL OF A MULTIPROGRAM COMPUTER WITH HIGH-PRIORITY PROGRAM FLOW, V. A. Signayevskiy.

[89]

The relations found above permit one to calculate in the usual manner [3] the optimum multiprogramming level N. Moreover, devices with optimum characteristics contained in the system can be selected on their basis. Finally, let us point out that a system closed by priority applications can also be analyzed in a similar manner.

In conclusion, the author expresses gratitude to Ya. A. Kogan for posing the problem and of supervising the work.

[90]

SIMULATION MODELLING OF THE SYSTEM PREDICTION MODE FOR AUTOMATIC CONTROL OF THERMAL DEFORMATION OF THE ROLLERS IN ROLLING MILLS, E. P. Slonim, N. I. Samokhvalov and I. M. Savoskina.

It becomes necessary when developing automatic control systems for production processes to analyze the quality of one or another planning solutions on a model similar to the real object. The most suitable apparatus for these purposes is the simulation model. For systems with UVM [Control computer] based on the principles of supervisor control, a number of blocks of the model subsequently becomes the structural component of the real system and is used as the program sensor of the controlled parameters, direct measurement of which is very difficult or generally impossible, for example, in the case of objects with distributed parameters. The model of the process in the forecasting mode is

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also included in the control circuit and serves to optimize calculations for the next production cycle in accelerated time. Development of a simulated model essentially becomes a step of designing the applied software of the system.

The automatic control system of the thermal profile of the rollers of wide-strip rolling mills (SAUTP) is one of the effective means affecting the qualitative indicators of the sheet in different thickness and layout. The control object of the SAUTP is the thermal fields and the thermal deformations of the working part of the rollers which must be stabilized during unstable thermal processes during cold rolling of strips with welded seams and upon variation of the grade of the rolled steel. The thermal profile is stabilized by regulating the consumption of cooling agent along the rollers. Objects of this type are described by differential equations in special derivatives, control of which is viewed from positions of optimum control theory of systems with distributed parameters [1, 2].

[96]

An example of a machine experiment is presented in Figure 2. The input experimental data were the results of investigating the thermal processes in the third stand of the four-stand cold-rolling mill 1700 of the Cherpovets Metallurgical Plant.

[97]

ANALYZING THE PROFESSIONAL QUALITIES OF A HUMAN OPERATOR DURING TEST DIALOGUE WITH A DIGITAL COMPUTER, V. Ye. Skhabyuk.

[98]

Deepest analysis of the individual psychological features of personality requires complex, universal and prolonged study of man not only under laboratory conditions but also under conditions of specific occupational activity. One of the approaches to solving the problem may be study of man under conditions of performing a certain set of occupationally directed test problems which simulate the future activity and which require similar capabilities. The final result of this study in our view should be construction of a psychophysiological portrait (PFP) of the test subject, on the basis of comparison of which to requirements of the future activity one can estimate not only the degree of his occupational suitability but can also compile recommendations directed toward formation or improvement of the required occupational qualities.

[100-102]

Modelling the dynamics of problems and program implementation of the test dialogue were tested on the M-6000 digital computer. The "weakest" spot

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in displaying the tests on the display screen was entering the test subject's response information in the digital computer. The existing means of input such as a keyboard register, alphanumeric and functional keyboard display, light pen and so on were not designed for an untrained user and the test subjects had to be trained first.

A device for coordinate data input, distinguished by simplicity of program realization of dialogue, was developed and manufactured to overcome this disadvantage. The input device is a transparent coordinate grid which forms up to several hundred invisible "buttons." This grid is installed in front of the display screen. The coordinate of the point on the screen can be indicated by simply touching the finger. This data input permits organization of dialogue which approximates to the maximum the natural dialogue in the alternative selection mode.

The investigations made it possible to note the structure of the dialogue system of a test check with branched network of video terminals.

A hypothetical block diagram of this system is presented in Figure 2. The core of the system is the M-6000 digital computer. Presentation of test problems and also functions of assembly and preliminary processing of input psychophysiological information can be assigned to individual minicomputers, for example, the Elektronika 100-I in combination with the UGD-43-1 graphic display. The number of test subject consoles can be more than one as a function of the postulated problems. This structure of the system permits solution of the problem of investigating not only individual, but also group operator activity.

The problems of further investigations are development of a library of formalized tests adequate to operator activity, program and apparatus realization of the test dialogue, mathematical processing and display of the test examination results in a form convenient to the investigator (or special committee). Let us assume that a PFP image presentation, a conditional diagram of which is shown in Figure 1, may be a compact and clear presentation of current test results. It is suggested that operational formation of this image during testing be accomplished on the SIGD graphic display screen. The PFP image constructed by the graph plotter on a paper carrier is possibly a unique occupational certificate of the operator. Construction of such a universal characteristic of man as the PFP may we feel solve the main problem of occupational selection.

[102-103]

SYNTHESIS AND OPTIMIZATION OF AUTOMATIC DIGITAL DEVICES USING VARIOUS TYPES OF MEMORY ELEMENTS AND A MIXED-TYPE MEMORY, N. G. Topol'skiy and V. I. Bozhich.

1. Introduction

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With regard to the development of the technology of large integrated circuits, homogeneous structures and media [1] have attracted a lot of attention of the designers of digital devices since it became possible to solve the problem of designing the integrated circuits of automatic digital machines and to develop their topology by the "basic crystal" method [2]. The main advantage of this method is the possibility of manufacturing different circuits using the same working set of phototemplates. Only one phototemplate has to be changed to produce a specific circuit. An example of developments in the form of the "base crystal" is programmed logic matrices (PLM) [3], which have low cost and which provide a large saving of time in design. PLM are finding ever wider application in manufacture of new-generation computer assemblies and blocks which control digital devices. It has become necessary to develop methods of realization and optimization of automatic digital devices based on PLM with regard to the requirements outlined in [3]. One of the methods convenient for this purpose is the unrepeated method of structural synthesis and optimization of automatons [4], distinguished by simplicity of realization on the computer, the possibility of decomposition synthesis and optimization of automatons with large number of states and so on. However, the nonrepeated method, like the method of realizing automatons based on PLM [5], is mainly oriented toward the use of D-flip-flops, which limits its capacity to use other types of memory elements. The problem of synthesis and optimization of automatons by the non-repeating method using different types of flip-flops as memory automatons and mixed-type memory when different types of memory elements are used in the circuit of the same automaton, is considered in the given paper. Moreover, an approach by means of which one can accomplish this selection is outlined in the paper with regard to the fact that the problem of optimum selection (from the viewpoint of apparatus expenditures) of the types of memory elements for specific automatons is very poorly outlined in the literature.

[116]

Conclusions. The problem of structural synthesis of digital automatons by the non-repetitive method when using the memory of different types of flip-flops as the automatons is considered in the paper. The possibility of optimizing the automaton structure by selection of various types of flip-flops and mixed-type memory is shown.

Based on the outlined methods, the authors developed algorithms and described the machine programs in FORTRAN language. The method can be used when synthesizing automatons based both on PLM and homogeneous structures and in the basis of digital logic components [9].

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[117]

SOME PRINCIPLES OF ORGANIZING INSTINCTIVE BEHAVIOR, V. V. Baranov and V. I. Matyukhin.

[125]

PLANNING OF ASSEMBLY PRODUCTION, V. A. Bol'shakov.

The linear model with discrete time is considered.

[133]

THE STATISTICAL PROBLEM OF CONTROLLING THE RESERVES OF INTERCHANGEABLE PRODUCTS WITH RANDOM DEMAND, T. V. Gonova.

Let us consider the statistical problem of controlling reserves at an isolated warehouse which supplies customers n with interchangeable products.

[139]

A POLYHEDRON FOR THE PROBLEM OF BRINGING ORDER TO OPERATIONS ON A SINGLE MACHINE TOOL, V. A. Dorfman

[145]

USING CORRELATION REGRESSION ANALYSIS IN INVESTIGATING THE CONSUMPTION OF VITAMINS, N. B. Dremova and L. V. Kobzar'.

Vitamins are related to the group of broad-spectrum medicinals, the demand for which comprises approximately 10 percent of the total monetary sum of demand for medicines of the Main Pharmaceutical Administration of the USSR Ministry of Health and comprises 20 percent in the total volume of product output of the medical industry [1].

The purpose of our investigation is to analyze the consumption of vitamins throughout the union republics on a background of various factors which logically determine the consumption of the indicated group of medicines. Correlation regression analysis is most frequently used to study and determine the relationship of several indicators which characterize the dynamics of the consumption process. The basis of the current and future prediction of the need for medicines of different phamacotherapeutic groups [2, 3] is determination of the main factors affecting consumption and subsequent mathematical modelling.

[149]

PROBLEMS OF OPTIMIZING THE CONTROL MECHANISMS OF COMPLEX DEVELOPMENTS, S. M. Moliboga and A. M. Cherkashin.

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[155]

METHOD OF DECISION-MAKING IN OPERATIONAL CONTROL PROBLEMS OF COMPLEX SYSTEMS, G. I. Moskinova.

[160-161]

SOME GENERAL SYSTEM AND MATHEMATICAL ASPECTS OF THE THEORY OF SYSTEMS WITH COMPETING ELEMENTS, N. N. Sandak.

Introduction

This paper is devoted to systems with competing elements (SSE). From positions of modern control theory, the results presented in it can be related to the trend connected to the use of theoretical gaming methods to design optimum functioning mechanisms of systems with fixed hierarcical structure and given description of its constituent components. This direction of control theory is most fully represented in the Soviet Union by the papers of colleagues of VTs AN SSSR [Computer Center of the USSR Academy of Sciences], among which those of N. N. Moiseyev and also those of Yu. B. Germeyyer and his successors on game theory with consistent interests and investigations on the mathematical theory of active systems, carried out at the Institute of Control Problems, occupy a special position. The purpose of the given paper is to assemble together and systematically outline some of the results obtained by the author in study of SSE: those already published but dispersed in individual collections and those previously unpublished.*

*The paper was reported at the 23rd Conference of Young Scientists and Specialists of the Institute of Control Problems (May 1977).

[172]

ANALYZING THE EFFECT OF NEW PRODUCTS ON SERIAL PLANT INDICATORS, M. V. Torochkova and Ye. V. Yurkevich.

[176]

SOME PROPERTIES OF DYNAMIC ECONOMIC PLANNING PROBLEMS, S. V. Chukanov.

[182]

SYNTHESIZING A MINIMUM-COST DISTRIBUTED COMMUNICATIONS NETWORK, G. A. Shatalova.

Postulation of the problem. The problem of designing the communications network of a territorially distributed mass-use teleautomatic system is considered in the paper [1]. The network units can be computers, mini-computers and terminals. Other networks are telephone and telegraph channels in different combinations. Message flows are generated in all the network units.

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[186]

The given synthesis algorithm is realized in the form of a program in FORTRAN-IV language. The access program to the LP-400 packet program is written.

Practical results. The method outlined in the paper was used in designing the All-Union airline ticket reservations system[1].

[187-188]

THE COMBINATORIAL PROBLEM OF OPTIMUM CONNECTION OF CUSTOMERS TO SUPPLIERS, V. Ye. Sheynis.

The considered problem occurred, specifically, during development of the automated control system of the Production Association Tsentrgaz.

The situation when the optimum plan received is not the most effective from the viewpoint of practical use is ordinary when solving problems of optimum attachment of raw material users to the supplier plants, which is explained by a number of factors of a production nature. Some set of undesirable relations between suppliers and customers is given in some cases due to technological limitations. A plan of attachments must be found so that a minimum number of relations from a given set would be used with permissible deviations of the entire function from the optimum.

We emphasize that we are interested in minimum new relations between customers and suppliers from some set of undesirable relations rather than in the similarity of quantitative values of variables in the optimum and some known plan. The most suitable for this case is the following model of the problem for optimum attachment of customers to suppliers.

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[192]

METHODS OF AUTOMATIC CONTROL OF THE REACTION SPEED OF A PREDICTING SYSTEM TO CHANGES IN THE MODEL OF THE PROCESS, Yu. V. Ageyev.

Among the different methods of increasing the reliability of automatic devices, electronic devices and other objects, predicting the technical state of control objects (OK) has recently occupied an even more important position. Individual forecasting control of the determining parameters by means of built-in predictors permits one to take into account the functioning history of each specific OK and to more precisely predict the moment of onset of gradual (parametric) failure, which permits one to adopt the necessary measures beforehand.

The accuracy of prediction in turn depends on the extent to how accurately the a priori selected model of the determined basis of the controllable parameter corresponds to a real process. Moreover, there may be changes of the model coefficients during operation of the OK, which can lead to impermissibly high forecasting errors in time during which the predicting system analyzes the new determined basis of the process with the required accuracy. The problem of regulating the reaction speed of the predictor to changes in the model of the controllable parameter arises in this case.

[197]

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[198]

ESTIMATING THE EXPENDITURES IN THE PROBLEM OF OPTIMIZING AN INSTRUMENT SYSTEM, I. P. Kislitsin.

When developing a parametric series and aggregate complexes of GSP [Group system of instruments], the problem of optimizing them by the expenditure criterion arises [1-3].

To solve them, one must have at his disposal the predicted estimates of the cost of the competing versions of articles, the advantages from an increase of serial production and losses determined by excess units, blocks and devices of the complex by functions and specifications.

An approach to developing the model of the cost of electronic monitoring and control devices designed for this purpose is considered in the given paper.

[202]

USING CURRENT LIMITERS IN DEVICES WHICH REALIZE ORDERED SELECTION FUNCTIONS, N. F. Mengazetdinov.

The specific characteristics of analog devices such as the close relationship of accuracy and reliability, the difficulty of failure detection and the impermissibility of parallel connection determine the difficulties which are encountered in accomplishing different methods of redundancy of these devices. Methods were recently proposed [1-3] which permit parallel operation of several devices of the same type and as a result permit an increase of accuracy and reliability. The essence of these methods reduces to the fact that the outputs of parallel-operating channels are connected by means of some solving device, a so-called restoring member VO, which selects the signal that occupies a specific position in it from all the ordered aggregate of available signals.

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THE PROBLEM OF PRELIMINARY PROCESSING OF CHROMATOGRAPHIC ANALYSIS DATA BY DIGITAL FILTRATION METHODS, V. V. Stanin.

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CONVERTER OF AC SIGNAL AMPLITUDE RATIO, R. M. Fel'dberg

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THE STABILITY OF FOUR-ARM BRIDGE MEASURING CIRCUITS WITH FEEDBACK, B. D. Khastsayev.
[213-6521]

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COMPLEX SYSTEMS OF CONTROL

Kiev KIBERNETIKA I VYCHISLITEL'NAYA TEKHNIKA (Cybernetics and Computer Technology) Academy of Sciences Ukrainian SSR, Order of Lenin Institute of Cybernetics, in Russian 1979 signed to press 25 Apr 79 p 2, 131

[Annotation and table of contents from the collection edited by A. I. Kukhtenico, Izdat. "Naukova dumka," 1,000 copies, 136 pages]

[Text] Complex systems of control, in particular multidimensional systems with a hierarchical structure, are considered. Special attention is given to the study of stability and precision of control, and to problems of optimal control of self-adjusting and adaptive systems. Issues in the analysis and synthesis of systems of control with distributed parameters and of systems with random perturbations are elucidated.

The collection is intended for scientific workers, instructors, engineers and graduate students, specializing in the area of control of complex systems and also undergraduates in the upper classes of the relevant department.

Drafting committee: V. M. Glushkov (editor-in-chief), V. L. Volkovich, G. F. Zaytsev, V. M. Kuntsevich (assist. editor-in-chief), A. I. Kukhtenko (assist. editor-in-chief), V. B. Larin, B. Yu. Mandrovskiy-Sokolev (secretary-in-chief of the issue), V. S. Mikhalevich, Yu. I. Samoylenko, K. G. Samofalov, A. A. Stogniy, B. B. Timofeyev, A. A. Tunik, N. S. Furs, A. G. Shevelev.

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COMPUTERS USED IN PHYSICS

Kiev VYCHISLITEL'NAYA MATEMATIKA, PROGRAMMIROVANIYE I OBRABOTKA EKSPERIMENTA (Computer Mathematics, Programming and Processing of An Experiment) in Russian 1979 signed to press 20 Apr 79 pp 2, 125

[Annotation and table of contents from collection of scientific works, edited by K. V. Maslov, Izd. "Naukova dumka," 3,550 copies, 132 pages]

[Text]

UDC 681.3; 518.5

This collection containing studies which present methods of calculation for problems in theoretical physics, cites original algorithms in ALGOL-60, and the results of concrete computations and their analysis. The creation of effective algorithms for the analysis of the electrodynamic characteristics of a number of complex waveguide irregularities is considered. The solutions of differential equations and the realization of the conclusion as graphs of functional relations in the SIRIUS system are described. A specialized polynomial subsystem, its operation in conjunction with the SIRIUS system and methods for calculating polynomial determinants in symbolic form are investigated.

Intended for specialists in the area of computer mathematics and technology, physicists and also teachers and students of math-physics and cybernetics departments.

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UDC 658.012.011.56

"KADRY" DIALOGUE INFORMATION SYSTEM

DIALOGOVAYA INFORMATSIONNAYA SISTEMS "KADRY" in Russian, Preprint No 7, Institute of Precision Mechanics and Computer Technology, USSR Academy of Sciences 1979, 20 pp

OVSYANKIN, B. P.

[From REFERATIVNYY SBORNIK, ORGANIZATSIYA UPRAVLENIYA No 11, 1979 Abstract No 11.67.115]

[No text]

[191-1386]

UDC 658.012.011.56

MANAGEMENT SIMULATION GAMES AND AUTOMATED CONTROL SYSTEMS

Novosibirsk UPRAVLENCHESKIYA IMITATSIONNYYE IGRY I ASU in Russian, Nauka, 1979 256 pp

KOMAROV, V. F.

[From REFERATIVNYY SBORNIK, ORGANIZATSIYA UPRAVLENIYA No 11, 1979 Abstract No 11.67.132 K]

[Text] The use of management simulation games in the solution of problems of automated control systems (ASU) is explored. The procedure for developing and performing experiments with such games is presented, as is a description of the game "Project Control," designed for simulation-game demonstration of aspects of a system for operative management of branch scientific-research institutes. The experience gained in conducting simulation games with the object of training ASU specialists is described. The book is designed for specialists in the development and introduction of ASU, personnel of the system for advanced training in management skills, and instructors at higher schools of economics.
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MULTIFUNCTION REGULAR COMPUTING STRUCTURES

Leningrad MNOGOFUNKTSIONAL'NYE REGULYARNYE VYCHISLITEL'NYE STRUKTURY in Russian 1978 signed to press 18 Apr 78 pp 2, 173-174

[Annotation and table of contents of collection edited by I. N. Ryazanova, Izd. Leningradskogo Universiteta, 1,882 copies, 183 pages]

[Text]

UDC 681.14

This collection includes articles by instructors, scientific workers and graduate students from a number of educational institutions of the nation and elucidates various aspects of designing devices of computer technology based on multifunction regular computing structures (MRVS).

The articles in the collection consider questions of the ideology of the MRVS, the design and application of microprocessors and other technical devices of computer technology based on the MRVS.

The collection is designed for specialists in the field of computer technology, and also for students and graduate students in relevant departments.

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NEW BOOKS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 1, 1980 p 45

[Text] Abraytis, L. B.; Sheynauskas, R. I.; Zhilevichus, V. A. Avtomatizatsiya proyektirovaniya EVM. Avtomatizirovannoye tekhnicheskoye proyektirovaniye konstruktivnykh uzlov tsifrovykh ustroystv (Automation of Computer Design. Automated Technical Design of Digital Unit Devices). Moscow: Sov. radio, 1978. 269 p, 11,000 copies, 1 ruble.

Problems of designing automated systems for making digital unit devices. Organization of system functioning, their implementation, organizing and storing data flows. Basic stages of technical design: circuit analysis, test generation, arrangement, layout.

For specialists who are involved in designing computers and various radio-electronic equipment.

Aven, O. I.; Kogan, Ya. A. Upravleniye vychislitel'nymi protsessami v EVM: Algoritmy i modeli (Control of Computing Processes in Computers Algorithms and Models). Moscow, Energiya, 1978. 240 p. (Computers: use in investigations and production control). 12,000 copies, 95 kopecks.

Posing and solving problems of controlling the distribution of basic computer reserves. Analysis of time distribution algorithms of the central processor and memory. Results on optimizing the computing process control on an example of a concrete third generation computer.

For a wide circle of specialists involved in problems of controlling the computing process.

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TRANSLATION OF IBM DOCUMENTATION

Moscow LOGICHESKOYE PROGRAMMIROVANIYE V SISTEME/360 (Logical Programming in System/360) in Russian 1979 p 5-6

[Editor's foreward from book by D. Stabley, translated from English by A. P. Gagarin, V. G. Merkulov and O. F. Myasin; edited by L. D. Raykov and M. P. Shura-Bura, Izd. "Mir."

[Text] In recent years we have published several translated books devoted to the IBM SYSTEM/360 computers. With differing levels of detail, these books consider issues of logical structure and software. Our readers have shown great interest in these editions of which printings of many thousands of copies have sold out.

The development of the third generation computer systems of which the SYSTEM/360 was the forefather has been characterized in part by the elemental process of "standardization," which has affected the logical structure of the computer as well as principles of construction of the operational systems. Thus, the computer firms of Siemens and ICL, which are widely distributed throughout Europe, have systems of commands, which are virtually identical to the system of command of the SYSTEM/360 computer. Several operational systems of the computer firms of IBM, Siemens and ICL are also close in their principles of construction and in the capabilities they offer. These practically established compatibilities and standards have had a definite influence on the logical structure and software produced in the Soviet Union for The Unified System of Computers (YeSEVM). For this reason the great interest in the documentation on the SYSTEM/360 can be explained not only by the fact that IBM is the largest developer and producer of computers in the capitalist world and that the ideas on which the SYSTEM/360 is based, reflect the state of the art in this area, but also by the possibility of using in practice part of the material contained in the translated editions on the SYSTEM/360.

This book is a manual for programming in assembly language, addressed primarily to beginners. The author limits himself to giving the methods of programming using unprivileged commands of the standard set and commands of

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decimal arithmetic. Information about translator commands and macrocommands is given only insofar as it is necessary for understanding the basic material. Individual chapters contain a short description of machine commands, completely sufficient for initial instruction and examples of their use. The method of presentation selected allows the reader to concentrate at first on methods of programming. It can be recommended that someone who wishes to study the SYSTEM/360 system of commands more fully should use the book: "The IBM/360 Computer System. Principles of operation,""Sov. radio," 1968.

A large quantity of examples and review exercises permit one to hope that the book will be useful for students of programming of third generation computers as well as for teachers.

The translators basically kept to the terminology of the book by K. Dzhermeyn "Programming of the IBM/360," "Mir," 1971, 1st edit., 1973, 2nd edit., which in practice coincides with the accepted terminology in documentation on the YeSEVM. In the translation the names of commands in English were given to correspond with official documents of IBM. Small errors and typos have been corrected without special reservations. Chapters 1-8 were translated by O. F. Myasin, 9-12 by V. G. Merkylov and 13-20 by A. P. Gagarin who also translated the glossary and answers to the exercises.

L. D. Raykov, M. P. Shura-Bura

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