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USSR Report

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

(FOUO 21/81)

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USSR REPORT

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

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GENERAL

DISPLAYS AT THE COMPUTER TECHNOLOGY PAVILION OF THE EXHIBITION OF THE ACHIEVEMENTS OF THE USSR NATIONAL ECONOMY IN 1981

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 5, May 81 pp 40-41

[Article by I. V. Litvinov, chief methods engineer of the Computer Technology Pavilion of the Exhibition of the Achievements of the USSR National Economy]

[Text] In 1981 the pavilion opened with a new display devoted to the 26th CPSU Congress and reflecting achievements in the area of building and applying computer technology. The pavilion is displaying work on the following topics: the results of development of computer technology in the 10th Five-Year Plan and prospects for the 11th Five-Year Plan, the Ryad-2 models of YeS [Unified System] computers and SM [International System of Small Computers], software for automated control systems, and the use of automated control systems in the non-industrial sphere.

The introductory section of the display features a table which illustrates the growth rate of production of computer technology and the introduction of general-purpose computers in the 10th Five-Year Plan. The figures are as follows:

Indicator	Growth Rate % of 1975				
	1976	1977	1978	1979	1980
Production of Computer Technology	117	146	177	205	224
Introduction of General-Purpose Computer Capacities	188	276	350	375	405

The section called "Models of Ryad-2 YeS and SM Computers" displays two operating Ryad-2 machines (the YeS-1035-01 and YeS-1045) which are standard general-purpose computers, and the SM-1, SM-3, and SM-4 complexes of SM computers.

The general-purpose YeS computers are used to solve a large number of scientific-technical, economic, information-logical, and other problems both in an autonomous mode and within data processing systems, including systems that work in real time, on time-sharing, and in interactive systems. The Ryad-2 computer is a further development and refinement of the Ryad-1 machine and is compatible with it in program and information terms.

The relatively low cost of SM computers with high reliability and simple operation gives small computers a broad area of application: in automated control systems for aggregate units, industrial processes, and production facilities; in experimental research complexes; for primary processing of the results of flight and other tests, findings from geological exploration, and biomedical investigations; in information retrieval systems and communications; as units to control instruments, devices, and the like.

The broad use of SM and YeS computers is supported by elaborate software that comprises several operating systems and a large number of packages of applied programs. This subject is reflected in detail in the section of the display named "ASU [Automated Control System] Software." The Tsentprogramisistern [Central Programming Systems] Science-Production Association of Kalinin is exhibiting progressive know-how in work to write and disseminate ASU software, design and introduce ASU's of various levels and types, and teach contemporary methods of designing control systems. The display familiarizes visitors with ASU software based on the YeS computers and SM machines, and with the use of ASU packages of applied programs in concrete developmental form.

The topic "The Application of ASU's in the Nonindustrial Sphere" is treated by the sections "The ASU for Olympic Sites," "ASU's in Public Health," "ASU's in Construction," and "ASU's in Municipal Services."

The pavilion will continue showing the displays described above until August of this year.

At the end of the third quarter of 1981 the "Computer Technology" pavilion will open a new topical exhibit called "YeS Computer Hardware and Software" and a special display called "Means of Automated Speech Control in Human-Machine Systems."

The Scientific Research Center of Electronic Computer Technology, while composing the topical exhibit "YeS Computer Hardware and Software," defines the objective of the exhibit as demonstrating a collective-use system based on powerful YeS computers and a set of new hardware and software developed in the 10th Five-Year Plan. The topical exhibit will feature articles that reflect the latest advances of the sector in computer technology and display actual systems and real results of their application.

In addition to collective-use systems the display will include YeS-7920 user stations, the YeS-7905 display system for machine designing, and the YeS-7908 set of units for automating scientific, planning, and design work. The YeS-1045 computer (see picture [not reproduced]) and the YeS-1035-01 computer at the display are presented as hardware; several remote users located in different parts of Moscow will be connected to them by communications channels.

Plans call for setting up a display on promising scientific and design developments in the fields of cylindrical magnetic domains, main memory on semiconductor elements, the technology of printed cards, jacks, fans, and power supply blocks.

The proposed sections of the topical exhibit are as follows:

1. Advances of the sector in the field of computer technology during the 10th Five-Year Plan;
2. Collective-use system with far-flung terminal networks;
3. New peripheral equipment operating in the automated work position regime;
4. The new design and element base, a distinctive feature of the second phase of the Unified System [YeS] of computers.

The special display "Means of Automated Speech Control in Human-Machine Systems" will demonstrate that in addition to the use of traditional means of displaying data visually it is also efficient to use data output devices in speech form. The UVR-1 speech output unit is a speech synthesizer with by-word synthesis of the message based on a vocabulary of assigned volume working under program control from a computer. The device consists of magnetic disk storage, a control frame, and several user consoles for user communication with the computer in the interactive mode. Each user console is a loud speaker and panel with four buttons "On," "Re-Ask," "Yes," and "No." The time of user work with the computer in each message cycle is controlled by a timer using program means. The software of the unit allows writing the vocabulary into the computer and recoding it, storing the vocabulary in a packet of disks, program control of the device, and coordination of the work of the consoles in the interactive mode.

The UVR-1 device can have a significant impact when used in ASU's where the objects of control are very remote from the computer; where it is necessary to get the sense of the data to the consumer in speech form, if he is occupied by his primary work; to organize information-reference service by means of standard communications equipment (telephone, radiotelephone, industrial communications); to control objects in critical situations; for a psychological influence on people to improve their interaction and raise labor productivity; to control large groups of people.

This has been a brief survey of the 1981 displays at the "Computer Technology" pavilion of the Exhibition of the Achievements of the USSR National Economy.

Visitors to the pavilion will see many new and interesting things in the fields of software and hardware for YeS computers, SM computers, and automated control systems.

The pavilion has two reference-information centers in 1981, one operating from the sectorial information institute of the Ministry of Instrument Making, Automation Equipment, and Control Systems TsNIITEI [Central Scientific Research Institute of Technical-Economic Information on Instrument Making] in Moscow, and the other from the specialized Algoritm Science-Production Association in Moscow. The information centers at the pavilion offer an opportunity for detailed acquaintance with technical documentation on the objects displayed. They also provide qualified consultation on questions of interest.

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UDC 681.327"313"

PROSPECTS FOR THE DEVELOPMENT OF PERIPHERAL EQUIPMENT FOR CONTROL COMPUTER COMPLEXES

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 5, May 81 pp 1-2

[Article by V. V. Borisenko, candidate of technical sciences and director of the Scientific Research and Design Institute of Peripheral Equipment, Kiev]

[Text] The document "Basic Directions of Economic and Social Development of the USSR for 1981-1985 and the Period Until 1990" gives the instrument making sector, among other assignments, important jobs in the development of computer equipment. Meeting these challenges necessitates a faster pace in developing the production of high-speed computers and peripheral equipment and software for them, expanding the automation of planning-design and scientific research work using electronic computers, and accelerating the introduction of automated methods of monitoring quality and testing output as a constituent part of industrial processes.

During the 10th Five-Year Plan NIIP [Scientific Research and Design Institute of Peripheral Equipment, Kiev], which is the head organization in the sector for development of peripheral equipment for control computer complexes, completed development of virtually the full range of peripheral equipment for the first phase of the SM control computer complexes. Twenty peripheral devices, six of which have received the state Mark of Quality, were built and introduced in production. These include new models of printers, alpha numeric and graphic displays, external memory devices, and the like. Work was also done in the area of standardizing interfaces, design assemblies, and technical concepts for virtually all the groups of peripheral equipment. Control units for the broad assortment of peripheral devices of SM computers produced in the CEMA countries appeared.

The SM-3 and SM-4 control computer complexes and specialized peripheral units developed at NIIP were used as the basis for development of a series of systems to automate planning-design work and industrial processes in instrument making: the ISAP-P printed card automated design system, the ASPROM general purpose microprogramming system, and an automated control system for the industrial winding process. The 11th Five-Year Plan envisions broadening the functional capabilities of these systems, increasing their operating efficiency, and improving the quality of output documents.

The KODIAK multiterminal automated complex for monitoring, debugging, testing, and diagnosing the logical and analog blocks of computer equipment, which was developed by NIIP, will provide the basis for continued work to solve the problems of automating quality control for instrument making products. This complex is now in industrial operation at the Kiev VUM Plant. The complex is designed for simultaneous work by 16 operators in the interactive regime with an SM-4 control computer complex.

Supplying organizations and enterprises of the sector with automated design systems and automated systems for control of industrial processes developed by specialists at NIIP will make it possible in the 11th Five-Year Plan to have a significant economic impact and raise the productivity and quality of work of engineers and workers.

The sectorial program for the 11th Five-Year Plan envisions a set of well-founded, precisely calculated organizational-technical and other measures aimed at accelerating the research and development of new, highly efficient peripheral devices for control computer complexes and also a sharp increase in the assortment and production volume of peripheral units. The technical policy of the ministry with respect to the development of new models of peripheral units, as defined in the program, is oriented to a significant increase in their technical level by broad use of advances in microelectronics, optical electronics, and laser engineering and building base models with subsequent development of standard series of peripheral equipment on this basis. The following steps must be insured to accomplish this:

1. Realization of the main technical solutions at the invention level;
2. Improving reliability and operating characteristics;
3. Improving the economic qualities and level of esthetic design;
4. Raising the degree of standardization of the basic design elements of the devices;
5. Creation and broad introduction of new materials, highly economical assemblies, and assembly components, including frequently used new microprocessor sets and large integrated circuits;
6. Consistently reducing the power consumption, dimensions, and weight of the unit.

In the field of peripheral memory units plans envision the development of improved models of small magnetic tape stores, flexible magnetic disk stores, and storage units using cassette magnetic tape and replaceable and cassette magnetic disks. The new models will differ from existing ones by the following features:

1. Greater density of recording on the magnetic medium and greater information capacity;

2. Greater speed of movement of the medium thanks to the use of highly efficient specialized electric drives;

3. Improvement in the convenience of technical servicing of peripheral memory units (automatic tape loading in the magnetic tape store, automatic monitoring of malfunctions and diagnosis of failures, and so on);

4. Improved reliability and reduction in dimensions.

A series of models of printers (including sequential character-synthesizing printers of differing productivity levels, and jet-type, parallel drum-type, and tape-type printers) is to be developed and produced. They will have greater reliability, permit work in the optimal printing mode, and be simple to operate and service and comparatively small in dimensions and weight. Work will continue to improve the assemblies and blocks of parallel-action alpha numeric printers: type carriers, printer and motor assemblies, assemblies of the automatic regulation system, and the like.

New models of graphic information input-output units (semiautomatic mapboard devices to read and convert information, devices to output various types of graphic information) are also being developed. Compared to existing ones they are to provide an enlarged working field, greater resolution, a reduction in the error of conversion in input devices, greater speed in data output, and a higher level of equipment "smartness."

In the field of data display equipment the energy characteristics and "smartness" of display units will be increased and standardization of basic design assemblies and blocks will be furthered. Standardization of key circuit engineering concepts will be made the basis for development and launching the production of a series of models of alpha numeric and graphic video terminals, including graphic displays with rearrangeable structure based on the use of microcomputers as the control element, semitone and colored graphic displays, and "smart" alpha numeric video terminals.

Research in the field of devices that display information on gas discharge panels, in liquid crystals and the like will continue.

Development and incorporation in production of terminals and terminal stations, in particular "smart" terminals designed to prepare programs and microprograms, automate text preparation in printing, solve statistical and scientific-technical problems, and perform medical research is planned. The terminal to prepare programs will have two specialized devices (a programmer and a unit for emulation and communication with the object) in addition to the traditional peripheral equipment (keyboard, display, flexible magnetic disk storage, a printer, and tape reader). The terminal to automate text preparation, which is designed for use in printing and systems to automate production planning and preparation, will make it possible to carry out one-time text editing of volumes up to 2,000 characters and output them to an information medium.

Devices will be developed and introduced in production to prepare data on the basis of cassette-type magnetic tape stores and flexible magnetic disk stores with representation of the data on the display screen. Plans call for building a complex to prepare, recopy, and sort data on magnetic media.

With respect to the development of remote-control and data transmission hardware, plans envision the development and initiation of series production of multiplexers for synchronous and asynchronous work regimes with data transmission speeds of 9,600-19,200 bits per second; adapters that provide remote linkage of terminal communications (local and long-distance) equipment to the computer and among computers of the SM and YeS systems, and an assortment of modems for transmitting data at speeds of 600-19,200 bits per second.

In the area of units for communication with an object plans envision building a series of subcomplexes for the work positions of the operator-engineers of automated control systems for industrial processes, and terminals to collect and process analog and discrete signals for various systems. A large assortment of modules for feeding and outputting analog and discrete signals is to be developed.

The development and production of a broad range of peripheral units with good technical characteristics makes it possible to develop efficient automated systems for various purposes. At the same time, to achieve maximum satisfaction of needs in this area, it is essential to build a system of specialized large-series enterprises to produce the peripheral equipment of control computer complexes. This will help perform the assignment given in the document "Basic Directions" of making the transition to large-scale use of highly efficient systems of machines and industrial processes that provide full mechanization and automation of production and to carry out the technical re-equipping of the basic production sectors.

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PROBLEMS OF CONSTRUCTING TROUBLEFREE COMPUTER SYSTEMS

Moscow IZMERENIYA, KONTROL', AVTOMATIZATSIYA in Russian No 2, 1981 pp 47-52

[Article by doctor of technical sciences A. F. Volkov and candidates of technical sciences V. A. Vedeshenkov and G. B. Semenov]

[Excerpts] The broadening sphere of application of computers and computer systems gives their developers fundamentally new problems in insuring high reliability and readiness. Indeed, the inclusion of computer systems in the control contour for domestic industrial processes or installations usually requires steps to preclude even brief system downtime caused by malfunction in the elements of the system.

Another factor that imposes higher requirements for the troublefree operation and readiness coefficient of computer systems is the increasingly broad distribution of collective access in real time. The USSR is planning to set up a State Network of Computer Setters [1]. In most cases the failure of a computer system at centers of the network will lead to an immediate loss of information and computing resources for many users.

Conclusion

1. There is a broad area of application of computer systems where troublefree systems are mandatory. Thus, for example, the requirement for systems for electronic telephone switching allow no more than two hours of downtime in 40 years [28]. This requirement cannot be met without automating all restoration procedures. In addition, there is a trend to sharply reduce restoration time for the collective-use systems of high-powered computer systems. All this makes the problem of developing troublefree computer systems very timely.

2. The problem of building troublefree computer systems continues to be a complex scientific-technical problem. Examples of highly reliable computer systems used in practice show [4, 27] that as a rule troublefree operation is accomplished by using the simplest (from a technical point of view) methods (doubling at the machine level, triple stand-by with balloting) which leads to considerable system redundancy.

3. Further studies on setting up troublefree computer systems should pursue the following directions:

a. the search for new principles of organizing the structures of computer systems that make it possible to solve the problem of troublefree operation efficiently;

b. development of a technique for insuring the required level of troublefree operation based on parallel designing of a non-redundant system and a subsystem for automatic restoration of work capability;

c. development of new methods of organizing restoration procedures oriented to the use of series produced microprocessor sets and microcomputers;

d. further improvement in machine methods of analyzing the reliability of troublefree computer systems, both more accurate than convenient methods for users and less accurate ones that permit a reduction in the number of alternatives considered in the initial stages of designing.

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DEPUTY MINISTER CONGRATULATED ON ANNIVERSARY

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 4, Apr 81 p 13

[Journal statement congratulates deputy minister of instrument manufacture, automation equipment and control systems: "Anniversary Congratulations!"]

[Text]

The collegium of the Ministry of Instrument Manufacturing, Automation Equipment and Control Systems, the presidium of the central committee of the machine-building and instrument-manufacturing workers' trade union, the central board of the Scientific-Technical Society of the Instrument-Manufacturing Industry imeni S. I. Vavilov and the editors and editorial board of PRIBORY I SISTEMY UPRAVLENIYA heartily congratulate on his anniversary Professor Valentin Vladimirovich Karibskiy, USSR deputy minister of instrument manufacturing, automation equipment and control systems, chairman of the central board of the Scientific-Technical Society, USSR Lenin and State Prize winner, a prominent industry organizer and one of our country's important public figures.

We wish this beloved man whose anniversary we celebrate continued creative successes, good health and happiness.

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TABLE OF CONTENTS FROM 'FOREIGN RADIO ELECTRONICS', MAY 1981

Moscow ZARUBEZHNAYA RADIOELEKTRONIKA in Russian No 5, May 81 pp 1-2

[Editorial board and table of contents]

[Text] Editorial board: P. A. Agadzhanov, P. A. Bakut, S. N. Bushev, G. I. Veselov, L. I. Glinkin, V. Ye. Dulevich, G. G., Zemskov, Ya. S. Itskhoki, Yu. B. Kobzarev, K. K. Likharev, I. N. Loshchilov, B. N. Mitashev, V. V. Molchanov, V. T. Ovcharov, V. V. Ovchinnikov, I. P. Panfilov, V. A. Puzyrev, V. I. Pustovoyt, V. A. Solntsev, V. N. Sretenskiy, V. I. Tikhonov, K. N. Trofimov, R. I. Ustyamishev, and V. P. Yakovlev; editor-in-chief, M. K. Razmakhnin.

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UDC 681.325.652

ANALYSIS OF JOSEPHSON LOGICAL ELEMENTS BASED ON INTERFERENCE AND ANHYSTERETIC CRYOTRONS

Kiev ANALIZ DZHOZEFSONOVSKIKH LOGICHESKIKH ELEMENTOV NA INTERFENTSIONNYKH BEZGISTEREZISNYKH KRIOTRONAKH in Russian 1979 (signed to press 19 Apr 79) pp 2, 47-49, 51

[Annotation, conclusion and bibliography from book "Analysis of Josephson Logical Elements Based on Interference and Anhysteretic Cryotrons" by Igor' Danilovich Voytovich, UkSSR Academy of Sciences, Order of Lenin Institute of Cybernetics, Preprint 79-24, 300 copies, 52 pages]

[Excerpts] Annotation

Three systems of Josephson logical elements with sensitive load are analyzed, based on interference tunnel cryotrons with drop of power supply, on interference tunnel cryotrons in a regime of self-restoration and on noncapacitive cyrotrons. The analysis was made with consideration of input noises and inevitable dispersion of the cryotron parameters. The dimensions of the working region of the elements and the conditions of their functioning in complex circuits are explained. The work of a memory element intended for information storage in the intervals between cycles is studied. It is shown that, as a function of the number of captured quanta of magnetic flux, a superconducting dc circuit can remember binary information in one of three modes. The results of analysis and specific computations agree with the experimental data published in the foreign literature.

The work is intended for specialists engaged in the development of computer components based on new physical principles.

Conclusions

1. Shortcomings characteristic of diffraction tunnel cryotrons (absence of prospects of further substantial increase of operation speed and relatively large dimensions and currents) are uncharacteristic of interference tunnel cryotrons. Thanks to the use of interference tunnel cryotrons the IBM Corporation has succeeded in increasing by several times the operation speed of logical elements and in changing to lines and tunnel junctions with dimensions of 5 micrometers. A further improvement of the system of elements was replacement of the current by potential supply, which had to have a favorable influence on the noise level, parasitic connections and crosstalk.

At the same time the estimates made in the present work have shown that the interference tunnel cryotron system of elements is far from perfect and the elements accomplishing various logical functions are not equivalent. If some of them have very high indicators, others work under critical conditions and are little suitable for practice.

2. The "OR" elements on hysteretic interference tunnel cryotrons surpass the elements on diffraction tunnel cryotrons not only in operation speed but also in the working region dimensions and noise resistance. They preserve efficiency during scattering of the cryotron parameters and working signals, and also voltage fluctuations in the range of ± 10-15 percent and allow on each intake noise of any sign constituting over 10 percent of the amplitude of the working signal.

3. In contrast with the "OR" elements, the "AND" elements on hysteretic interference tunnel cryotrons have a working region little used for practice. In their design and work they are far more complex than the "OR" elements and are matched with them with didficulty, have one third the operation speed and require precise assignemt of the rated values of the parameters. The same shortcomings are intrinsic to the still more complex element "NOT". The situation can be corrected if the elements "AMD" and "NOT" are replaced by the two-cascade universal element "OR NOT" [1], which has the merits of the "OR" element.

4. Analysis of memory elements intended for information storage in intervals between cycles permitted determining three working regimes of the memory circuit connected to a dc source I_{dc}: a) the regime of capture of single quanta of magnetic flux ϕ_o in each state is characterized by a minimum operation speed, but it is critical toward values of branch inductances L_H and L_g, and in the case of their incorrect selection or great scattering (over 5-10 percent) the circuit loses efficiency; b) the regime of capture of single quanta in one state and of an absence of capture in the other state; it is characterized by a high operation speed, commensurable with that of the preceding state, and moderate requirements for reproducibility of the inductances L_H and L_g, but in relation to one of them the condition $L_H < \phi_o/2I_{dc}$ must be fulfilled, which is not always possible; c) the regime of capture of a large number of quanta of magnetic flux in each state $[L_H(L_g) \gg \phi_o/I_{dc}]$, is characterized by an absence of any sort of requirements for reproducibility of the inductances L_H and L_g, but has a minimum operation speed.

5. Logical elements on hysteretic interference tunnel cryotrons can work in a regime of self-restoration on dc. In that case they withstand very great noise ($\eta = 0.2$), react less than others to scattering of the cryotron parameters (± 15 percent) and to large currents ($\gamma = 0.2$) and preserve efficiency at a high cryotron amplification factor ($G \approx 2$). However, the long time of return of elements to the cold state presents a serious obstacle to their practical use.

6. Logical elements without power supply drop on noncapacitive Josephson weak bonds (for example, bridges of variable thickness) have good indicators. The great resistance of such a cryotron permits matching the load resistance with the wave resistance of the connecting line and thus assuring the conditions for obtaining the maximum operation speed. Logical elements based on noncapacitive cryotrons with a rectangular control characteristic have high tolerances for the power current (over ± 15 percent) in a scattering of cryotron paramters in the range of ± 10-15 percent and an amplification factor of less than 2.

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UDC 681.325.5

INCREASING THE SPEED OF FREQUENCY-PULSE COMPUTERS

Taganrog MNOGOPROTSESSORNIYE VYCHISLITEL'NYYE STRUKTURY in Russian No 1/10, 1979 pp 16-20

PALAMARYUK, G. O.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B489 by T. M. Kuznetsova]

[Text] The different directions in development of increased speed frequency-pulse computers are analyzed. A method of constructing frequency-pulse computers that analyzes the operating principles which ensure that the result of mathematical operation during the period of the output frequency will be found is considered. The disadvantages of these frequency-pulse computers are the lack of the possibility to find the result in code form and the presence of attenuation and fluctuation in the resulting signal, due to which the indicated frequency-pulse computers are used as constituent blocks of frequency-pulse computers of the compensation type. The compensation method of designing operational frequency-pulse models, based on comparison of the values of the frequencies of pulse sequences, is analyzed. The broad operational capabilities that permit realization of six main types of mathematical operations are indicated as the main advantages of the frequency-pulse models. The use of the double conversion method in which a group of input signals is converted to a code which is then converted to frequency by either linear or functional law, is also considered. Realization of a combination method is proposed, according to which two interconnected operating devices are allocated in the frequency-pulse model. The compensation method is suggested as the basis for design of one of them and the conversion method is suggested as the basis of designing the other. The condition of compatibility of the two operating devices is the identity of their simulating functions. Conclusions are made about an increased of the speed of frequency-pulse models with high simulation accuracy in static and dynamic modes on the basis of tabular data about the specifications of a frequency-pulse multiplier constructed on the basis of the combination approach. Figures 5; tables 4; references 5.

[182-6521]

UDC 681.327.66

UTILIZING CHARACTERISTICS OF FARADAY ROTATION NEAR A COMPENSATION POINT FOR THERMOMAGNETIC RECORDING OF INFORMATION

Tbilisi OPTOELEKTRONIKA, KVANTOVAYA ELEKTRONIKA I PRIKLADNAYA OPTIKA in Russian 1980 pp 32-37

DOLIDZE, G. F., MERKULOVA, G. I. and BUKHNIKASHVILI, R. N.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 3, Mar 81 Abstract No 3B431 by T. M. Kuznetsova]

[Text] The problem of using the characteristics of behavior of ferromagnetics at the compensation point for thermomagnetic recording of information is considered. The characteristic features are understood as the sharply marked dependence of coercive force on temperature and also rotation of the magnetic moments of the windings in the external magnetic field and the temperature hysteresis of this rotation. The capabilities of increasing the speed and of reducing the consumed magnetic power and of recording devices are using magnetic fields of single polarity both in recording information and in erasing it are noted, which leads to a significant decrease of the erasing field compared to the known method. Figures 5; references 6.

[190-6521]

UDC 681.325

ACOUSTOOPTICAL HOLOGRAPHIC PROCESSORS

Moscow MEZHVUZOVYY SBORNIK NAUCHNYKH TRUDOV MOSKOVSKOGO INSTITUT RADIOTEKHNIKI, ELEKTRONIKI I AVTOMAT in Russian No 12, 1979 pp 33-54

YEVSTIKHIYEV, N. N. and YESIKOV, O. S.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 3, Mar 81 Abstract No 3B229 by T. M. Kuznetsova]

[Text] The results of investigating various methods of operational information processing given both in analog and in digital form are presented. It is shown that the use of acoustooptical information input into a holographic processor now permits solution of different problems. The principles of design of acoustooptical holographic processors are outlined. Different methods of processing and storage of signal components in real time: methods of direct identification of analog components of signals, operational processing of digital information and storage

and subsequent reproduction of signal components, are described. The prospects of the considered methods and devices are analyzed from the viewpoint of optimizing the process of identification, reliability, durability and so on. Figures 10; references 1.

UDC 681.325.5

SPECIALIZED RAPID FOURIER TRANSFORM PROCESSOR FOR INVESTIGATING ALGORITHMS FOR DIGITAL PROCESSING OF SIGNALS. REPORT 1. SYNTHESIS OF THE OVERALL STRUCTURE OF THE PROCESSOR

Khar'kov RADIOTEKHNIKA in Russian No 54, 1980 pp 100-106

SYRTSOV, S. L.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 3, Mar 81 Abstract No 3B238]

[Text] A specialized rapid Fourier transform processor is considered in the given article. A schematic diagram of the processor with a single arithmetic device for operations on complex numbers and sequential circuit control is developed. Figures 2; references 2.

UDC 681.32

SPECIALIZED RAPID FOURIER TRANSFORM PROCESSOR FOR INVESTIGATING ALGORITHMS FOR DIGITAL PROCESSING OF SIGNALS. REPORT 2. OPERATIONAL DESCRIPTION OF THE PROCESSOR

Khar'kov RADIOTEKHNIKA in Russian No 54, 1980 pp 106-111

SYRTSOV, S. L., LYAKHOVETS, V. A. and SKOROKHODOV, Yu. I.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 3, Mar 81 Abstract No 3B231]

[Text] Operator description of a processor that performs rapid Fourier transformation on sampling of 4,096 readings of a radio signal with maximum band of 100 kHz is compiled in CDL language. Figure 1; references 4.

UDC 681.323

MULTIPROCESSOR DIGITAL PROCESSING SYSTEM FOR IONOSPHERIC NONCOHERENT-SCATTERED SIGNALS

Khar'kov RADIOTEKHNIKA in Russian No 54, 1980 pp 117-123

SMOL'YANINOV, S. S. and LYAKHOVETS, V. A.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 3, Mar 81 Abstract No 3B212]

[Text] Problems of using a multiprocessor system based on a matrix processor with microprogram control to process noncoherent-scattered signals are considered. Figures 3; references 8.

[190-6521]

UDC 681.32.04

MEASURING INFORMATION GATHERING AND PROCESSING SYSTEMS

Taganrog SISTEMY SBORA I OBRABOTKI IZMERITEL'NOY INFORMATSII in Russian No 2, 1980 pp 1-130

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TAKHNIKA No 3, Mar 81 Abstract No 3B100 by T. M. Kuznetsova]

[Text] The devices and components of information gathering systems are considered in the collection. Mathematical description of systems during automated design is given and the error of the integral distribution function, the possibilities of optimizing the structure of measuring information gathering networks by evaluating the information characteristics of the random process on correlated sampling and restoring in digital temperature measuring systems with rejection of noise-affected samples are analyzed in the first section "Information Gathering and Processing Systems. Development of the information measuring system for test benches and organization of software of the data gathering multiprocessor module are described and the effectiveness of the combined data compression algorithm is analyzed. The devices and components of information-gathering systems: devices for measuring and recording of the parameters of pulsed electromagnetic processes, an information converter based on a multiprocessor, an analog storage device of increased accuracy and buffer storage devices for conveyor storage systems are described in the second stage. The maximum capabilities of

modulators of digital conducting communications lines, the sensitivity of a dynamic logic element based on a flip-flop with direct coupling and also synthesis of noise-resistant structures of analog to digital converters are analyzed. The third section is devoted to primary converters: integral pressure tensor converters, membrane type tensor converters and devices for precision adjustment of thin-film resistors.

UDC 681.322.07

SERVO GATING OF REPRODUCTION AMPLIFIERS IN LARGE-CAPACITY SEMIPERMANENT MEMORY UNITS BASED ON BIAX TYPE COMPONENTS

Unknown INSTITUT TOCHNOY MEKHANIKI I VYCHISLITEL'NOY TEKHNIKI AN SSSR in Russian Preprint No 25, 1980 pp 1-14

ZVERKOV, V. P., MARKOV, A. I. and FOL'DMAN, V. M.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKI I VYCHISLITEL'NAYA TEKHNIKA No 3, Mar 80 Abstract No 3B414 by T. M. Kuznetsova]

[Text] Organization of servo gating of playback amplifiers in high-speed large-capacity semipermanent storage devices based on BIAX (storage capacity of 32K 36-digit words with cycle of 0.8 ms) type components is described. Servo gating of playback amplifiers is introduced into the semipermanent storage device to maintain the stability of its functioning with variation of surrounding temperature, nominal values of power supply sources and also upon deviation of parameters under serial production conditions. The essence of the servo gating method includes compensation for the difference of delays in the pulse shaping and propagation circuits of the gate and of information signals by identification of these paths. A number of design and circuit-engineering characteristics of the developed semipermanent storage device is noted. The organization of the storage device and gate shaper is organized. The forms of the reference and information signals and also the voltages on the address line are analyzed. Figures 8.

UDC 681.335.2:621.376

IMPROVING PARAMETERS OF VOLTAGE-FREQUENCY CONVERTERS BY USING GALVANIC ISOLATION DEVICES

Moscow PROYEKTIROVANIYE VYCHISLITEL'NYKH SISTEM I IKH USTROYSTV DLYA LETATEL'NYKH APPARATOV in Russian 1980 pp 74-79

SOBOLEV, I. V.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 3, Mar 81 Abstract No 3A118]

[Text] Direct current voltage to pulsed frequency converters find wide application in remote measuring and information measuring devices, automation and monitoring devices, nuclear electronics and experimental physics systems and direct-current voltage integrators with long integration time. Galvanic isolation in the pulsed frequency control channel can be created by using an optron that can be effectively microminiaturized. The use of a single optron may not provide satisfactory thermal stability of the regulating properties of pulsed frequency due to the strong dependence of the optron parameters on temperature. A pulsed frequency circuit in which a galvanic isolation device with open phase discriminator of the optron (i.e., without direct current control) is used in the control channel is devoid of this deficiency. The output current of the control channel is the current of the reverse-biased phase discriminator of the optron that, besides galvanic isolation, makes it possible to use the high output resistance of the phase discriminator for current stabilization during discharge (charge) of the relaxation circuit capacitors. Current I is thermally stabilized by using negative feedback introduced by the optron. Figures 1; references 4.

[190-6521]

UDC 681.322.01

MULTIPROCESSOR COMPUTER SYSTEM

Taganrog MNOGOPROTSESSORNYYE VYCHISLITEL'NYYE STRUKTURY in Russian No 2/11, 1980 pp 37-38

ITENBERG, I. I., KOSTELYANSKIY, V. M., NABATOV, A. S., PIVOVAROV, G. Yu. and REZANOV, V. V.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 3, Mar 81 Abstract No 3B47]

[Text] The structure of SIMD type multiprocessor computer systems designed to process large information files by regular paralleled algorithms is discussed. The productivity of the system, consisting of 64 processor components, may reach 200 million operations per second of the register-register addition type.

[190-6521]

HUGHES IC FOR VHSIC PROGRAM

Moscow ZARUBEZHNAYA RADIOELEKTRONIKA in Russian No 5, May 81 p 108

[Article from IEEE SPECTRUM, Oct 80]

[Text] The Hughes Company (USA) has developed a new microelectronic chip containing about 0.50 million circuit elements. The speed of the device is hundreds of times greater than that of other cirucits. Specialists think that the new chip will find wide application in military instruments and equipment. The first such circuits, which have been called "very high speed integrated circuits" (VHSIC) were made by photolithographic methods; the geometery of individual elements was measured in values of the order of magnitude of 1.25 micron. The specialists assume that in the mid-1980's such chips will be made by means of electron beam lithography and that individual elements will have submicronic dimensions. Named as areas of possible applications of VHSIC are processors for multimode radio relay communication lines, communication systems, sonars, electron-optical systems and control circuits for multi-target rockets. The main purpose of the project which gave rise to the creation of the VHSIC was the creation of standard types for military applications, called upon to replace a large number of different chips developed in various organizations and now in use.

2174
CSO: 1863/187

UDC 681.325:621.382

UNITED STATES DEPARTMENT OF DEFENSE PROGRAM ON VERY HIGH-SPEED INTEGRATED CIRCUITS

New York 13TH ASILOMAR CONFERENCE ON CIRCUITS, SYSTEMS AND COMPUTERS, PACIFIC GROVE, CALIFORNIA, 1979, CONFERENCE RECORD in Russian 1980 pp 146-150

SUMNEY, L. W.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B371 by A. V. Foygel']

[Text] The United States Department of Defense program for research in the field of developing super high-speed integrated circuits, designed for 1980-1985, is considered. It is noted that the Department of Defense previously did not compile its own expensive programs on development of integrated circuits since all the requirements for development of new integrated circuits for military systems were satisfied by developments of manufacturing companies. The circumstances that required compilation of its own research program by the Department of Defense and the inadequate reliability of commercial integrated circuits are indicated. Development of a technique for producing integrated circuits with thickness of 1.25 micron during the first step and 0.5-0.8 micron during the second step of the program is provided. The main purpose of the program is preparation for development of highly effective data processing subsystems for use in wideband military communications systems, encoding, underwater military communications and navigation systems, military control and command systems, military guidance and tracking systems, military image processing systems, adaptive military radar systems and so on. Tables 1.

UDC 681.327.004.11

DEVELOPMENT OF A SEMIAUTOMATIC PLOTTING UNIT FOR FEEDING GRAPHIC INFORMATION

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 5, May 81 pp 2-4

[Article by engineers V. G. Sakharin, A. A. Sofiyuk, and G. S. Kolomiyets]

[Text] Devices for feeding graphic information within computer complexes find broad use in solving problems of automating planning and scientific-technical experiments, obtaining raw data when automating technological preparation for production, and in other applications.

Feeding graphic information using automatic devices requires the development of a set of complex programs that describe and recognize images and provide automatic input; in addition, it imposes high requirements for the quality of plotting graphic information and on its medium. This greatly complicates the structure of the automatic input system, increases its cost, and leads to a rise in operating expenditures. The lack of efficient techniques for optical reading of large images also limits the area of application of automatic input systems today. Therefore, the most widely used systems have been ones where graphic information is fed by semiautomatic plotting units, and the problems of image description and recognition are handled by the human operator.

The basic element of the semiautomatic graphic input unit is the plotter. Its working field is designed for allocation of the graphic information carrier with the image plotted on it. The graphic information is read by an operator by pointing the coordinate pickup at distinctive points of the image or by outlining the image. The methods of reading graphic information that make it possible to obtain the codes of the coordinates of the selected point on the image for feeding to the computer are based on various physical principles [1].

Analysis of the characteristics of graphic input devices produced by domestic industry and abroad shows that discrete-continuous electrical devices in which the pickup has inductive or capacitive linkage to the working field have the greatest advantages. These devices, which combine all the best features of the discrete and continuous methods of reading and converting coordinates, provide high values for such parameters as precision and resolution and have large working fields for their plotters.

The working field of the discrete-continuous graphic input unit is a coordinate matrix consisting of two mutually perpendicular systems of parallel wires, coordinate lines which are excited by pulses of current or voltage. This makes it possible to distribute the electromagnetic field along the coordinate axes of the working field following a definite rule. A signal read by the coordinate pickup has one or several information parameters which are functionally related to the position of the pickup on the working field of the plotter. As a result, these parameters can be converted into the digital codes of the coordinates of the point selected.

Because graphic input units are becoming a tool used by designers and developers, a search is underway for technical concepts which could insure a reduction in the labor-intensiveness of manufacture and the cost of the unit while maintaining high values for its basic parameters.

Let us briefly consider the basic parameters of the graphic input device: the size of the working field of the plotter; precision of reading; resolution; maximum reading speed.

Because the size of the image being encoded as a rule must not exceed the size of the working field of the plotter, this parameter is often the determining one in selecting a unit. It should be observed, however, that increasing the coding surface that is not part of the zone of optimal operator accessibility in such a case reduces convenience and, ultimately, the efficiency of operator work. In a number of cases, therefore, it is wise to encode the graphic object by parts, allocating the part of the image being processed to the optimal zone. Where this is possible, the range of application of units with working fields of "small" and "medium" size, possessing higher labor efficiency and relatively low cost, may be greatly expanded.

The error of coordinate measurement, which determines the accuracy of reading, includes systematic and random error. Errors are subdivided into equipment and technique errors depending on the error of measurement equipment and the error occurring because of imperfect measurement techniques [2]. Systematic equipment error in graphic input units depends on the quality of manufacture of the specific assemblies (the working field and coordinate pickup) and on the quality of work of the electronic assemblies that read the graphic information. The quality of manufacture of the working field is determined by the evenness of the discretizing step of its coordinate lines, while the quality of the coordinate pickup is determined by the uniformity of its sensitive element. The precision of reading also depends significantly on the quality of work of the electronic assemblies. This is determined by the stability and equality of the currents or voltages that excite the coordinate lines; the stability of the characteristics of the elements that convert the signal that is read; reducing the effect of noise on the signal read.

Systematic equipment error is reduced by various design and technological concepts that insure the necessary parameters for these assemblies and elements of the unit. Technique error occurs because of the finite dimensions of the working field, which give rise to boundary effects; the nonlinearity of the conversion characteristic, which is a result of the curved shape of the sensitive

element of the pickup; quantization of the quantity being measured, and the like. Methods of reducing technique error vary and depend on the specific technique used to read graphic information.

In the general case, precision may be improved by installing supplementary coordinate lines along the margins of the working field, reducing the ratio of distance between coordinate lines to the diameter of the sensitive element, introducing a correction to the value obtained for the quantity being measured, and increasing the number of degrees of quantization. Random error, which occurs as the result of the influence of noise from both internal and external sources on the unit, is fully or partially eliminated by protective screening and band filtration of the signal being read and multiple measurement of the coordinates of each point being read.

When discrete-continuous methods of reading are used, the resolution, which is determined by the degree of quantization of the coordinates, may be very high. Experience shows that a resolution level equal to 0.1 millimeters is entirely adequate for encoding a broad class of graphic objects. The operator cannot realize a higher value of resolution with special attachments because encoding objects of such density goes beyond the limits of his psychophysiological capabilities.

The maximum possible reading speed reflects the "capability" of the device with respect to speed when converting a pair of coordinates of the selected point to digital codes. This parameter must not limit the productivity of work, but at the same time making it too fast leads to a more complex and costly unit.

The indicators that reflect the capabilities of the unit that make it more convenient and efficient for the operator to work are very important. Such capabilities may be realized on the basis of preliminary processing of graphic information, which includes recomputation of the values of the coordinates of the coordinate system of the working field into a system of coordinates of a drawing; rounding off the values of the coordinates within the coordinate network of the drawing; analysis of data and forming messages on the state of the unit or erroneous situations that arise during coding; conversion of the codes of the coordinates into a form that is convenient for operator perception.

The presence of these functions takes load off the central computer of the complex and makes it possible to preclude errors arising because of deformation, for example shrinkage, of the carrier of graphic information and careless aiming of the pickup at the selected point when coding the images laid out on the coordinate grid. It permits the operator to monitor the reading process and detect malfunctions in the work of the unit.

For preliminary data processing it is wise for the graphic input device to include a special processor with microprogram control, linked to the other functional blocks of the unit through interblock interfaces. In this case the structure of the graphic input unit acquires flexibility that, when necessary, allows additional blocks to be connected and functional capabilities to be expanded.

Figure 1 presents a structural diagram of the semiautomatic plotter for reading and converting graphic information that has been developed by NIIP (Kiev). Figure 2 shows the external appearance of the unit.

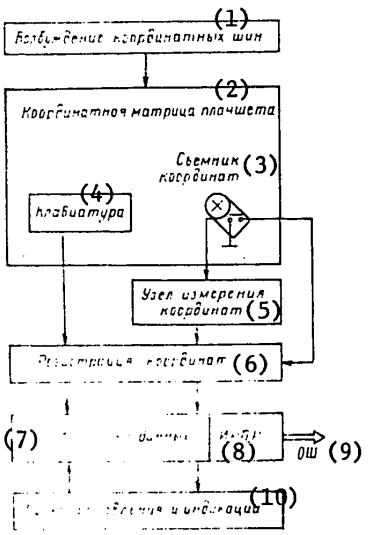

Figure 1

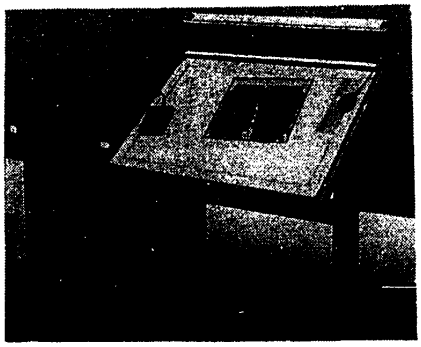

Figure 2

Key:
(1) Excitation of Coordinate Lines;
(2) Coordinate Matrix of Plotter;
(3) Coordinate Pickup;
(4) Keyboard;
(5) Coordinate Measurement Assembly;
(6) Coordinate Registration;
(7) Data Processing;
(8) IRPR Interface;
(9) OSh Interface;
(10) Control and Display Console.

Technical Specifications of the Semiautomatic Plotter for Reading and Converting Graphic Information

Dimensions of the working field in millimeters	850 × 600
Error of reading in millimeters	±0.5
Resolution in millimeters	0.1
Maximum possible reading speed in points per second	100
Linkage of pickup to working field	inductive
Type of interface	IRPR, OSh

The method of reading and converting coordinates used in the unit is based on sequential excitation of the coordinate lines by pulses of current and conversion of the signal read in a time interval proportionate to the coordinates being measured.

The unit includes the following basic blocks and assemblies:

a. block to excite the coordinate line, which shapes the sequences of pulses of current going to the coordinate lines;

b. coordinate matrix on a two-sided printed card with coordinate lines; distance between two neighboring lines is 10 millimeters;

c. coordinate pickup, in which the sensitive element is a measuring coil that receives signals from the nearest coordinate lines;

d. coordinate measurement assembly, which converts the signals being read into time intervals proportionate to the coordinates of the position of the pickup on the working field;

e. coordinate registration block, which converts the time intervals into digital codes, registers the coordinates, and outputs them to the data processing block;

f. keyboard, which is used to assign certain most frequently used symbols that characterize the elements of the graphic image;

g. data processing block, built on the microprogram principle and performing preliminary processing of graphic information;

h. control and display console, designed to set work regimes and display information on the state of the unit and the coordinates and number of the point being encoded.

During the work process the unit may be carrying out any one of three procedures at a certain moment: feeding base parameters, calibration, or coding.

The procedure for feeding base parameters, which are a sequence of alpha numeric or special symbols, makes it possible to feed the computer raw data or initial conditions determined by the requirements of the complex which includes a graphic input unit. Feeding is accomplished by means of a symbol matrix organized in the upper right-hand corner of the working field of the plotter and containing 256 cells of 10 × 10 millimeters apiece.

The calibration procedure envisions determining the data necessary to convert the coordinates of the points of the graphic image from the coordinate system of the working field to the coordinate system of the drawing. During the calibration process the four boundary points of the drawing are read and the coordinates of the two boundary points that have the minimum and maximum values in the coordinate system of the drawing are assigned by means of a symbol matrix or keyboard block.

Coding, which is the primary work mode, involves reading the points of the image and assigning symbolic information that characterizes the elements of this image. During the coding process the data processing block performs the following functions:

a. determines whether the point being coded goes beyond the boundaries of the drawing and, if it is within the limits of the drawing, whether it falls within the zone of the symbol matrix or not;

b. determines whether the point being coded is located in the "dead space" separating the cells of the symbol matrix or the zone of sensitivity surrounding each assembly of the coordinate grid of the drawing;

c. shapes the code of the signal in conformity with the cell selected if the point read is located in the zone of the symbol matrix and does not fall in the "dead space";

d. converts the coordinates from the coordinate system of the working field to the coordinate system of the drawing according to calibration data;

e. rounds off the values of the coordinates within the coordinate grid, at steps selected as 1, 1.25, 2.5, and 5 millimeters;

f. converts the values of the coordinates to binary-decimal codes for outputting to digital indicators;

g. determines the correspondence of the angle between the segment being coded and the axes of the coordinates of the drawing to the condition of being a multiple of 45 degrees where it is necessary to monitor this correspondence;

h. selects the coordinates of the points that are transmitted to the computer in the continuous coding regime (transmission to the computer takes place only if the sum of absolute values of increments of the coordinates of two adjacent points is not less than the assigned value);

i. forms signals that control data exchange among blocks of the unit and between the unit and the computer.

The microprogram software of the data processing block has about 3,000 microcommands.

An operator using the graphic input unit receives information on the state of the unit and certain situations that occur by means of sound and light signals located in the control console and by indicators. The following data are outputted: information has been accepted by the unit or the computer; information transmitted to the computer contains a mistake; the unit is locked out while information is processed in the computer; a mistake has been made in performing the calibration procedure; the point being encoded is outside the bounds of the drawing; the segment being coded and the axes of the coordinates form an angle that is not a multiple of 45 degrees; the point being encoded is in the "dead space."

The work of the graphic input device in the interactive mode with the operator is particularly interesting. To realize the interactive mode it is suggested that the unit include an alpha numeric video terminal and a data store in addition to special software.

FOOTNOTES

1. P. M. Chegolin, E. N. Leonovich, and V. P. Savenkov, "Avtomatizatsiya Preobrazovaniya Slozhnykh Form Graficheskoy Informatsii" [Automating the Conversion of Complex Forms of Graphic Information], Minsk, "Nauka i Tekhnika", 1973.

2. P. P. Ornatskiy, "Teoreticheskiye Osnovy Informatsionno-Izmeritel'noy Tekhniki" [Theoretical Foundations of Information-Measurement Equipment], Kiev, "Vishcha Shkola", 1976.

3. Author's Certificate 714434 (USSR).

11,176
CSO: 1863/191

UDC 681.327.64.001.23

MICROPROGRAM CASSETTE MAGNETIC TAPE MEMORY

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 5, May 81 pp 8-10

[Article by engineers A. I. Kulik and V. A. Cherepanov]

[Excerpt] Cassette magnetic tape is inexpensive and compact. It provides reliable long-term storage of recorded information. One of the chief advantages of cassette magnetic tape is the possibility of using it to replace traditional punched cards and punched tape in input-output units.

The cassette magnetic tape microprogram memory unit developed at NIIP [Scientific Research and Design Institute of Peripheral Equipment] was designed to expand external memory and organize data input-output to the SM-3 and SM-4 control computer complexes, providing for storage of large arrays of data and information exchange by means of recorded cassettes. In design terms the cassette magnetic tape microprogram memory is made in the form of a self-contained composite block and consists of the microprogram controller, a block to interlink with the "common line," and two cassette magnetic tape stores.

With the SM-3 and SM-4 complexes the cassette magnetic tape microprogram memory forms the following functions: receive and execute commands; shape and output information on the state of the controller and stores; receive information from the processor; output information to the processor.

The memory unit we are describing has a control and indicator console that makes possible: indication of the content of the most important registers, work in a cyclical regime, a stop at an assigned address, returning the unit to its initial state, sequential reading of microcommands, and cycling one microcommand. The existence of these possibilities greatly reduces the time required for preventive servicing in the "diagnosis" regime and in the combined regime with the machine.

11,176
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MAKING PRINTERS FOR DATA PROCESSING SYSTEMS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 5, May 81 pp 6-7

[Article by candidate of technical sciences V. V. Borisenko, director of the Scientific Research and Design Institute of Peripheral Equipment, Kiev, and candidates of technical sciences L. D. Shabas and Sh. A. Lorman]

[Text] Printers for data processing systems are perhaps the only area of computer technology where the work of the equipment can be based on a broad variety of physical principles. Printers use dozens of techniques (and variations of them) for recording an image on paper [1, 2]. The abundance of techniques and the lack of substantiated recommendations for using them in printers sometimes leads to incorrect conclusions about their areas of application.

Selection of the principle of recording to be used in the printer is one of the paramount problems in making these devices. The consumer resolves a similar question: what unit (based on what operating principle) should be used in the particular article or system.

This article proposes to reach solutions to this question by reviewing the principal recording techniques from the standpoint of an evaluation of energy inputs, that is, to analyze how much energy must be expended, in fact and theoretically, to use the particular technique, for example to record one character on paper. What is the efficiency of the technique (if we have in mind energy input)? What effect does it have on the dimensions, cost, and productivity of the device? This approach seems logical because the basic characteristics of printers, including operating costs, depend on the printing mechanism, which emobodies a definite recording technique.

We will consider the following basic recording techniques: electrochemical, on heat-sensitive paper, evaporation of an aluminum film from metallized paper, electrographic without an intermediate medium (electrostatic printing), electrographic with an intermediate medium (for example laser printing), percussion printing, and jet printing. The first four techniques require the use of special paper for recording, while the last three use ordinary paper. Each of these techniques has a number of modifications. For example, jet printing includes the pulsed pressure method, the high-pressure method, the axial electrostatic field technique, the "ink cloud" technique, and others. The percussion method may be printing "on the fly," or using a stopped type carrier, may differ by the kind of

type carrier, may use sequential, parallel, or mixed printing principles, and so on.

The following premises were taken into account in analyzing the energy inputs of the recording techniques.

1. Each character recorded on printing paper can be synthesized from 25 points on the average. The diameter of a point is 0.2 millimeters.

2. Energy inputs for recording one character (discounting losses) are equal to the sum of energy inputs to record 25 points.

3. For electrochemical printing the energy inputs necessary to drive the paper (where moistened paper is used) are not considered.

4. For electrographic printing without an intermediate medium only energy inputs to secure the image (heat) are considered because they are significantly greater than inputs to electrify the medium.

Figure 1 below contains diagrams that illustrate the energy inputs necessary to record one character for the different techniques (Figure 1a) considering losses and without losses (the right and left columns respectively); efficiency, productivity П in relation to volume (dimensions) V of the device; the cost of a unit of volume of the device Ц/V*; and the specific cost c = Ц/П of the device per unit of productivity. The diagrams of energy inputs without considering losses were obtained by calculation; the other diagrams were obtained on the basis of an analysis of concrete printers with average characteristics.

As can be seen from the diagram (see Figure 1a), jet printing is the least energy-intensive, while percussion printing has the lowest efficiency at the present time. The efficiency of the percussion technique is determined by the striking mechanism, which is a special electrical machine, a kind of low-output electrical motor. The theory and practice of electrical machines testifies that an efficiency of 10 percent for small electrical machines is entirely realistic, and the figure may reach 30 percent [3]. The percussion technique has great potential capabilities. This is confirmed by the fact that raising efficiency by just one percent (from 2.5 to 3.5 percent), which occurred in the last decade, made it possible to build percussion-type printers with good technical parameters.

Table 1 below shows how the quality of devices depends on the basic elements of the control unit and the efficiency of the striking mechanism. Thus, the YeS-7031, YeS-7032, and YeS-7033 units have the same class of striking mechanisms with an efficiency equal to roughly 2.5 percent. The YeS-7031 unit is built on "discrete" basic elements, while the YeS-7032 and YeS-7033 devices use integrated microcircuits. As we see, the units of integrated microcircuits as basic elements made it possible to double the quality of the unit. The SM-6135 and DP-2260 printers, using practically the same basic elements as YeS-7032 and YeS-7033 units, have a striking mechanism efficiency that is one percent greater. This improved the quality of the units almost 80-fold.

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* [Ц = price]

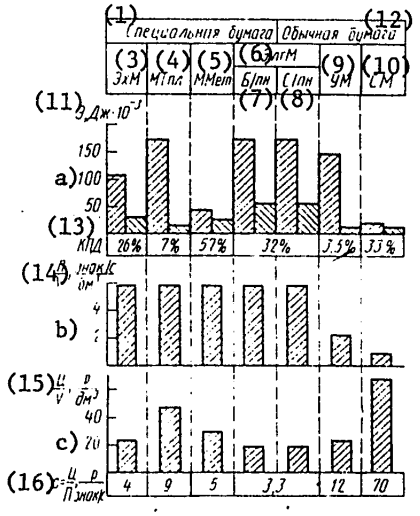


Figure 1. Diagram of (a) Energy Input; (b) Specific Productivity; and (c) Cost, relative to the volume of the printers.

Key:
(1) Special Paper;
(2) Ordinary Paper;
(3) Electrochemical;
(4) Heat-Sensitive Paper;
(5) Evaporation from Metallized Paper;
(6) Electrographic;
(7) Without Intermediate Medium;
(8) With Intermediate Medium;
(9) Percussion;
(10) Jet Printing;
(11) Energy, joules·10^{3}
(13) Efficiency;
(14) Productivity/Volume — Characters per Second/Cubic Inches;
(15) Price/Volume, rubles per cubic inch
(16) Cost = Price (Rubles)/Productivity (Characters per Second).

Figures 1b and 1c show estimates of the productivity of devices relative to the volume (dimensions) and the cost of a unit of volume of the device for different recording techniques. The first evaluation characterizes the complexity and cumbersomeness of the design; the second describes the complexity and labor-intensiveness of their manufacture.

The values of the ratios Ц/V and П/V make it possible to determine $c = Ц/V \div П/V = Ц/П$, that is, the specific expenditures of the techniques per unit of productivity. Thus, the devices built using the techniques of recording on conventional paper (with the exception of electrographic with an intermediate carrier) are more expensive than other devices of the same productivity. However, the additional initial expenditures are repaid during operations (see Figure 2 below).

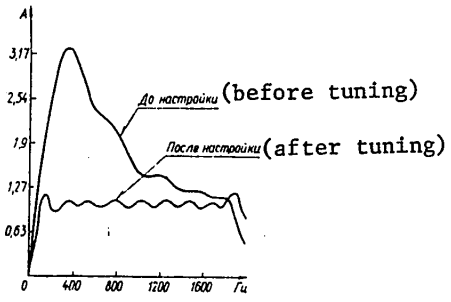
Устройство (1)	Скорость $Ск$ в строк/мин (2)	Длина строки L (3)	Приведенная скорость $Ск_1$ в строк/мин (4)	Наработка на отказ P в ч (5)	Объем V в м³ (6)	Масса G в кг (7)	Мощность W в кВт (8)	Коэффициент качества K (9)
ЕС-7031 (ГДР) (a)	900	120	820	70	2,35	750	2,4	14
ЕС-7032 (СССР) (b)	750	128	730		1,35	700	2	27
ЕС-7033 (ПНР) (c)	1100	160	1340		1,31		3,5	30
СМ-6315 (СССР) (d)	500	132	500	400	0,61	220	0,65	2300
DP-2260 (США) (e)	436	136	450		0,62	168	0,68	2500

Note: $Sk_1 = SkL/132$ — the calculated printing speed (for a line length of 132 and a set of 96 characters); P — mean time between failures where $K_{print} = 1$; K - Sk P/VGW.

Table 1. Comparative Characteristics of Alphanumeric Printers.

Key: (1) Unit;
(2) Speed Sk in Lines per Minute;
(3) Length of Line L;
(4) Calculated Speed Sk in Lines per Minute;
(5) Mean Time per Failure P in Hours;
(6) Volume V in Cubic Meters;
(7) Weight G in Kilograms;
(8) Power W in Kilowatts;
(9) Quality Coefficient K;
(a) YeS-7031 (East Germany)
(b) YeS-7032 (USSR);
(c) YeS-7033 (Poland);
(d) SM-6315 (USSR;
(e) DP-2260 (United States).

Figure 2. Growth in Expenditures During Operation of Devices that Work with Special (Curve 1) and Ordinary (Curve 2) Paper: $Ц_1$ and $Ц_2$ — Costs of the Devices.



[The above Figure 2 is reproduced, captioned, and keyed as given in the Russian article; the discrepancy between the graphics and the words is as printed -- translator.]

Because $Ц_1 + Ц_1 П t_o = Ц_2 + Ц_2 П t_o$ and $Ц = cП$, the moment in time after which total expenditures for devices working with special paper (curve 1 in Figure 2) begin to exceed expenditures for devices that use ordinary paper (curve 2, Figure 2) is determined by the expression $t_o = (c_1 - c_2)/(y_2 - y_1)$ where y_1 and y_2 are the specific costs of paper (special and ordinary respectively) per character in rubles per character and П is productivity in characters per second.

Using the values of the corresponding characteristics (see Figure 1 above and Table 2 below) for devices that perform percussion printing, the time t_o in seconds for other devices in comparison with percussion devices may be expressed as follows: $t_o = (12 - c_1)/(y_1 - 0.51 \cdot 10^{-6})$.

Table 2. Specific Cost of Paper (Approximate)

(1) Бумага	(2) Удельная стоимость	
	(3) в р./м²	(4) в р./знак
(5) Электрохимическая	0.61	$4.45 \cdot 10^{-6}$
(6) Металлизированная	0.67	$4.8 \cdot 10^{-6}$
(7) Теплочувствительная	0.4	$3 \cdot 10^{-6}$
(8) Электростатическая	0.2	$1.46 \cdot 10^{-6}$
(9) Обычная	0.07	$0.51 \cdot 10^{-6}$

Key: (1) Paper;
(2) Specific Cost;
(3) In Rubles/m^2;
(4) In Rubles/Character;
(5) Electrochemical;
(6) Metallized;
(7) Heat Sensitive;
(8) Electrostatic;
(9) Ordinary.

The values of time t_o delineate the boundaries of the areas of application of printers with particular working principles. Figure 3 below shows an evaluation of time t_o for various devices compared with percussion printing. It may be concluded that it is wise to use the heat sensitive technique only in printers designed for active work (printing) for no more than one percent of all working time. Such printers may be useful for keyboard computers, microcalculators, and in measuring instruments.

The methods of recording using metallized, electrochemical, or electrostatic paper are suitable in devices that print no more than 1-5 percent of total working time. Such printers may find application in special program-oriented data processing complexes and measurement systems. Finally, it is recommended that recording techniques on ordinary paper be used for printers designed to work with a printing coefficient of more than five percent.

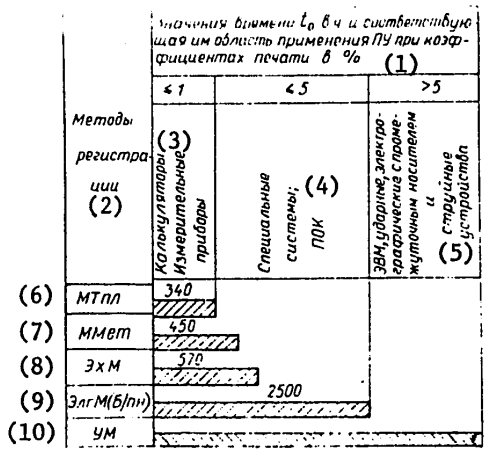


Figure 3. Values of Time t_0 for Devices Constructed with Different Recording Techniques Compared to Percussion Devices: Areas of Application.

Key: (1) Values of Time t_0 in Hours and Corresponding Area of Application of Printers Where Printing Coefficient in Percentage is:
(2) Methods of Recording;
(3) Calculators, Measuring Instruments;
(4) Special Systems, Problem-Oriented Complexes;
(5) Computers and Percussion, Electrographic (with Intermediater Carrier), and Jet Devices;
(6) Heat Sensitive;
(7) Metallized;
(8) Electrochemical;
(9) Electrographic Without Intermediate Carrier;
(10) Percussion.

FOOTNOTES

1. N. N. Saveta, L. M. Khokhlov, B. S. Brikman, and others, "Pechatayushchiye Ustroystva" [Printers], Moscow, "Mashinostroyeniye", 1977.

2. M. G. Arutyunov, and V. D. Markovich, "Skorostnoy Vvod-Vyvod Informatsii" [High Speed Data Input-Output], Moscow, "Energiya", 1970.

3. A. I. Vol'dek, "Elektricheskiye Mashiny" [Electrical Machines], Moscow-Leningrad, "Energiya", 1966.

11,176
CSO: 1863/191

UDC 621.391:53.08.621.327.11

CONSTRUCTION OF AN INFORMATION-MEASUREMENT SYSTEM BASED ON A LSI SERIES K589 MICROPROCESSOR COMPLEX

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 5, May 81 pp 17-18

[Article by engineers O. N. Merkulov, M. I. Avilov, and I. M. Petrov]

[Excerpt] Developers of information-measurement systems today face the problems of devising means to monitor the states of an object with a large number of parameters and significant information in the parameters. Some examples are the problems of monitoring the work regimes of power grids, automation of diagnosis and biomedical experiments, and the like.

The multiplicity of changing physical and electrical characteristics of objects, the unpredictability of their reactions, and the lack of an adequately precise formal description of the phenomena being investigated necessitate a flexible and adaptive system of data collection and processing. In many cases control computer complexes and minicomputers make it possible to find efficient enough solutions to such problems. But in the process of setting up centralized systems for data collection and processing high requirements are imposed for their software, speed, and volume of main memory, and this greatly increases the cost of the control computer and the system as a whole. Therefore, the principle of decentralized control, under which the means of processing raw data are taken closer to data sources, is receiving increasing development. In this case information-measurement systems are built on a hierarchical structure with maximum possible data processing at each level. The use of microprocessor large integrated circuits makes it possible to begin data processing at the lowest levels of the hierarchy.

A multichannel system for feeding analog signals is used as the data source at the lowest level in the proposed system. When all channels are queried, there must be either a large number of analog-digital convertors, which is not economically advantageous, or an analog-digital convertor with a multichannel commutator must be used. But controlling a commutator by command from a control computer requires considerable time of the central processor, while simple cyclical querying of all sensing units diminishes the frequency of querying for each channel and, therefore, reduces the informational quality of the particular parameters. At the same time there is inevitably a reduction in the

efficiency of monitoring and control for all the parameters of the system with multiple linkages.

The alternative proposed is a multichannel analog-digital convertor with channel selection by adaptive algorithms; the convertor is controlled by a programmed automaton. For this kind of control it is advisable to use a peripheral processor which, in functional and design terms, is included within the configuration of an interface and performs, in addition to interface functions, part of the functions of the central processor relating to initial data processing (conversion of codes, ordering arrays, sorting data, and the like).

In this case the series K589 multiprocessor complex of large integrated circuits is used to build a general-purpose (universal) programmable interface. This complex was selected because of its high speed, the availability of means to construct an internal interface and an external interface, the possibility of designing processes with different bit configurations, and the possibility of microprogramming, which permits development of a system of interface commands that is compatible with the system of commands of practically any digital computer.

The hierarchical structure of the information-measurement system includes three levels (see Figure 1 below): the central processor (control computer), the peripheral processor with its own main memory, and the analog input subsystem which consists of a 32-channel commutator and an analog-digital convertor. The input

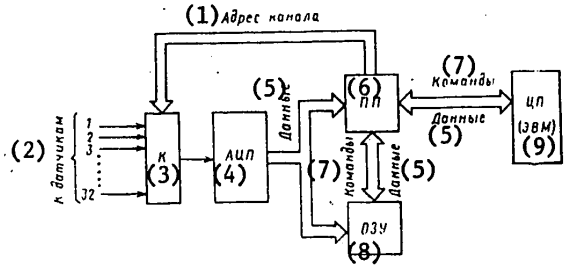


Figure 1. Structure of the Information-Measurement System

Key:
(1) Channel Address;
(2) To Sensing Units;
(3) Commutator;
(4) Analog-Digital Convertor;
(5) Data;
(6) Peripheral Processor;
(7) Commands;
(8) Main Memory;
(9) Central Processor (Computer).

analog signals are selected by the commutator under the control of the peripheral processor; at this time the channels of the commutator are addressed by the processor as external registers. The bit configuration of the analog-digital convertor coincides with the word length of the peripheral processor: 16 bits.

Conversion time is 5-8 microseconds, and the range of input signals is ±5 volts. The signal, converted to digital form by the analog-digital convertor, goes to the peripheral processor for initial processing. In addition to the functions of controlling the multichannel commutator, the peripheral processor synchronizes the work of the system with the central processor, performs initial data processing, sorts arrays of data, performs spectral and statistical analysis, and initiates and processes interrupt signals.

The peripheral processor is constructed as a 16-bit microcomputer with an expandable main memory unit (see Figure 2 [not reproduced]). It consists of a matrix of central processor series K589 elements, a microprogram control block with a microprogram memory unit and microcommand buffer register, a priority interrupt block with a buffer register, a cyclical pulse generator, an address line shaper, a circuit to control data transmission, and a main memory unit.

Thanks to the possibility of microprogramming the system of commands of the peripheral processor can emulate the system of commands of the central processor or be modified in accordance with the nature of the problems being solved by reprogramming the microprogram loading unit without touching the structure of the peripheral processor. Emulation of the system of commands of the peripheral processor makes it possible to use the software of the control computer when writing and debugging programs for the peripheral processor. Programs are loaded and the results of data processing are outputted through the external devices of the control computer (central processor). Data exchange between the control computer and peripheral processor is organized on the basis of central processor commands through a two-way data transmission line. Up to eight interrupt signals with different levels of priority assigned by external commutation may go from the central processor and peripheral units (analog-digital convertor and sensing devices) to the peripheral processor. The peripheral processor has a main memory unit that can be built up to 32,000 words, which greatly expands the capabilities of the system for concentrating and processing data and reduces the loading of the central processor memory with unprocessed data. The central processor can address either specific cells or memory blocks of the peripheral processor determined by program.

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FUNCTIONAL REDUNDANCY IN MULTIMACHINE CONTROL SYSTEMS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 4, Apr 81 pp 3-5

[Article by engineers M. N. Bayraka, Yu. I. Burgutin and V. V. Lyutov: "Establishing Functional Redundancy in Multimachine Control Computer Systems"]

[Excerpts] Taking as an example the system for automatic control of blast-furnace production at the Krivorozhstal' Metallurgical Plant imeni V. I. Lenin, let us look at some aspects of the development of highly reliable systems employing an ASVT-M [modular system of computer hardware] complex through the introduction of functional redundancy in a two-machine computer system. The ASU [automatic control system] for blast-furnace operations is functionally divided into two systems, the central component of which is two M-6000 computer systems. One system operates in a direct control mode, the other in a passive redundancy mode. Hardware selection is dictated by more rigorous requirements for control-program stability with data distortion, malfunctions or partial equipment failures.

Following the required updating of our set of tasks, we achieve with the use of the system program package now developed a basic capability of establishing a functional redundancy for these tasks in another computer system, which substantially enhances the reliability of both the computing and control systems. Use of the package has made it possible to increase 5-6-fold the operating time of the ASU TP [system for automatic control of technical production processes] for No. 9 blast furnace of the Krivorozhstal' Metallurgical Plant imeni V. I. Lenin. Operation of the package offers a certain redundancy, which permits the user or ASU TP developer to select specific functions requiring redundancy. The inter-machine information links of the M-6000 computer system discussed in this article have been realized in the form of most reliable, easily operated series-manufactured data links as well as of peripheral equipment.

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SELECTING REPROGRAMMABLE CONTROL MEMORY OF MICROCOMPUTERS

Unknown TRUDY INSTITUTA ELEKTRONNYKH UPRAVLYAYUSHCHIKH MASHIN in Russian No 82, 1980 pp 132-141

MARKAROV. G. I.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B542 by T. M. Kuznetsova]

[Text] A comparative analysis is given of the effectiveness and method of selecting the optimum areas of application of internal storage devices, programmable permanent storage devices and cylindrical magnetic disk storage devices as the reprogrammable control memory of microcomputers. Minimization of the price of productivity is selected as the criterion of effectiveness, which may be determined in the case of the microcomputer as $V = Z/P$, where Z is the expenditures for the microcomputer that include its cost and operating expenses and P is the productivity of the microcomputer. The productivity of a microcomputer is determined as a value inverse to the time affecting the solution of the set of problems, each of which is repeated several times. Expressions are derived which can be used to determine the optimum areas of application of the considered types of storage devices with respect to the parameters that characterize the set of programs and also for selection of the most effective type of reprogrammable control memory and to determine the values of the cylindrical magnetic domain parameters at which their application is more effective than the use of internal storage devices. Figures 2; references 3.

UDC 681.327.664.4

MATRIX INFORMATION READING SCHEME IN DOMAIN STORAGE DEVICES

Unknown TRUDY INSTITUTA ELEKTRONNYKH UPRAVLYAYUSHCHIKH MASHIN in Russian No 82, 1980 pp 128-131

KRASOVSKIY, V. Ye., KUKHAREV, V. Yu. and PADYUKOV, L. N.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B539 by T. M. Kuznetsova]

[Text] The problem of selecting the best organization of the information reproduction channel in the reading devices of domain storage devices is considered from the viewpoint of reliability and cost. A number of approaches is proposed for organization of reading circuits that permit a reduction of the composition of electronic equipment and simplification of the device. One of these approaches includes a combination of sensors arranged in different domain registers by means of a group control device serviced by one reproduction condition. The effective data transmission speed from the domain storage device is increas n-times (n is the number of sensors in the group, usually two or four). According to the other approach, the combination of domain registers is organized so that the registers in the matrix column are arranged in an independent domain integral microassembly, while the magnetic resistor sensors of registers located in each line of the matrix are joined in series and are connected to the arm of the bridge circuits. In this case the volume of electronic equipment is reduced by a factor of $\sqrt{m}$, where m is the number of registers, but some increase of the noise level occurs. The latter approach is matrix organization of the reading circuits with connection of diodes to the bridge circuit, freeing the previous one of deficiencies, but requiring additional use of diodes. Figures 1; references 4.

UDC 681.327.664.4

MODELLING THE STATICS AND DYNAMICS OF CYLINDRICAL MAGNETIC DOMAINS IN DOMAIN-MOVING CIRCUITS

Unknown TRUDY INSTITUTA ELEKTRONNYKH UPRAVLYAYUSHCHIKH MASHIN in Russian No 82, 1980 pp 118-122

ANDREYEVA, L. P., SPERANSKIY, O. A. and ANDREYEV, A. K.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B540 by T. M. Kuznetsova]

[Text] The problem of modelling the processes of the statics and dynamics of cylindrical magnetic domains in permalloy domain-moving circuits is considered for optimization of the operating characteristics of cylindrical magnetic domain devices. The results of investigating the dynamics of cylindical magnetic domains using model representation of the application scattering fields are presented. Equations of the statics and dynamics of cylindrical magnetic domains that are the basis of the mathematical model of the static and dynamic behavior of cylindrical magnetic domains in moving circuits are solved jointly with equations for a permalloy subsystem (on the assumption of homogeneous magnetization of applications in rotating control fields). A modelling program written in FORTRAN-IV language and which permits calculation of the trajectory and variation of radius, instantaneous velocity of a cylindrical magnetic domain, elliptical deformation of the domain and also the area of stable operation of cylindrical magnetic domain devices is developed for given configuration of applications both in statics and dynamics. The time of modelling the motion of cylindrical magnetic domains during one period of the moving circuit on a Siemens-4004 type computer comprises 20 minutes. The trajectories of motion of cylindrical magnetic domains in circuits with rectangular applications and T-1 type applications are presented. Figures 2; references 4.

UDC 681.327.664.4

FOUR TRENDS IN DEVELOPING COMPONENT BASE OF DOMAIN STORAGE DEVICES

Unknown TRUDY INSTITUTA ELEKTRONNYKH UPRAVLYAYUSHCHIKH MASHIN in Russian No 82, 1980 pp 3-16

RAYEV, V. K.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B541 by T. M. Kuznetsova]

[Text] Four trends in development of the component base of domain storage devices, which are understood as the aggregate of circuit engineering and design solutions, and also the physical effects used to perform functional operations on central magnetic domains, including translations of cylindrical magnetic domains, encoding, recording, switching, replication and so on, are considered. The first trend is the basis for development of first-generation storage devices whose storage file is formed by the aggregate of discrete microelements--permalloy applications. The use of compositions resistant to electron migration for conducting components, a reduction of current density by selection of efficient topology of the components in the chip structure and also the use of planar technology and so-called gapless circuits in the form of adjacent disks are proposed. The second trend is construction of cylindrical magnetic domain fillers on the basis of ion-implanted control circuits of cylindrical magnetic domains that provides chip capacity of more than 10^8 bits. The third trend is the use of essentially new principles of information coding in cylindrical magnetic domain stores that make it possible to form a domain lattice capable of existing in a demagnetized cylindrical magnetic domain film and which permits an approximately 16-fold increase of recording density with given resolution of the lithographic equipment. The fourth trend is current perforated circuits designed in the form perforated circuits designed in the form of two conducting perforated films around which flow sinusoidal currents with linear density on the order of 1 mA/micron. The advantages of the indicated circuits are the absence of coils--control field solenoids, that limit the speed of the domain devices and the absence of electron migration and also the possibility of controlling groups of cylindrical magnetic domains in domain lattices to achieve maximum recording density. The state and prospects for development of the component base of domain storage devices are analyzed. Considerable progress in industrial methods of producing materials with cylindrical magnetic domain diameters considerably less than the resolution of lithographic equipment and also high rates of development of the industrial technique of producing thin micropatterns is predicted for the next 10 years. Figures 2, references 7.

UDC 681.327.664.4

ANALYZING DISTRIBUTED CURRENT CONTROL SYSTEMS OF CYLINDRICAL MAGNETIC DOMAINS

Unknown TRUDY INSTITUTA ELEKTRONNYKH UPRAVLYAYUSHCHIKH MASHIN in Russian No 82, 1980 pp 96-109

LYASHENKO, Ye. P. and RAYEV, V. K.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B543 by T. M. Kuznetsova]

[Text] The problem of adequate analytical description of the dynamic properties in cylindrical magnetic domains is considered in circuits that permit numerical modelling of the functional characteristics of cylindrical magnetic domain devices based on perforated current circuits. Analytical methods of calculating the control fields of perforated current circuits are presented which, jointly with the equations of motion of cylindrical magnetic domains, totally describe the dynamic characteristics of cylindrical magnetic domain circuits with increased recording density and high speed. The problem of analytical description of the dynamics of cylindrical magnetic domains in perforated current circuits is divided into two independent subproblems: calculation of the magnetic fields of perforated current circuits created by external current sources and solution of the differential equations of cylindrical magnetic domains that directly describe the dynamics of the macroparameters of the domain determined by the dynamics of magnetostatic traps created by the current circuits. The problem of quasi-steady current distribution through an infinitely long conducting layer with perforations is considered. Methods are proposed for calculating the magnetic fields of distributed current and the problem of the divergence of its vector potential is described. A simple integral expression is derived for the z-component of the magnetic current field flowing around an opening of arbitrary shape, which is an analogue of Biot-Savart law for plane current layers and which significantly simplifies the calculations. The results of calculations for a circular perforation, which are represented in closed analytical form, indicate the significant inhomogeneity and strong localization of the fields near the edges of the perforation. Problems of analytical description of the dynamics of a cylindrical magnetic domain in perforated current circuits are touched on. The effects of high-frequency shielding of the control field in dual currents of the circuits and the transverse skin effect that arise at increased frequencies are discussed. Qualitative analyses of the degree of the indicated effects are presented. Figures 3; references 21.

UDC 681.327.664.4

ANALYZING INFORMATION-LOGIC STRUCTURES OF MULTIFUNCTIONAL DOMAIN STORAGE DEVICE CHIPS

Unknown TRUDY INSTITUTA ELEKTRONNYKH UPRAVLYAYUSHCHIKH MASHIN in Russian No 82, 1980 pp 17-21

PROKHOROV, N. L. and MEL'NIKOV, B. F.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B544 by T. M. Kuznetsova]

[Text] The problem of designing multifunctional storage devices based on cylindrical magnetic domains on the basis of multifunctional rearranged logic elements is considered. New structures of chips with matrix arrangement of the storage registers and with complete sequential processing are proposed. Information is arranged in the latter structure of the chip in the storage register block and is reproduced upon processing from the block to an additional register and the given structure is characterized by long processing time. A structure is also proposed that uses the advantages of matrix and sequential structures. The degree of parallelism of information processing in the given structure is less than that in a matrix structure, but it permits sufficiently short processing time. The latter is accomplished sequentially by words and parallel by bits. The integrals between adjacent rearranged logic elements are filled by bits of the same type of one or several operands, which permits one not to read the result of processing after each logic operation, which reduces the processing time by a factor of 2M (compared to sequential organization). Figures 3; references 3.

UDC 681.327.664.4

CALCULATION AND PRINCIPLES OF DESIGN OF HERRINGBONE READING DEVICES OF CYLINDRICAL MAGNETIC DOMAINS IN DOMAIN STORAGE DEVICES

Unknown TRUDY INSTITUTA ELEKTRONNYKH UPRAVLYAYUSHCHIKH MASHIN in Russian No 82, 1980 pp 27-39

SHORYGIN, M. P.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B545 by T. M. Kuznetsova]

[Text] An attempt is made to systematize the data on design of single-layer herringbone reading devices of cylindrical magnetic domains that include a magnetoresistive herringbone detector of cylindrical magnetic domains and a domain

expander based on herringbones. The calculating model of a magnetoresistive herringbone detector is considered that permits one to determine the components of magnetization of a sequence of uniformly magnetized rectangular elements by the iteration method, which simplifies the program calculations. The number of division elements is low in this case, which produces the reading time. The model is a compromise between simplicity and accuracy. A method of selecting the topology and parameters of herringbone reading devices by determining all the significant factors for output characteristics such as the technological restriction, dimensions of applications, angles of the herringbone components, jumpers, current through the herringbone detector and so on is outlined. The main principles of designing the topology of herringbone reading devices are formulated that have the goal of improving the output characteristics: consideration of the factors enumerated above, minimization of the total area of the herringbone reading device and the distance between the main and compensating detectors, the maximum identity of dimensions and orientation of detectors, the maximum possible packing of components in the vertical column, optimization of the topology of basic components of the herringbone reading devices and the connections between them, the uniformity of depth of the magnetostatic trap and so on. The structure of a herringbone reading device designed according to the foregoing and its main characteristics are presented. Figures 7; references 17.

[182-6521]

UDC 681.317.664.4

INVESTIGATING SOME CIRCUITS OF PASSIVE CYLINDRICAL MAGNETIC DOMAINS OF FORBID-AND ASSEMBLIES

Unknown TRUDY INSTITUTA ELEKTRONNYKH UPRAVLYAYUSHCHIKH MASHIN in Russian No 82, 1980 pp 86-91

SMIRNOV, S. N.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B546 by T. M. Kuznetsova]

[Text] The results of investigating the developed topologies of the circuits of passive cylindrical magnetic domain FORBID-AND assemblies based on T-1 components with improved characteristics are reported. Problems of selecting the type of arrangement of the components of the branched channel of the assembly, of determining the topology of the branched channel and of providing amplification of the interaction of the cylindrical magnetic domain at the point of magnetic communications of the channels are solved sequentially on the basis of experimental and theoretical investigations of active assemblies. Two circuits constructed on the basis of a combination of the following main principles are

proposed. A cylindrical magnetic domain is converted from one channel to another at the direct contact with a permalloy application (along it) without overcoming the air gaps. The interaction of the cylindrical magnetic domain of adjacent channels is intensified due to common applications. Interaction of the domains due to elongation of one of them is intensified. Repelling fields are used during interaction of cylindrical magnetic domains. One of the developed circuits is constructed without increasing the gaps between components, which increases the speed of the logic assembly. Figures 5; references 5.

UDC 681.317.664.4

CHARACTERISTIC BEHAVIOR OF CYLINDRICAL MAGNETIC DOMAINS IN ION-IMPLANTED ADVANCE STRUCTURE

Unknown TRUDY INSTITUTA ELEKTRONNYKH UPRAVLYAYUSHCHIKH MASHIN in Russian No 82, 1980 pp 110-117

MILYAYEV, Yu. K. and CHIRKIN, G. K.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B547 by T. M. Kuznetsova]

[Text] The results of experimental study of the dependence of domain advance characteristics on the shape of non-implanted components of ion-implaned advance structure and the mutual arrangement of shift registers are presented. The effect of the shape of the component on domain advance and the behavior of cylindrical magnetic domains in an information storage file were studied. Conclusions are made on the basis of the data about the need to minimize the cubic magnetic anisotropy of the surface layer of the film to achieve high characteristics of the ion-implanted advance structure. Cubic anisotropy in a ferrite-garnet film caused doubling of the moving field and a one-half decrease of the stable operation zone of the ion-implanted advance structure components. The dependence of the stable operating zone of one side of the circuit on the unimplanted components of the configuration of the opposite side was found. The best domain advance was found for symmetrical components (contiguous disks) with respect to the circuit. The need to take into account the interaction of registers and the increased effective length of charged walls on extreme registers and those second from the edge of components is noted. Expressions were derived for the optimum distances of information registers from each other and from the common input-output register. Figures 3; references 5.

UDC 681.317.664.4

CONNECTING CYLINDRICAL MAGNETIC DOMAIN DETECTORS TO THE ADVANCE CHANNEL OF CYLINDRICAL MAGNETIC DOMAINS OF DOMAIN STORAGE DEVICES

Unknown TRUDY INSTITUTA ELEKTRONNYKH UPRAVLYAYUSHCHIKH MASHIN in Russian No 82, 1980 pp 82-85

RAYEV, V. K. and SHORYGIN, M. P.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TAKHNIKA No 4, Apr 81 Abstract No 4B548 by T. M. Kuznetsova]

[Text] A herringbone reading device of a cylindrical magnetic domain is proposed, the basis of which is the idea of mutual arrangement of the main detector and of the compensating detector or of their active parts at a distance less than the period of the advance channel λ. The device includes asymmetrical herringbone main and compensation detectors arranged in a row in the advance channel in which the detecting (active) parts are arranged opposite, specifically in specular fashion. The proposed cylindrical magnetic domain reading combines the advantages of devices with compensation detector outside the advance channel (the capability of recording a continuous sequence of cylindrical magnetic domains and of reducing the electron framing of the chip) and also devices with main and compensation detectors arranged in a row (significantly smaller area). The suitability of the developed principle of mutual arrangement of main and compensation detectors at a distance less than λ for the other types of cylindrical magnetic domain detectors is noted. Figures 2; references 3.

UDC 681.327.664.4

READING INFORMATION IN MAGNETIC DOMAIN DEVICES USING ORTHOGONAL EXPANSIONS

Unknown TRUDY INSTITUTA ELEKTRONNYKH UPRAVLYAYUSHCHIKH MASHIN in Russian No 82, 1980 pp 92-95

KRASOVSKIY, V. Ye. and SHABALOV, D. V.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B549 by T. M. Kuznetsova]

[Text] The problem of increasing the reliability of reading information in magnetic domain devices and the related increase of their operating reliability is considered. A method of analyzing the shapes of the signal from the sensor that converts magnetic energy of the magnetic domain to an electric pulse is

proposed, according to which the pulse shape from the sensor output is analyzed. The latter more fully characterizes the state of the magnetic domain: the presence or absence of it according to logic "0" and "1") and the dimensions of cylindrical and flat magnetic domains. The analysis is carried out by the method of analytical description using orthogonal expansions. The signal from the sensor output is integrated sequentially and the spectral coefficients are determined. Analysis either on values of a sequentially integrated pulse or on determination of the spectral coefficients may stop at this to identify the pulse shape as a function of the required reliability of readout. A block diagram of the pulse shape identification device that contains a sensor, a row of series-connected integrators and a processing block is presented. The indicated diagram, besides increasing the reliability of information readout, permits filtration of the useful signal from noise and permits development of a more reliable type of controller for magnetic domain storage devices. Figure 1; references 6.

UDC 681.327.664.4

STORAGE DEVICE

Unknown USSR INVENTOR'S CERTIFICATE, CL. G11C11/14, No 773726, applied for 7 Feb 79 No 2722685, published 25 Oct 80

LOMOV, L. S., MILYAYEV, Yu. K., RED'KO, V. G. and CHIRKIN, G. K.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B557]

[Text] A storage device containing a magnetic-uniaxial film with bistable cylindrical magnetic domains is proposed that is distinguished by the fact that to increase the information recording density, unimplanted disks of the information storage registers adjoin the corresponding unimplanted disks of the information input-output register. The ratio of the diameters of unimplanted disks of the information input-output register to the diameters of the unimplanted disks of the information storage registers is no less than 2:1.
Figures 2; references 2.

UDC 681.327.21

POSSIBILITY OF USING UPDK-32 PUNCH CARDS TO PREPARE DATA IN CODES OF UNIFIED COMPUTER SYSTEM

Kiev MEKHANIZATSIYA I AVTOMATIZATSIYA UPRAVLENIYA in Russian No 4, 1980 pp 50-51

ABBASOV, T. I. and CHECHNEV, V. P.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B647]

[Text] The diagram for finishing a data preparation device based on UPDK-32 punch cards to prepare data in codes of the unified computer system is described. Introduction of the finishing diagram permits an increase of the productivity of the data preparation process at the computer center, where computers of Minsk-32 type continue to be operated along with the unified computer system. Figures 1.

UDC 6281.327.2:621.035

FIBER-OPTIC INTERFACE FOR UNIFIED COMPUTER SYSTEM

Unknown FIZICHESKIY INSTITUT AN SSSR in Russian Preprint No 159, 1980 pp 1-12

BERG, V. P., ZHILIN, Ye. B., KALMYKOV, I. V., KORZINKIN, V. S., KUZ'MIN, V. I., LOSHANOV, V. G., PROKHOROV, A. M., SEMENIKHIN, V. S. and SISAKYAN, I. N.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B711 by V. G. Mikutskiy]

[Text] A fiber-optic communications system designed to operate with a standard interface of the unified computer system containing 34 lines is considered. Information is transmitted sequentially over two-ply optical fibers with light strand diameter of 60 microns. The transmitter is matched with the interface by an integration device. Transmission is accomplished by the time packing principle. All the interface lines are divided into three groups: information buses, information identification lines and the remaining lines of the interface. Information is transmitted to the fiber line in groups. Transmission of each group is initiated when the state of the corresponding lines varies. Each transmitted combination contains a starting pulse and marker code of the group. The additional delay introduced by the circuit in the monopole mode does not exceed 900 nanoseconds/byte while that in the multiplex mode is not more than 3.5 microseconds/byte. The integration devices is based on integrated circuits of series 100, 133 and 140. Figures 3; references 4.

SOFTWARE

UDC 681.322.066

INSTRUCTION LANGUAGE OF THE COMPUTER CENTER ADMINISTRATOR OF THE EL'BRUS MULTI-COMPUTER COMPLEX

Unknown INSTITUT TOCHNOY MEKHANIKI VYCHISLITEL'NOY TEKHNIKI AN SSSR in Russian Preprint No 21, 1980 pp 1-24

KHARITONOV, M. I.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B174 by S. G. Romanova]

[Text] The instruction language of a computer center administrator for the EL'BRUS multicomputer complex is considered. The problems of the administrator instruction language of the computer center and the principles of its design are analyzed. It is pointed out that the user of each specific installation of the EL'BRUS multicomputer complex should be put on account, i.e., a dossier for each of them is stored in the systems file of the user's account. This permits organization of the context protection of user files, realization of authorized startup of a problem and connection of a budget service that follows the use of systems resources individually by each user. This level of systems user accounting is called procedural. One can interfere administratively in the activity of computer center programmers with introduction of procedural user accounting. To do this, the administrator instruction language of the computer center is used which is the language superstructure over the procedural level of the accounting system. The administrator instruction language is carried out as an expanded instruction. The administrator instruction language, methods of realizing it and also the principles which are the basis for developing it are described. Figures 3; references 1.

[182-6521]

UDC 681.3.008

DESIGNING EDITED SYSTEMS DATA STRUCTURES AND REALIZATION ON THE EL'BRUS MULTICOMPUTER COMPLEX

Unknown INSTITUT TOCHNOY MEKHANIKI I VYCHISLITEL'NOY TEKHNIKI AN SSSR in Russian Preprint No 23, 1980 pp 1-24

KHARITONOV, M. I.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKI I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B118 by S. G. Zuyev]

[Text] Methods of organizing systems data and structure reorganization devices are described on the example of user documentation of the El'brus multimachine complex. The operating system of the El'brus multimachine complex assumes the need to take into account users working on a specific installation of the complex, to carry out context protection of user files, for functioning of the budget system and administrative interference into the user's activity. This need led to the development of a system for the user taking into account the program complex designed to service a special system file of the user's account. The dossier structure and methods of implementing changes in it without changing the servicing programs are considered. The language for describing the user dossier is presented and an idea is given of the process of translation and substitution of the description version. Figures 3; tables 1; references 6.

[182-6521]

UDC 681.322.068

AUXILIARY DEVICES OF THE PASCAL-AUTOCODE SYSTEM

Unknown INSTITUT TOCHNOY MEKHANIKI I VYCHISLITEL'NOY TEKHNIKI AN SSSR in Russian Preprint No 22, 1980 pp 1-20

TIKHORSKIY, V. V.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKI I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B252 by S. G. Romanova]

[Text] Auxiliary devices of the Pascal-AUTOCODE system are considered. Work with the ChISTKA program is described. The ChISTKA program accomplishes static finding of marks, constants, types, variables and procedures not utilized in user texts written in Pascal-AUTOCODE language. The EKhOLOT program is considered that permits one to determine the internal storage capacity required for operation

of one or another program. It is pointed out that the system translator should have auxiliary debugging devices to simplify and accelerate the program debugging process. These devices permit one to follow the values of the variables and the process of completing the program (printing of marks, names of procedures and so on). Additional means of debugging are presented. References 5.

[182-6521]

UDC 681.322-192

ESTIMATING EFFECTIVENESS OF INTRODUCING PRELIMINARY TESTS OF DIGITAL COMPUTER ASSEMBLIES TO INCREASE THEIR OPERATING RELIABILITY

Unknown INSTITUT TOCHNOY MEKHANIKI I VYCHISLITEL'NOY TEKHNIKI AN SSSR in Russian No 26, 1980 pp 1-12

BUDNIK, P. P.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 3, Mar 81 Abstract No 3B59 by T. M. Kuznetsova]

[Text] The problem of determining the effectiveness of introducing accelerated tests of computer assemblies is solved. An index-criterion that links time and cost expenditures for conducting preliminary tests of integrated circuits and assemblies with quantitative indicators of reliability is proposed. A value equal to the ratio of the advantage (the increase of useful effect) during manufacture, adjustment and operation of the computer by implementation of measures to increase reliability to the expenditures to conduct preliminary tests is selected as the criterion. The method of using the criterion is illustrated on the example of electrothermal aging of integrated circuits. Figures 1; tables 1; references 4.

[190-6521]

UDC 681.322.519.765

COMPUTER ANALYSIS AND SYNTHESIS OF RUSSIAN LANGUAGE WORDS

Unknown INSTITUT TOCHNOY MEKHANIKI I VYCHISLITEL'NOY TEKHNIKI AN SSSR in Russian Preprint No 24, 1980 pp 1-20

ROZHKOV, S. A. and RYZHAKOV, A. K.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 3, Mar 81 Abstract No 3B185 by T. M. Kuznetsova]

[Text] The procedural approach to the problem of morphological analysis and synthesis of natural (Russian) language words that occurs with automatic translation of text from one natural language to another is considered. The proposed procedures are precise and are constructed on the basis of a dictionary of word bases. The operation of procedures is indicated on the example of a program that rephrases the input sentence. All the programs are written in PASCAL language for a BESM-6 computer. The possibility of constructing a system that permits dialogue with the computer in natural language on the basis of the developed procedures is noted. Figures 1.

[190-6521]

UDC 681.322.06:519.12

GRAF/2 FLOW CHART GENERATION APPLIED PROGRAM PACK

Novosibirsk VYCHISLITEL'NYY TSENTR SO AN SSSR in Russian Preprint No 266, 1980 pp 1-26

POSTNIKOVA, L. N.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B155]

[Text] This is a continuation of the series of preliminary publications of materials on program packs for solving applied problems of graph and network theory developed at the computer center, Siberian Department, USSR Academy of Sciences for the YeS EVM [Unified computer system] (GRAF-YeS Applied Program Pack) and EL'BRUS multicomputer complex (GRAF-VS Applied Program Pack). The procedures for systematic generation of ordinary flow charts, oriented multiflow charts and pseudo-flow charts by the number of vertices, number of ribs and the stage (multistage) file, procedures for generation of random flow charts with given properties (connected--unconnected, presence of loops, contours of cycles and symmetry), organizational flow charts, ordinary flow charts, multiflow charts,

pseudo flow charts, organizational flow charts without contours by the number of vertices and ribs, procedures for checking strong connnectedness, separation of components and strong components, some procedures for finding methods and calculating the number of stops are presented. The texts of all procedures are given in PL-1. The programs were debugged in the YeS-1055 operating system.

UDC 681.322.066

ORGANIZING EFFECTIVE FLOW SHEET DESIGNS IN THE GRAFOR COMPLEX

Gor'kiy ALGORITHMY I PROGRAMMY in Russian No 7, 1980 pp 67-85

RYABOV, A. N.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B222 by author]

[Text] Software designed to increase the productivity of the GRAFOR flow sheet program complex is described. This is achieved by introducing an optimization block into the GRAFOR that organizes buffering of the display image, formation of a flow sheet file and processing of it prior to printout onto a flow sheet device. The nearest neighbor algorithm is used to find the trajectory of the light pen. The length of the idle path of the light pen is reduced by an average of one-third to one-fourth with a slight increase of the working time of the central processor. All the optimizing conversions are performed without participation of the GRAFOR user. The structure of the flow sheet file is considered and the program texts of the optimization block are presented.

UDC 681.322.068

TRANSFERRING PROGRAMS WRITTEN IN FORTRAN LANGUAGE FOR BESM-6 COMPUTER TO THE UNIFIED COMPUTER SYSTEM OPERATING SYSTEM

Unknown INSTITUT PRIKLADNOY MATEMATIKI AN SSR in Russian Preprint No 111, 1980 pp 1-24

GORELIK, A. M.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B253 by S. G. Romanova]

[Text] It is noted that the need has arisen to translate programs written in FORTRAN language for BESM-6 computers to YeS EVM [Unified computer system] with regard to the wide distribution of computers of the YeS series. The restrictions and differences in interpretation of the same structures of FORTRAN-IV YeS language compared to FORTRAN input languages for BESM-6 type computers are enumerated. Recommendations are given for modification of programs written in FORTRAN language for BESM-6 type computers to achieve compatibility with FORTRAN-VI YeS language. Some supplements and refinements are introduced which appeared during operation of the latest version of the FORTRAN-Dubna translator. Language differences and the differences caused by different word lengths in BESM-6 and YeS computers are considered. Data are presented on the operating system of the unified computer system and on translators from FORTRAN language and also typical sets of tasks for starting FORTRAN programs in the operating system of the unified computer system. Special attention is devoted to a method of establishing the agreement of the numbers of the input-output channels used in programs on BESM-6 computers with real devices of the unified computer system.

[182-6521]

UDC 681.322.068

PROGRAM-MONITOR FOR THE KM 0001 MICROCOMPUTER IN THE CAMAC STANDARD

Dubna OB"YEDINENNYY INSTITUT YADERNYKH ISSLEDOVANYY, SOOBSHCHENIYE in Russian No 10-80-567, 1980 pp 1-17

SIDOROV, V. T.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B196]

[Text] The monitor is oriented toward joint operation of the KM 001 microcomputer with the KK 006 mainline control block. The monitor provides dialogue

communications of the operator with the microcomputer through the main terminal, processing of interruptions and communications with the papertape equipment through interfaces in the CAMAC standard and also includes equipment for program debugging.

[182-6521]

ASU SOFTWARE

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 5, May 81 p 41

[Article by N. B. Mozhayeva, senior methods engineer of the "Computer Technology" pavilion at the Exhibition of the Achievements of the USSR National Economy]

[Text] The "Computer Technology" pavilion at the Exhibition of the Achievements of the USSR National Economy has organized an exhibit named "ASU [Automated Control System] Software" for the purpose of broadly disseminating progressive know-how in automating control functions in industrial production. The exhibit has five sections: Introductory; ASU Software Based on YeS [Unified System] Computers; ASU Software Based on SM [International Small Computer] Computers; Software for Automated Systems To Control Nonindustrial Facilities; The Use of Packages of Applied Programs in Particular ASU Developments.

The introductory section familiarizes the visitor with industrial methods of setting up ASU's at the Tsentrprogrammsistem [Central Program System] Science-Production Association in the City of Kalinin. The main tasks of the association are to design and disseminate ASU software, design and introduce ASU's of various levels and types, and teach contemporary methods of designing control systems.

The association has developed the following to supply customers with software:

a. A centralized fund of ASU algorithms and programs in which preference is given to program means that make it possible to reduce the labor-intensity of programming and designing ASU's and allow a large number of users to use them;

b. A sectorial fund of algorithms and programs which includes packages of applied programs that are of interest to a broad range of specialists at organizations and enterprises of the Ministry of Instrument Making, Control Systems, and Automation Equipment;

c. A fund of methodological materials containing development work by organizations of the Soyuzsistemprom [USSR Systems Industry] Science-Production Association reflecting the

methodology of designing ASU's, improvements in the organizational structure of control systems, and the like.

Analysis of needs and the state of availability of software is the basis for making up the fund.

When necessary fund users receive a catalog, brief descriptions and recommendations on the use of software, materials from seminars, meetings, and conferences, abstract surveys, and bibliographic and topical indexes of literature in the principal subject areas. When software is transmitted the user receives the program documentation, new verisons of programs and their modifications, and a recording of the programs on magnetic tape or disks.

Specialists of the association are accompanying the software, following through to its introduction at the user's site. The association trains specialists for user organizations. Each year more than 1,200 specialists improve their qualifications and master the principles of using contemporary software in the development and operation of automated control systems.

The section "ASU Software Based on YeS Computers" is represented by the following programs:

a. Organization and management of an ASU information base (the packages of the "ASU Information Base" software system, the SIOD 3-OS package of applied programs, and the "Bank-OS" software system);

b. General-purpose (the packages of the "Tver'-YeS" software system, the "Base-Terminal" software system, and the "Tver's-Interface" software system as well as the packages of applied programs called "Table Generator," "Organization of the Computing Process," "Operating System Input-Output Generator," "Pegasus," and "Retrieval-1");

c. Organization and management of a process (ORGVYTs-1 software complex);

d. Optimal methods of planning and controlling packages of applied programs ("Linear Programming in the ASU" and SOLMI YeS);

e. Realization of functional subsystems in ASU's (the packages of applied programs "Control of a Shop," "Planning Needs," "Planning Capacity," "Control of Stocks," "Accounting for Labor and Wages," "Accounting for Fixed Capital," and "Accounting for Financial-Charge Transactions");

f. Programming technology (the package of applied programs "The Programmer-1 Technological Complex").

The Tver'-YeS software system has the most universal set of equipment for automating hardware. The use of this system makes it possible to rapidly modify problem-oriented programs that have been developed when expanding the composition and altering the structure of the information base. The system permits the creation and processing of information bases of complex structure, made up of aggregates of linear files and data bases of universal structure.

The section "ASU Software Based on SM Computers" is represented by the packages of applied programs "Bank," a system to prepare programs for SM Computers, and the "Dialog" package. The system to prepare programs for SM computers is designed to debug programs written in the DOS M-600/M-7000 input languages in YeS computers supplied with disk operating systems (DOS's). The "Bank" package is designed for functioning in automated control systems for enterprises, industrial processes, and NS [translation unknown], and in information retrieval systems based on SM-1, SM-2, and M-7000 machines.

The section "ASU Software for Nonindustrial Facilities" is represented by the packages of applied programs "Expansion Software System" and "Blood Bank." The "Expansion Software System" package of applied programs is oriented to solving problems of optimization distribution of resources using critical path plan models. The "Expansion Software System" functions in the environment of a disk operating system, being a modified and functionally expanded variation of the package of applied programs that supports the use of critical path planning methods based on third-generation computers.

Questions of automating a number of functions at blood donor points and blood transfusion departments with respect to controlling the flow of donors and blood supplies are successfully resolved by introduction of the "Blood Bank" package of applied programs.

The section "Use of Packages of Applied Programs in Concrete ASU Developments" is represented by the "ASU-Automotive Transport TU-1 System" and the "IKAMOU-YeS Software System." The automated system for transportation control (based on the example of the Middle Volga Transportation Administration) solves the problem of streamlining the management of motor vehicle transportation and insuring optimal use of rolling stock, materials, and labor resources to increase shipping volume and raise its profitability. The simulation complex for the interaction of an ASU and a production model of the object of control (the IKAMOU YeS software system) permits rapid implementation of the first phase of an ASU at a concrete enterprise which has a discrete form of production.

Technical documentation and prospectuses are available for the software in all sections of the display. Visitors may look at them in the halls of the pavilion and at the information center. Specialists from the Tsentrprogrammsistem Science-Production Association offer daily consultation in the pavilion.

Four five-day classes have been conducted at the exhibit: "Organization of the Economics and Technology for Escorting Software in ASU's" (January); "The Use of Packages of Applied General-Purpose Programs and Designing ASU's" (February); "The Use of Packages of Applied Programs of Integrated Production Control Systems and Functional Packages of Applied ASU Programs" (March); "SM Computer Software" (April).

The editors of the journal PRIBORY I SISTEMY UPRAVLENIYA took part in the class titled "The Use of Packages of Applied General-Purpose Programs and Designing ASU's."

The exhibit is a convenient place for developers and users to meet. Specialists can consult with representatives of the Tsentrprogrammsistem Science-Production Association on questions of interest to them and view movies on particular topics.

The "ASU Software" display will be open at the pavilion until August 1981

11,176
CSO: 1863/191

UDC 681.325.5-181.48

COMPLEX OF DEBUGGING DEVICES FOR INSTRUMENT MICROPROCESSOR SYSTEMS BASED ON K582, K583 and K584 MICROPROCESSORS

Kiev PRIMENENIYE MIKROPROTSESSOROV V LOKAL'NYKH SISTEMAKH in Russian 1980 pp 115-121

NIKITENKO, S. G., PETUKHOV, Yu. V. and STREPETOV, S. F.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B409 by authors]

[Text] Some problems of design and development of specialized microcomputer debugging systems based on microprogram multiprocessors of type K582, K583 and K584 are considered. The hardware and software, beginning with the simplest programmers, programmer testers and storage simulators to special systems based on serial microcomputers, are considered as debugging devices. Modelling programs and problems of developing a simplified microassembler language are considered as program debugging devices. The structure and capabilities which a universal modelling system should have are described. A modelling program realized in PL/1 language of the disk operating system of the unified computer system is considered on the experience of development of specialized microcomputers. It models the developed microcomputer with given instruction system at the level of internal registers and permits one to check the correctness of programming algorithms written either in machine codes or in simplified microassembler language, printout of the register contents at the check points of the initial program, determination of the number of machine time steps and detection of syntactical errors in the initial program. References 2.

[182-6521]

SOFTWARE ORGANIZATION FOR SYSTEMS WITH FUNCTION SEPARATION FOR SMALL-COMPUTER SYSTEMS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 4, Apr 81 pp 5-7

[Article by G. V. Vigdorchik, engineer, and V. P. Syomik, candidate of physical and mathematical sciences: "The Organization of Software of Systems with Division of Function for Small-Computer Systems"]

[Text] Solution of many applied problems imposes high productivity and reliability requirements upon computer hardware.

Development of computer systems incorporating SM EVM [small-computer systems] hardware and software [1-3] continues to a substantial degree to be based upon structural methods of increasing speed of operation and upon distributed data processing [4-8].

It has been proposed that productivity be increased by the use of systems with division of function (SDF) comprised of a number of special-purpose processors. These systems increase productivity through division of function among processors functioning in parallel and the special orientation of each toward performance of one or several functions. High-level-language procedure calls grant access to specific functions performed by the special-purpose processors.

This article presents a discussion of the general structure of the operating system, which does not depend upon the type of special processors incorporated in the complex and converts procedure calls into access to the special-purpose processors.

Systems with Division of Function

Systems with division of function incorporate SM EVM complexes comprising a central processor, internal storage and peripheral equipment connected by a single main line, a common bus. SDF also include special-purpose processors, specially oriented toward efficient of a single or several functions. We will be employing the term special-purpose processor to refer to a computer which from a hardware and/or software point of view performs one or a number of functions. It may incorporate a central memory. Serial microprocessors, for example, may function as a special-purpose processor. The special processors are also connected with the system by the common bus. All SDF components, including the central processor, special processors and the peripheral devices, must function in parallel. SDF productivity is accordingly increased by the parallel functioning of the special processors and the division of functions between them.

This approach to computer-system architecture permits creation of specialized high-productivity control systems oriented toward execution of a given type of task--problem-oriented systems.

SDF Software

Organizing efficient combined utilization of SDF software is the operating system with division of functions (RAFOS), modular in structure and oriented toward the servicing of a broad range of special-purpose processors. RAFOS serves as an instrument system for the formation of problem-oriented control complexes employing a variety of programming languages and packages of application programs.

RAFOS comprises the following basic components: control system, system programs, systems for programming from different input languages and packages and libraries of application programs.

RAFOS system programs permit the performance of a variety of service functions: the copying of files from external memory; the printing of catalogs of files residing in external carriers with presorting by type, date of creation etc.; assembly of object modules and libraries into programs in load format; the collation and editing of text files; the printing of files in the required format etc.

RAFOS also incorporates systems for programming from different high-level input languages, which permit utilization of the functional capabilities of the special processors forming part of the SDF. It is suggested that primarily FORTRAN-IV, BASIC and other languages be employed for this purpose.

Packages and libraries of application programs permitting SDF problem orientation toward a specific type of task are an indispensable component of RAFOS. Serving as such program packages are a library of programs for scientific and technical computation and the automation of laboratory experiments unifying more than 200 modules; a system for simulation modeling of continuous, discrete and continuous-discrete processes permitting study of a control object and system as a whole, in a planning stage for example; and a system for the construction of application-language translators permitting a user to develop, debug and then use his own programming system, one oriented toward solution of a specific type of problem.

The RAFOS Control System

The RAFOS control system comprises a set of monitors performing supervisory functions within the system and driver programs to service the special processors and peripheral devices.

The structure of a driver program for a special processor depends upon three basic factors: the system for exchange of information between the central and special processors, the possibility for programming the special processor and its functional capabilities. These factors determine the methods of the controlling the special processor in the application programs.

Methods of Information Exchange

SDF employ the same methods of information exchange with external i/o devices as do conventional computers: interrogation, interrupts and direct access to internal memory. Various methods of information exchange in special processors may be combined. The interrupt or interrogation methods, for example, may be employed in a special processor in the exchange of command (control) information, the method of direct access to memory in the transmission of data files.

The efficient method of data exchange is determined through judicious compromise between the required speed of operation and the cost of the equipment on the one hand and the volume of data to be transmitted and the speed at which it is processed on the other.

Programming Possibilities

SDF special processors may be divided into two standard groups depending upon their programming possibilities. In the first group we will include special processors having one or several functions written into read-only memory. RAFOS procedures controlling the special processor will be comparatively simple in this instance. The second group includes special processors permitting reprogramming. A distinction should be made at this point between special processors having an instruction code compatible with the system's central processor and those having a unique instruction code. In the latter instance RAFOS would include additional software containing cross assemblers, cross linkers etc. If the special processor instruction code is compatible with the instruction code of the central processor or is a subset of it, the procedure for the development and debugging of special processor programs is executed with the use of all service routines of both RAFOS and the system's central processor.

Functional Capabilities of Special Processors

SDF special processors may be divided into a number of standard groups depending upon their functional capabilities. Their assignment to one group or another affects the method of application-program access to the special processor as well as the RAFOS control modules servicing it.

The first group should include special processors performing the simplest procedures involved in mathematical-logical data processing. They can incorporate either microprocessors or special-purpose computers. As a rule, the special processors comprising this group realize logarithmic and trigonometric functions, perform complex and decimal arithmetic etc.

The second group includes special processors performing the complex procedures of calculus mathematics (of the rapid Fourier transform variety). These special processors may comprise one or several microprocessors or special-purpose computers. They may incorporate their own internal memory for storing the results of intermediate computations.

The next group of special processors is designed to expand SDF capabilities by means of complex "architectural" procedures. A high-capacity parallel-matrix processor would be an example of this type of special processor. Special processors comprising this group ordinarily incorporate several computing systems, a control processor and an independent operating system.

The group of independent special processors could comprise those realizing entire programming systems from high-level input languages.

A last group of special processors would include those constituting programmable general-purpose processors to which are connected their own peripheral devices, to include terminals and external memory devices. Special processors comprising this group are the most general and can perform a broad range of functions, from i/o multiplexers and preprocessors to intelligent terminals and graphics displays.

SDF Reliability

The orientation of SDF primarily toward the execution of control and planning tasks dictates the high reliability requirements imposed upon the system as a whole. Special hardware and software provide SDF their capacity for solving this problem.

The use of two-processor complexes connected with the object of control, for example, via a common-bus switch, constitutes one of the simplest means of developing highly reliable systems. When one of the processors fails, the control function is thus immediately transferred to the other processor, which increases the functional reliability of the entire control system. RAFOS incorporate special driver programs, which permit an application program to monitor the operational efficiency of the other processor and, if necessary, to assume control of the object system.

Operating System Monitors

By performing supervisory functions within the system and maintaining file structures, RAFOS monitors support various modes of SDF operation.

RAFOS monitors are created in the course of the generation process. They may be divided into three types: single-task, background-on line and background-on line monitors with memory control.

A monitor's resident component may occupy 1.8K-7K words of internal memory.

All RAFOS monitors are program-compatible all the way up.

The operating system incorporates access-authorization facilities monitoring and collecting statistical information on users' use of the system.

RAFOS monitors incorporate programs for the organization of files in magnetic disc and tape (including cassette magnetic tape) memory. The RAFOS file system is compatible with the organization of files in a background-on line real-time base operating system top to bottom. For external memory devices with direct access to storage it permits the organization of both simple and hierarchical file structures.

In the simplest instance, disk storage has a single catalog storing all information necessary concerning files residing on the carrier. All files are continuous in structure, that is, they occupy adjacent blocks on the external carrier. This insures rapid access to information contained in the file based upon the relative number of the block in the file. A continuous file structure permits, for example, the loading of an application program for a single "access" to memory.

In the general case, the file system may also have a more complex structure. In this instance, each file is considered an independent carrier. This file has a complex structure and includes a catalog of the files it contains. All this is necessary to insure that several file operators (users) have only limited access to information residing in "other" files and that files belonging to other users located on one and the same physical carrier are not inadvertently damaged.

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EXCERPTS FROM THE JOURNAL 'ALGORITHMS AND PROGRAMS', JANUARY 1981

Moscow ALGORITMY I PROGRAMMY in Russian No 1, Jan 81 pp 1-113

[Preface and selected items from ALGORITMY I PROGRAMMY. BIBLIOGRAFICHESKAYA INFORMATSIYA (ALGORITHMS AND PROGRAMS. BIBLIOGRAPHIC INFORMATION), a bibliographic publication of GPTNB]

[Excerpts]

Preface

The USSR State Public Scientific and Technical Library accomplishes work on the accumulation, systematization and storage of algorithms and programs, instructional, methodical, informational and bibliographic reference materials on computer software published in Soviet and foreign printed publications.

The library publishes the journal in accordance with a specially developed plan. The first section includes works of a general character: descriptions of programming systems, textbooks, methodical, instructional and bibliographic reference materials. Then follow sections corresponding to specific algorithmic languages and computers. If a large amount of material is concentrated in a section, the following thematic subdivisions are introduced:

0. General Questions
1. Software Systems
2. Computational Mathematics
3. Engineering-technical and Natural Scientific Tasks
4. Statistical Processing and the Processing of Observations
5. File Processing and Tasks of Information Retrieval
6. Economic Computations. Optimum Planning
7. Control of Production Processes. Administrative Management
8. Simulation, Operations Research, Forecasting, Image Diagnosis and Recognition

Within the sections, material is arranged in alphabetic order by authors and titles.

The descriptions of all materials published in the journal are provided with annotations and key words or phrases. Key words revealing the character of the material are published with the following abbreviations:

AIG algorithms (a program written in one of the algorithmic languages);
INSTR instructional material;
INFORM informational material;
METOD methodical material;
PROGR program written in a machine language or autocode;
UCH educational aid.

Materials relating simultaneously to two or more sections are placed in one of them and in the other sections a reference is given to the corresponding numbers of the bibliographic descriptions.

To facilitate retrieval of necessary literature each number of the journal ALGORITMY I PROGRAMMY is provided with an auxiliary thematic index, and in the first quarter of 1982 a summary thematic index for the complete year will be published as a separate issue.

The bibliographic descriptions of publications are made in accordance with All-Union State Standards (GOST) 7-1-76 and 7-12-77 and the methodical instructions "Bibliographic description of works of the press" (Moscow, 1978), and also in accordance with the list of abbrevistions adopted in addition to GOST 7-12-77.

Bibliographic recordings included in the journal are numbered consecutively.

Each issue contains a list of sources for the issue, arranged analytically, and the GPNTB numbers for those publications are printed in the same place.

Please report all detected errors and imprecisions in algorithms and programs and instructional and methodical materials to the address: USSR GPNTB, Scientific Bibliographic Section, 12 Kuznetskiy most, Moscow 103031. Send your comments and desires relating to the ALGORITMY I PROGRAMMY journal to that address.

3. ADAPTATSIYA I MNOGOMASHINNYKH VYCHISLITEL'NYKH SISTEMAKH (Adaptation in Multi-machine Computer Systems). Latvian SSR Academy of Sciences, Institute of Electronics and Computer Technology. Riga, Zinatiye, 1980, 114 pages. Bibliography at end of articles.

Structural adaptation is subdivided into the alternative, in which one of two or three alternatives of the structure is selected, and the evolutional, which is used for objects where the number of alternatives is large but the transition from one to another involves a metric correlation. Tasks of alternative adaptation are examined: adaptation of multi-machine discipline of servicing the flow of tasks and copying in the data transmission system, evolutionary adaptation and adaptation of the disposition of information and program bases on disks and memory distribution over the multi-machine computer system.

4. Annotirovannyy perechen' program dlya EVM, razrabotannykh v nauchno-issledovatel'skikh i kompleksnykh institutakh Gosstroy USSR (ne vkluchennykh v OFAP) [Annotated List of Computer Programs Developed in Scientific Research and Complex Institutes of the USSR Gosstroy (not included in OFAP--Sector Fund of Algorithms and Programs). Alekseyev, V. K., and Starostina, N. P. Moscow, 1980, 40 pages. (FAP for EVM (in "Construction" sector). Central Scientific Research and Planning and Design Institute of Automation of Systems in Construction.

After obtaining the materials included in the list, refer to the developer organization, a list of the addresses of which is attached.

17. Pervaya Vsesoyuznaya konferentsiya "Banki dannykh" (First All-Union Conference on "Data Banks"), Summaries of Reports, Sections 1-5, VNIIPOU, Tsentrprogrammsistem Scientific Production Association, Tbilisi, 1980.

Section 1. Theoretical Problems, 163 pages.
Section 2. Software Development, 139 pages.
Section 3. Industrial and Experimental Software, 256 pages.
Section 4. Data Base Planning, 78 pages.
Section 5. Experience in the Application of Data Base Control Systems and Information Retrieval Systems, 125 pages.

25. Myshleniye cheloveka i pererabotka informatsii EVM (Human Thinking and Computer Information Processing). Shapiro, S. I. Moscow, Sovetskoye Radio, 1980, 288 pages. Bibliography: 127 items.

An operator-logical model of thinking is analyzed in the plane of organization of mutually advantageous collaboration of man with the computer. The central member of the model is the concept of the logical-psychological coordinate. The role of that concept in the actions of man and computer programs is investigated, as are approaches to the construction of dialog of man with computer in the process of joint solution of problems. The tasks "Igra-8" were used for ordering the numerical arrays. The author considers the possibility of studying the mechanism of image (concept) recognition by man by means of a program taxonomy--breakdown of the set of signs into non-intersecting classes.

63. Estimation of the statistical precision of digital correlation devices for analysis of the parameters of weak harmonic signals. Blinov, V. S., Dolgov, A. I., and Dzhus, V. S. Radiotekhnika (Radio Engineering), Republic Interdepartmental Scientific and Technical Collection. Khar'kov Institute of Radioelectronics, 1980, No 54, pp 128-134. Bibliography: 3 items.

The effectiveness of a number of correlators in solving the task of separating a useful harmonic signal from a mixture with intensive normal noise in the case of a fixed selection is analyzed with an ALGOL program.

69. Software of a computerized recognition system. Mdvani, M. V. In book: Tekhnicheskaya Kibernetika (Technical Cybernetics), Tbilisi, 1980, pp 149-154. Bibliography: 9 items.

Software of a complex self-learning and recognizing system has been created in the form of a package of ALGOL programs for image processing and the production of decisive rules.

76. Dopolnitel'nyye sredstva sistemy PASKAL' Avtokod (Additional facilities of the PASCAL-Autocode system). Tikhorskiy, V. V. Scientific-Technical Collection. USSR Academy of Sciences, Institute of Precision Mechanics and Computer Technology Preprint No 22. Bibliography: 5 items.

The article describes programs in the PASCAL Autocode language: ChISTKA--the static finding of marks, constants, types, variables and procedures not used in program texts in PASCAL Autocode; EKhOLOT--determination of the volume of the main memory necessary for work of the programs.

81. Vosprosy razrabotki, vnedreniya, ekspluatatsii (Questions of Development, Introduction and Operation), No 4, Moscow Fund of Algorithms and Programs, Moscow, 1980, 60 pages. Bibliography: 4 items.

The booklet presents a computer-aided course of instruction in programming in PL/1.

101. Estimating possibility characteristics in alternatives analysis. Borisov, A. N., and Appen, Ye. P. Metody prinyatiya resheniy v uslovihakh bespredelennosti (Decision Making Under Conditions of Indeterminancy). Intervuz collection of scientific works, 1980, No 7, pp 91-98. Bibliography: 4 items.

The article describes a method of evaluating alternatives on the basis of possibility functions. Precision of the results depends on work with an expert. Results were obtained from an expert by setting up a man-computer interaction mode in FORTRAN with the KODIAL-SOAVTOR 2 system drawn in.

132. Program for automating the setting of initial conditions in solving three-dimensional problems of electronic optics. Bleyvas, I. M., Voronchenkova, T. A., Zuyev, A. V., et al. ELEKTRONNAYA TEKHNIKA, SERIYA ELEKTRONIKA SVCh, 1980, No 6, pp 104-108. Bibliography: 4 items.

The FORTRAN program includes assignment of an emitter of arbitrary form, breakdown of the emitter into elementary cells and computation of the coordinates of the centers of those cells, computation of the values of the direction cosines and the coordinates of the ends of the normals restored at the centers of the elementary cells. The readout time of one variant is about 1 second.

133. Program for computation of impedances of displacing diodes with a Schottky barrier. Kiselev, V. V., Smyslov, G. M., Fel'dman, E. N., and Shubina, V. A. ELEKTRONNAYA TEKHNIKA, SERIYA ELEKTRONIKA SVCh, 1980, No 6, pp 103-104. Bibliography: 2 items.

Impedances are calculated with consideration of minimization of losses of conversion during given displacement for direct current and consideration of nonlinear dependece of the activity of the diode on the power of the heterodyne in the FORTRAN language.

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The program is organized on the modular hierarchic and overlay principle. In it 47 subroutines are accomplished, 42 of them in FORTRAN-4 with a total of about 4000 operators and five in the Assembler language.

146. Programmnoye obespecheniye avtomatizirovannoy ustanovki dlya izucheniya lazernoy plazmy (Software of Automated Installation for Lazer Plasma Study). Vlazhenko, B.V., Kostikov, S. M., and Chuzo, A. N. Moscow, 1980, 36 pages. USSR Academy of Sciences, Physics Institute Preprint No 107. Bibliography: 13 items.

148. Bank dannykh DSI-6 i dostup k nemu na EVM serii YeS (DSI-6 Data Bank and YeS Computer Access to It). Rivin, G. S., Sakulin, V. N., and Sludnov, A. V. Novosibirsk, 1980, 23 pages. USSR Academy of Sciences, Siberian Department Computer Center Preprint No 240. Bibliography: 3 items.

The article briefly describes the bank and set of modules for data selection from the DSI-6 written in FORTRAN. Examples of work with modules are presented.

220. Spetsializirovannyy protsessor bystrogo preobrazovaniya Fur'ye dlya issledovaniya algoritmov: tsifrovoy obrabotki signalov (Specialized Fast Fourier Transform Processor for Investigating Algorithms: Digital Signal Processing). Reports 1-2. Radio Engineering. Republic Interdepartmental Scientific-Technical Collection. Khar'kov Institute of Radioelectronics, 1980, No 54.

Report 1. Synthesis of the general structure of a processor. Syrpov, S. L., pp 100-106. Bibliography: 2 items. Report 2. Operator description of a processor. Syrpov, S. L., Lyakhovets, V. A., and Skorokhodov, Yu. I., pp 106-111. Bibliography: 4 items.

The processor is oriented toward joint work with the universal M-6000 (M-7000) computer. An operator description of a processor was compiled in the CDL language, a processor performing a fast Fourier transform on a selection with a volume of 4096 readings of a radio signal with a maximum band of 100 kHz.

221. Sistema postroyeniya i punktsionirovaniya paketov prikladnykh programm (System of Functioning of Applied Program Packages). Bezhanova, M. M., and Moskvina, L. A. Novosibirsk, 1980, 27 pages, USSR Academy of Sciences, Siberian Department Computer Center Preprint No 244. Bibliography: 8 items.

The PACKAGE system is a system for automating the construction and functioning of a certain family of problem-oriented systems (packages). It inclues a technology for description of problem components; the requirements for source languages; a language and means of construction of problem systems; a processor for the processing of source languages of problem systems. The PACKAGE system is oriented toward construction of packages containing a library of problem modules. The source language was built in in ALGOL or FORTRAN by the Dubna MS.

222. Analiz i sintez slov russkogo yazyka na EVM (Computer Analysis and Synthesis of Russian Language Words). Rozhkov, S. A., and Ryzhakov, A. K. Moscow, 20 pages. USSR Academy of Sciences, Institute of Precision Mechanics and Computer Technology, Preprint No 24. Bibliography: 5 items.

The article describes a procedural approach to the task of morphological analysis and synthesis of words of a natural language (Russian) on the basis of a dictionary of basic words. The dictionary structure is presented and the work of the described procedure is shown on the example of a program which rephrases the initial proposal and is a part of the service dialog system DZhIN.

[illegible] separation in the direction of approach in commutation antenna grids. Ayzin, F. L., and Kogan, B. L. Trudy USSR Academy of Sciences, Radio Engineering Institute, 1980, No 38. Information Processing, pp 23-36. Bibliography: 4 items.

The article describes a two-phase algorithm for the separation of useful and noisy signals by direction of approach in antenna grids with phase shifters of a discrete type. Results of numerical experiment on a BESM-6 computer are presented.

250. YeS EVM. Operatsionnaya sistema. Zapisi programmnoy registratsii mashinnykh i kanal'nykh oshibok tsifrovoy EVM YeS-1080 (The YeS Computer System. Operating System. Records of Program Registration of Machine and Channel Errors of the Digital YeS-1080 Computer). Hardware Handbook: Ts51.804.006. D108. Moscow, 1980, 39 pages. Bibliography: 7 items.

258. YeS EVM. Operatsionnaya sistema. Nezavisimaya programma redaktirovaniya i pechati informatsii ob oshibkakh SEREP (The YeS Computer System. Operationg System. Independent Program for Editing and Printing Information on Errors SEREP). Operator's Handbook: Ts51.804.006. D73. Moscow, 1980, 20 pages. Bibliography: 4 items.

299. YeS EVM. Sistema upravleniya bazami donnykh "OKA" ("OKA" Data Base Control System). Operator's Handbook: Ts51.804.033. D5. Moscow, 1980, 165 pages, Biblliography: 5 items.

312. Program for creation of a control point on a disk. Yakovenko, V. Yu., Dvornikov, S. V., and Perestyuk, N. N. ELEKTRONNAYA TEKHNIKA. SERIYA ELEKTRONIKA SVCh, 1980, No 6, p 109. Bibliography: 1 item.

The program is written in Assembler with use of DOS YeS software and interrupts solution of the problem at any time and when necessary renews it.

350. Automated correction of astigmatism in CRT systems. Osipov, Ye. A., and Uvarov, V. A. Trudy. USSR Academy of Sciences. Radio Engineering, 1980, No 38, Information Processing, pp 88-98. Bibliography: 7 items.

The article describes a procedure for automated correction during use of a high-resolution CRT as a generator of a light spot in systems for graphic information processing. The control program was written in the autocode of the Elektronika-100 computer, and the total volume of the program is about 1000_8 memory cells. The volume of the program for determination of the analytical dependence according to measured values of the correcting currents of the order of 17K 24-digit words of the ICL-1000 computer.

352. Precision automated system for measurement of imates with tracks of nuclear particles in a bubble chamber (ELAS system). Uvarov, V. A. Trudy. USSR Academy of Sciences, Radio Engineering Institute, 1980, No 38. Information Processing, pp 70-87. Bibliography: 15 items.

Hardware of the cathode-ray automated ELAS system consists of an Elektronika-100 computer and a universal medium-capacity ICL-1903A computer which connect one another and apparatus in a line. The volume of the measuring program without consideration of the calibration programs and test programs is about 90K words.

354. Komandnyy yazyk administratora vychislitel'nogo tsentra MVK "El'brus" ("El'brus" Multiprocessor Computer Complex Computer Center Administrator Instruction Language). Kharitonov, M. I. Moscow, 1980, 24 pages. USSR Academy of Sciences, Institute of Precision Mechanics and Computer Technology, Preprint No 21. Bibliography: 1 item.

The administrator instruction language represents the linguistic superstructure above the procedural level of the accounting system of users and makes possible administrative intervention in the activity of the computer center programmers.

355. Metod postroyeniya redaktiruyemykh sistemnykh struktur dannykh i yego realizatsiya na MVK "El'brus" (Method of Constructing Editable System Data Structures and Its Realization on the "El'brus" Multiprocessor Computer Complex). Kharitonov, M. I. Moscow, 1980, 24 pages. USSR Academy of Sciences, Institute of Precision Mechanics and Computer Technology, No 23. Bibliography: 6 items.

The article describes methods of organizing system data and means of reorganizing their structure on the example of user documentation, so-called user DOSSIER.

358. Package of subroutines for statistical processing STATIC: Instructions for Users. Gusentsova, L. A., Kolesnikova, O. N., and Podol'skaya, G. I. Materialy po MO (Materials on Software). Leningrad, 1980, 43 pages. USSR Academy of Sciences, Leningrad Scientific Research Computer Center. Bibliography: 2 items.

The package of subroutines enters the standard software of the CYBER-172 computer. Working procedure with the package and of the subroutine included in it is described.

362. Sistema KOMIS. Ch I. Vkhodnyy yazyk (The KOMIS System. Part I. The Source Language). Kulikov, V. A., Mukhin, S. A., and Nikitin, S. G. Serpukhov, 1980, 19 pages. Institute of High Energy Physics Preprint No 80-99. Bibliography: 6 items.

The KOMIS system belongs to the category of mixed systems and is realized on an ICL computer. A program created within the framework of that system consists of two parts with equal rights and interacting with one another--the interpreted and the compiled. FORTRAN is taken as the basis of the interpreter language. The software of the KOMIS system consists of about 20K instructions.

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370. Hierarchic two-processor system for experimental data gathering and processing. Vikulov, S. P., Vystavkin, A. N., Romanovtsev, V. V., and Shumpanov, O. Ye. AVTOMETRIYA, 1980, No 3, pp 11-16.

The article discusses the structure, software and organization of work of a system for automation of laboratory experiment on the stretching of optical fiber to monitor the diameter, the stretching rate and the summary losses of light in fiber on the basis of the Wang-2200 VP minicomputer, the Intel-8080 microprocessor and the CAMAC crate.

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PROGRAMS FOR OPTIMIZING CURRENT ENTERPRISE PRODUCTION PLANNING (THE PLANIR SYSTEM)

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 4, Apr 81 pp 41-43

[Article by O. A. Polyakov, candidate of technical sciences and engineers V. G. Gurevich, S. P. Klyuyeva and N. A. Usiyevich: "Programs for Optimizing Current Enterprise Production Planning (the PLANIR system)"]

[Text] Article [1] proposed a practical approach to the problem of optimizing current enterprise production planning realizable with the employment of man-machine procedures. It reported on the development of a set of implementing machine programs and of an automated planning system (APS) in use in a specific enterprise. It can now be safely concluded that the operation of this APS (since 1976) has confirmed the convenience and high degree of efficiency of the system in plan preparation.

The set of PLANIR programs, which comprises the instrumental base of the APS, may, without substantial modification, be employed in many enterprises in different branches of the national economy. In our view, it may be employed to particular advantage in enterprises with integrated multiproduct production programs and characterized by certain changes in product mix in consequence of improvements in technology, the introduction of new products and fluctuations in supply and market conditions.

Presented below for the information of potential users is a description of the functional capabilities, parameters and characteristic features of the operation of the PLANIR system. More detailed information on the system may be obtained from the Institute of Control Problems (Moscow). Copies of reports are available from the VNTITsentr [All-Union Center for Scientific and Technical Information] (Moscow). The programs have been deposited with the branch algorithm and program library (Kiev PKB ASU) [office for the development of automatic control systems].

General Functional Characteristics

The PLANIR system provides a man-machine procedure for the preparation of current enterprise production plans satisfying the requirement for approximation to the desired values of technical-economic indicators (TEI) in each quarter or month. The system solves, among others, the problems of selecting annual production programs (with or without their simultaneous quarterly distribution), distributing a given production program (an annual program by quarters or a quarterly program by month) and calculating the TEI for a given plan.

TEI are to be understood to include volumes of commodity and gross production, total cost of commodity production, per-ruble cost of commodity production, the labor-intensiveness of a given production program and quarterly (monthly) productive-capacity utilization coefficients.

An annual program with quarterly distribution may be selected at the beginning of any quarter, the distribution of the given production program at any point in time. This permits updating of the plan if the need arises to alter individual items in the plan or introduce new TEI. Such situation frequently arise in practice as a result of irregular raw-material deliveries, customer requests to shift deadlines for finished-product deliveries and the modification of TEI this entails as well as of directives from higher authorities involving changes in output volumes of different types of products or in a number of TEI.

Planning with the aid of the set of programs which has been developed has obvious advantages over the traditional manual method. It now becomes possible for the planner to work in a job-analysis mode by assigning required plan parameters and then analyzing the solution obtained from the computer. He can undertake his analysis immediately in the context of all basic TEI and look at many different variants. The result is a better plan, and planning service personnel are relieved of the burden of having to perform their laborious calculations.

This method also offers advantages over the traditional, more formal, approach to the optimization of planning. Briefly (this point is discussed in detail in [1]), these advantages flow from the high degree with which it conforms to the interests of an enterprise operating under the existing system of management and control and from its more efficient distribution of functions between man and machine in the solution of this problem, which is at once complex and difficult to formalize.

As is generally known, the planning process is frequently forced to contend with the uncertainties and ambiguities arising from the conjuncture of supply and market condition as well as from considerations of technical-economic policy. It is difficult to obtain a realistic result in this situation by taking a formal approach; the quality of planning decisions depends to a great extent upon the intuition and experience of the planner. The PLANIR system makes full use of this experience. The search for the final version of the plan is an iterative man-machine procedure, at each step of which the version arrived at is analyzed and the task for the next step formulated. Part of the plan is prepared by the human planner directly, the rest of it automatically in accordance with his instructions. These specify in precisely which quarters (months) one product or another can be turned out, the minimum allowable production, the TEI required and the deviations from them permissible.

In formulating the task, some user instructions may prove contradictory. In this instance, the PLANIR system gives an approximate solution (involving departures from certain requirements), which permits determination of the reason for the contradiction so as to be able with the next step to specify more appropriate conditions.

Use of the PLANIR system requires the compilation of norm reference data (NRD) on prices, labor intensiveness, aggregate figures and the conditionally variable portion of specific production cost with respect to all types of products as well as on productive capacities in each month. An accessory program prerecords this data on magnetic tape.

The job to be executed comprises operating data in the form of a plan scheme, a list of TEI requirements for the plan and a table of parameters. The format in which this data appears depands upon the job to be executed.

Let us begin a more detailed description of the functional and computational parameters of the system with the distribution problems.

Distribution of the Desired Production Program (the PLANIR-1 Subsystem)

Input Data. Let us look first at the distribution of an annual production program by quarters.

The plan scheme is a plan table on which the planner making a decision (PMD) indicates the requirements governing individual items of the plan, including the required products list, instructions concerning the precise quarter in which one product or another is to be manufactured and the decisions the user has made concerning production volume. The accessory, or auxiliary, program first provides an empty table (blank form) showing the names of the products and the NRD corresponding to these products. Table 1 shows a fragment of a plan scheme with various alternative PMD instructions.

Table 1

Product	Unit of measurement	Annual plan P_i	Actual production from the beginning of the quarter	Plan in physical terms by quarter				Minimum production
				I	II	III	IV	
1	2	3	4	5	6	7	8	9
		1500	0	-	-	1500	-	0
		70	0	-1	-1	-1	-1	15
		10,500	500	1500	-1	-1	-	1500

In this table the PMD has completed columns 5-9. The figure "-1" indicates an instruction to plan production output for the given quarter, production volume being specified by computer solution of the optimization problem; lines in the table correspond to zero output. Entered in column 9 is the minimum permissible production in a single quarter. This value is assigned on the basis of technical production conditions or chosen as a regulator of uniform distribution of production output by quarter. The lines of the plan form containing the figure "-1" in their aggregate comprise what is referred to as the optimizable part of the plan. The permissible number of lines I in the optimizable part of the plan is determined by the possibilities offered by the computer's optimization program (see below).

The user compiles his list of requirements for plan TEI on the basis of the set of optimization limits and criteria available in the program. Table 2 presents a set of limits. Minimization of the greatest of all quarterly relative deviations from required values with respect to one of the selected indicators has been adopted as an optimization criterion: production volume in current or gross (constant wholesale) prices, labor intensiveness of the production program or the total cost of commodity production. Minimization of the greatest relative deviation from required values with respect not only to all quarters but to a number of selected indicators as well could be a more complex criterion. The permissible number R of requirements for plan TEI (the term "requirement" should be understood to refer to the assignment of a single limit, a single production sector from Table 2 or the criterion with respect to a single indicator) is determined by the possibilities offered by the optimization program.

The parameter table contains the desired values for quarterly production volumes in current and gross prices, permissible percentage deviations with respect to all plan TEI and conditionally constant expenditures for each quarter. Also assigned are percentage declines in available labor and distributions of total production cost by quarter. This data is employed to calculate desired values of the indicated TEI for each quarter.

Monthly distribution of the quarterly program requires only slight modification of the input data format: a smaller number of columns in Table 1 and less data in the parameter table. Desired values of monthly plan TEI are input indirectly: the number of calendar days in each month of the quarter is indicated, in proportion to which the computer computes the desired distribution of labor intensiveness and production volumes.

Table 2

Each quarter	Remarks
1. Production sector load does not exceed that permissible	Job incorporates list of production sectors
2. Production volume in current prices not below that required	
3. Production volume increases over that of preceding quarter by no less than desired magnitude.	
4. Relative deviation of production volume from required value does not exceed permissible level.	Job incorporates required values and permissible deviations
5-7. Requirements analogous to 2-4 for output in gross prices.	
8. Relative deviation of PP labor intensiveness from required does not exceed desired level.	
9. Relative deviation of total commodity production cost is not greater than desired level.	
10. Per-ruble cost of commodity production decreases as against this figure for preceding quarter by no less than desired amount.	

The Method of Optimization. The plan model, the list of requirements and the table of parameters constitute a working mathematical model of the problem, which is then automatically reduced to the canonical form of a problem in linear programming. This is solved using a standard modified simplex-method subroutine [2]. If the linear programming problem is incorrect the program automatically gives an approximate solution, which helps identify the "bottle necks" in the initial problem. The algorithm employed to obtain this solution is similar to that described in [3].

Output Data. The user has available a full array of output data sufficient for convenient analysis of the version of the breakdown obtained: the job to be broken down, the production plan obtained in cost and physical terms, its basic TEI, including the table showing production capacity utilization for each quarter, as well data permitting judgement concern the correctness of the job and the nature of the breakdown.

Parameters of the PLANIR-1 Subsystem. The version of the PLANIR-1 subsystem used with the YeS-1022 computer occupies 120K of internal memory with the following limitations on the dimensions of the problems to be solved: the total number of items in the production program N<100, no more than 250 equations and variables in the mathematical model,

the number of nonzero elements in the matrix of the optimization problem does not exceed 1000. These limitations permit inclusion of up to I = 40 lines in the optimizable part of the plan with R = 10 selected plan requirements.

The PLANIR-1 subsystem can solve large problems, but this entails reprogramming and enlarging memory. Experience with the operation of APS has seen the solution of problems with the following parameters: N = 70-100, I = 10-40 and R = 6-13. Solution time with a YeS-1022 has varied from 5 to 15 min.

Successful use of the PLANIR-1 subsystem is evidence of the effectiveness of the methodological approach adopted to the optimization of short-term planning. This has been a stimulus to the development on the basis of the same approach of a procedure and computer programs for solving a more general problem--preparation of an annual enterprise production plan.

Preparation of an Annual Production Plan (the PLANIR-2 Subsystem)

The task of preparing an annual plan comprises two steps: preparation of the annual production program (PP) and then dividing it up into quarters. The first step consists in selecting from the enterprise's existing "portfolio of orders" those products i and production volumes P_i which would satisfy all requirements with respect to the PP as a whole as well as to its individual components. The second stage consists in breaking production volume P_i down into quarterly production volumes taking into account all requirements governing parameters of the plan for each quarter.

It is not difficult to see that different versions of the PP having equivalent TEI permit breakdowns differing substantially in quality. The tasks of formulating and then distributing PP would therefore to advantage be accomplished in conjunction with one another. This would expand the range within which permissible distributions can be sought and in the final analysis facilitates the process of formulating a satisfactory plan.

The procedure employed to solve this problem is similar to that described in [1]; the software involved is a modification of the PLANIR-1 subsystem software. The basic differences between them consist in the following.

Table 3

Product	No. item	Production limit max	Production limit min	Production by quarter I	II	III	IV	Minimum production
1	2	3	4	5	6	7	8	9
		100	100	-	-	50	50	-
		2000	0	-	-1	-1	-1	200
		100	-40	40	-1	-	-1	10

Input Information. In the process of preparing the plan model, the format of which for this problem is shown in Table 3, the PMD selects from the portfolio of orders those items which are candidates for inclusion in the PP. The following cases are possible in this instance:

a given item, in the PMD's view, must be incorporated in the PP and the computer has only to determine production volume within the permissible range (PMD enters maximum and minimum limits); a given item should be included in the PP and the computer calculates annual production volume P_i; the question of the advantage of including a given item in the PP remains open (in this instance a 0 is entered in column 4).

Columns 5-9 are filled in as in Table 1. The PLANIR-2 subsystem can also perform the task of selecting PP without establishing a quarterly distribution of the program. In this case the PMD fills in columns 3-5.

The list of plan requirements includes Table 2 supplemented by the requirements for annual TEI: the annual PP has to be supported by the requisite production capacities (production sectors must be indicated); the annual indicator (commodity and gross production, production cost, labor intensiveness) vary from desired value by no more than Δ%; the annual indicator is no less (no greater) than the desired value.

The table of parameters contains all the values indicated above; the user in addition assigns the desired values of annual TEI and the vector of the relative importance of the various groups of plan requirements.

Method of Optimization. A multicriterion problem of object programming is formulated on the basis of the plan model (see Table 3) and the requirements selected by the user. The requirements for approximation to desired values of plan parameters are considered local criteria. The penalty function method is employed to solve the problem; local criteria are incorporated in the penalty functional taking into account the relative importance of the requirement groups assigned by the user. A standard conjugate-gradient-method program searches for the penalty functional minimum [4].

Output Data. The set of output data is analogous to that described above. Information concerning the course of the minimization process is also available to the user, information facilitating directional changes in the relative-requirement-importance vector during "final modification" of the plan.

Parameters of the PLANIR-2 Subsystem. The version of the PLANIR-2 subsystem used with the 4030 computer occupies 92K of internal memory with the following limitations imposed upon the dimensions of the problems to be solved: total number of items in the production program N<120, no more than 200 equations and variables in the mathematical model, no more than 1000 nonzero elements in the matrix. With a total of R = 10-15 requirements the optimizable part of the plan may contain up to I = 25 lines.

The time required to solve the problem depends upon many factors and may vary within fairly wide limits. To obtain satisfactory solutions to a series of problems having the parameters I = 4-14 and R = 5-9, for example, required 1.5-11 min on a 4030; in this instance, depending upon the selection of the initial point and the criteria weight vector, the solution time for the version varied 1.5-3-fold.

The PLANIR-2 subsystem used with the YeS-1022 was first introduced into operations in the Mosmedpreparaty Production Association imeni L. Ya. Karpov (Moscow) as the first stage of an automated planning system in the first quarter of 1980.

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CSO: 1863/177

UDC 519.6:519.83

GROUP ALGORITHM FOR ORDERING NUMBERS IN A FILE FOR PARALLEL COMPUTER EQUIPMENT

Taganrog MNOGOPROTSESSORNIYE VYCHISLITEL'NYYE STRUKTURY in Russian No 1/10, 1979 pp 32-33

MAKAREVICH, O. B. and GORBATYUK, A. F.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B160 by T. M. Kuznetsova]

[Text] The problem of the group operation of ordering numbers in a file for multiprocessor computer equipment is considered. The procedures for parallel finding of the maximum number in the file and a block diagram of the main component of the proposed algorithm are presented. The speed of the procedure under consideration is evaluated. Figures 2; reference 1.

UDC 681.322.068

SERVICE PROGRAM PACK FOR SM-3 (SM-4) COMPUTER

Unknown INSTITUT RADIOTEKHNIKI I ELEKTRONIKI AN SSSR in Russian Preprint No 18/301, 1980 pp 1-25

KOPTYAYEV, V. I.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B195 by S. G. Romanova]

[Text] A service program pack for SM-3 and SM-4 computers is suggested which permits operation without a monitor if this work is not related to a file structure. A library of facility, position-unreplaced modules that form most main monitor functions (input-output for different peripheral devices, conversion

of numbers from one display to another and so on) was created to provide monitorless operation of the program pack. All the programs and modules are written in the microassembler of the SM-3. Each program pack is described (the functions performed and a black diagram of the algorithm). The program pack is applicable for operation on SM-4 computers in the memory dispatcherless mode. The program pack significantly increases the efficiency of using SM-3 and SM-4 computers, which is confirmed by the many years of experience of using the pack on these types of computers. It is more feasible to use some program packs jointly with standard programs (for example, SEND can be used for some editing purposes and EDIT can be used for others). Figures 12.

UDC 681.322.066

CAMAC, MACROINSTRUCTIONS IN MACPO-II LANGUAGE

Unknown INSTITUT AVTOMATIKI I PROTSESSOV UPRAVLENIYA S VYCHISLITEL'NYM TSENTROM DAL'NEVOSTNOGO NAUCHNOGO TSENTRA AN SSSR in Russian Preprint No 9, 1980 pp 1-18

GERBEK, E. E. and SERGEYEVA, T. N.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B185]

[Text] A macrodefinition pack for programming CAMAC operations in radial and branch CAMAC systems is described. The pack was tested in the CAMAC system on the basis of an M-400 minicomputer. The pack is used with MACPO-II language of the DOS-P disk operating system of the international small computer system. The use of the pack permits compilation of time-saving programs, which is important for programs for processing interruptions of real-time systems. The test of the pack is presented. References 8.

UDC 681.322.019

REALIZING A SYNTACTICALLY CONTROLLED PROCESSOR AND ITS USE IN A DATA BASE CONTROL SYSTEM

Moscow SISTEMY UPRAVLENIYE BAZAMI DANNYKH S MNOGOUROVNEVNOY ARKHITEKTUROY in Russian 1980 pp 102-118

YEFIMOVA, Ye. N.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B209 by S. G. Antimonov]

[Text] One of the methods of realizing a syntactically controlled processor designed for use in a multilanguage data base control system of the MUSSON type is discussed. The language processor is realized on the YeS EVM [Unified computer system] in setting up the operating system of the OS YeS as a complex of procedures in PL/1 language. Khomskiy automation grammar and flow sheet grammar are used as the formal grammars to describe the dictionary and syntax of the languages. The processor is designed to support language interfaces in the initial format at all levels of data base control systems of the MUSSON types. The functions and problems of realizing the flow sheets of grammatical tables, scanner and syntax analyzer are considered in detail. Figures 5; references 6.

UDC 681.322.068

SATISFYING TIMER REQUESTS OF PROGRAMS IN THE DOS/YES OPERATING SYSTEM

Gor'kiy ALGORITMY I PROGRAMMY in Russian No 6, 1980 pp 106-113

RYABOV, A. N.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B197 by author]

[Text] Two subroutines are described that permit printing of the current date and time of day on a printer or that permit inversion of current time in second as a value of function. The subroutines are compiled in DOS/YeS Assembler language and satisfy agreements on interprogram communications. The initial texts of the subroutines are presented.

UDC 681.325.5

PROGRAM DEBUGGING USING AN INTRACIRCUIT EMULATOR

Kiev PRIMENENIYE MIKROPROTSESSOROV V LOKAL'NYKH SISTEMAKH in Russian 1980 pp 82-87

ARTEMOV, Yu. I., VYALOV, V. L., KODENSKIY, G. S. and TARAN, Ye. A.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 3, Mar 81 Abstract No 3B353 by authors]

[Text] A distributing frame instrument complex for debugging the programs of microcomputers that include multiprocessors of type K580IK80 is described. The complex is based on a control computer of the M-6000 type. Its characteristic feature is the use of an intracircuit emulator. The emulator includes a machine time-step generator and multiprocessor. The microcomputer program is stored in the internal storage of the M-6000 computer and is transmitted through an interface to the multiprocessor for instruction by instruction execution. The emulator operates under the control of the debugger. A list of services offered to the user by the debugger is presented. The capability of simulating interruptions and operation of the input-output devices is distinguished among them. The software of the complex also includes a cross-assembler and display editor of symbolic information.

[190-6521]

UDC 681.322.068

SYSTEM FOR AUTOMATION OF DESIGNING CENTRALIZED COMPUTER SYSTEMS BASED ON THE K580IK80 MICROPROCESSOR

Kiev PRIMENENIYE MIKROPROTSESSOROV V LOKAL'NYKH SISTEMAKH in Russian 1980 pp 13-19

PETRENKO, A. I., BUDNYAK, A. A. and MOLYAVKO, S. I.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 3, Mar 81 Abstract No 3B144 by authors]

[Text] An automated software design system for multiprocessors of type K580IK80 is described. The system consists of a dialogue cross-assembler combined with a symbolic information editor and cross-debugger (emulator). The system is represented in the form of two autonomous models requiring M6000/M7000 type computers for operation of 16K words. Both modules are dialogue and permit

efficient operation on a minimum set of peripheral devices. The cross-assembler permits processing up to 200 lines of symbolic input file. The emulator permits demonstration of multiprocessor operation and the operation of external devices at the programmer level in Assembler language. The capabilities of simulating interruptions, accounting for read time and program runs are also contained in the emulator. References 5.

[190-6521]

APPLICATIONS

UDC 62.011.56:681.32

DEVELOPMENT AND USE OF LOCAL PRODUCTION PROCESS CONTROL SYSTEMS BASED ON ELEKTRONIKA S5, ELEKTRONIKA DZ-28 AND ELEKTRONIKA B38-21 MICROCOMPUTERS

Kiev PRIMENENIYE MIKROPROTSESSOROV V LOKAL'NYKH SISTEMAKH in Russian 1980 pp 34-41

SUKHOMLINOV, M. M., MALINOVSKIY, G. AN. PROKOF'YEV, A. A., VOLOSHIN, P. A., IGDAL, V. G., MIKHAL'SKIY, A. D. and BEZSMOLOV, Yu. A.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4A4443 by Authors]

[Text] Problems of development and use of local systems hardware of automated production process control systems based on microcomputers are considered. Examples of constructing subsystems for automatic determination of the beginning of slowing down of a rolling mill at the end of rolling a strip, gathering and processing of production information from the mine, automatic control of the loading section and automatic control of glass fiber pipe output are presented. The use of different groups of equipment (Elektronika S5, Elektronika DZ-28 and Elektronika BZ-21) made it possible to achieve a better combination of the advantages of multiprocessor equipment for solving specific problems of automating the production processes of ASU TP. References 3.

UDC 621.771.012-531.2:681.325-181.5

DEVELOPING ELECTROHYDRAULIC CONTROL SYSTEMS BASED ON THE KTS LIUS-2 MICROPROCESSOR COMPLEX

Kiev PRIMENENIYE MIKROPROTSESSOROV V LOKAL'NYKH SISTEMAKH in Russian pp 59-65

LEBED', V. V., GAGARIN, P. P., KORCHUN, V. I., GLUKHOV, A. N., DROBOT, N. D. and SMIRNOVA, S. A.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4A505 by authors]

[Text] A control system for the hydraulic pressure device of a rolling stand is considered. The system synchronously performs the assignment on total shifting of the pistons of two hydraulic cylinders. Preference is given to the synchronization circuit under conditions of limiting the output of two controls by the total displacement circuit and by the synchronization circuit. Proportional-integral laws of regulation are used. The amplification factor in the tracking mode is higher than in the stabilization mode. The system is constructed on the basis of KTS LIUS-2 components. Its structure includes three microprocessors: the first compares the moving coordinates with the tasks and realizes laws of regulation, the second formulates the tasks during manual control, logic-mathematical processing of input information and display and the third (bit) accomplishes program-logic control. Restriction of the volume of functions performed by the first microprocessor permits better use of the dynamic characteristics of the hydraulic drive. Full-scale investigations showed that the time required to process a 100-micron jump does not exceed 50 milliseconds.

[182-6521]

UDC 621.867-52-38

USING ELEKTRONIKA-60 MICROCOMPUTER TO CONTROL FLOTATION PROCESSES AND IN ROLLED STEEL PRODUCTION

Kiev PRIMENENIYE MIKROPROTSESSOROV V LOKAL'NYKH SISTEMAKH in Russian pp 42-50

LYAKHOVICH, V. Z., MASOL, V. G., ONISHCHENKO, E. L., SKOROBOGAT'KO, S. M., BALMAGIYA, Zh. A., GONCHAROV, V. N. and SHCHETKINA, E. P.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4A509 by authors]

[Text] A microprocessor complex based on the Elektronika-60 microcomputer, designed to control production processes, is considered. Modules of the device for microcomputer communications with a facility containing a timer, interfaces,

binary-decimal calculating to binary system converter, analog-code converter, code-analog converter and so on are described. Descriptions of the control system for the chemical process of potassium ore flotation and a subsystem for digital control of the position of the thrust screws of rolling mills by a previously assigned program are presented as examples of using the developed complex in an automated production process control system. References 2.

[182-6521]

UDC 621.77.06-52

STANDARDIZED AUTOMATED PRODUCTION PROCESS CONTROL SYSTEM FOR ROLLING ON REVERSIBLE BLOOMING MILLS BASED ON MICROPROCESSORS

Kiev PRIMENENIYE MIKROPROTSESSOROV V LOKAL'NYKH SISTEMAKH in Russian pp 66-74

POPEL'NUKH, V. I., KORBUT, V. V., ANPILOGOV, G. A., ZARIN, A. V. and S''YEDINA, N. M.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4A510 by authors]

[Text] The development of hardware based on microprocessors creates good prerequisites for development of highly efficient and comparatively inexpensive automated production process control systems for single- and multi-ingot rolling on reversible blooming mills. The structure of a three-level automated production process control system for rolling for redesigned blooming mills based on microprocessors is developed. Two modifications of the developed system: automated control system of the blooming modes and automated control system of the blooming and high-speed modes, are considered. All levels of the automated production process control system are encompassed by software and hardware protection against the occurrence of emergency situations arising on the production line during rolling. The calculated saving from introduction of the automated production process control system on a blooming mill with productivity of 3.2 million tons of rolled steel annually comprises 450,000 rubles annually with a payback period of 0.28 years. References 3.

[182-6521]

UDC 681.178.9:681.3

AUTOMATED MONITORING-DIAGNOSTIC COMPLEX

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 5, May 81 pp 4-5

[Article by candidates of technical sciences V. P. Sidorenko, O. D. Rukkas, and M. S. Bershteyn and engineers Ye. N. Chichirin and V. N. Korolev]

[Text] One of the principal means of insuring highly efficient production of complex radio electronic apparatus (instruments, computer equipment, and the like) is automating monitoring and debugging operations. The increasing complexity of the objects that are monitored and the growing volume of production have given rise to the contemporary trend to switch from local automatic devices to monitoring-measuring systems that guarantee the necessary productivity, reliability of tests, and prolonged avoidance of obsolescence.

This class of systems is generalized under the conception of measuring-computing complexes [1], which are sets of hardware and software that automatically output stimulating actions and receive and process response signals from the object being monitored.

An essential condition for building problem-oriented measurement-computing complexes is the possibility of modifying the configuration of the equipment and flexible adaptation to different types of production. This is accomplished by following the modular block principle in the structure of the complexes themselves and of the individual units included in them. The software of the complex is also oriented to meeting this problem.

Taking into account the basic trends in development of automated monitoring systems, NIIP [Scientific Research and Design Institute of Peripheral Equipment] in Kiev has built an automated monitoring-diagnostic complex called the KODIAK [based on Russian letters]. It is a multiterminal complex consisting of a SM-4 central control computer and a number of problem-oriented units working in a time-sharing mode. The complex includes units to monitor logical and analog blocks. The units to monitor logical and analog blocks are linked to the SM-4 control computer by means of a 2K interface through a USS OSh/2K matching unit [2]. The permissible distance between the units to monitor analog and logical blocks and the computer may be up to 50 meters where "duplex register" (A491-3M)

interface TEZ's [translation unknown] are used and up to 1,000 meters where rapid data transmission modules (A72/1) are used. The complex can have up to a total of 16 units for monitoring logical and/or analog blocks.

A distinguishing feature of the units to monitor logical blocks is the possibility of feeding a large number of sequences of test signals from the high-speed generator of the apparatus to the object being monitored. All the basic parameters of the sequences of test signals are program-controlled. For example, cyclical programmed sequences, pseudorandom and pseudocyclical signals, test patterns, and the like may be fed to any of the 192 inputs of the object being monitored. The unit to monitor the logical block has a logical analyzer to localize malfunctions. It contains a set of standard microcircuits whose work is equated to similar microcircuits in the object being monitored.

The unit to monitor analog blocks contains program-controlled measurement and instrument commutators, channels to actuate and analyze logical signals, a set of standard measurement instruments, and sources of direct and pulsed voltage.

The KODIAK software system is designed to control the units for monitoring logical and analog blocks in the interactive mode and the mode of running prepared test programs. It can also be used for automated preparation of test programs. The system has means for automated modification of the composition of the service units and instruments. The system is built on the basis of a real-time operating system and consists of a terminal problem, an interpreter problem, a subsystem for preliminary preparation of test programs, and a package of programs for automated modification of the set of instruments and units. The control program of the real-time operating system is supplemented by the driver of the units for monitoring the logical and analog blocks.

The input language of the system is a problem-oriented language for assigning test algorithms (Russian acronym "ZALP"). This language makes it possible to write test algorithms for use with the units that monitor the logical and analog blocks in convenient and compact form. A program in the ZALP language consists of a sequence of directives that encode individual functions of controlling the process of monitoring and processing information coming from the object. The group of directives to control the monitoring process includes directives oriented to performing the specific functions of the units to monitor the logical and analog blocks as well as a universal directive to control instruments of any type.

The first group of directives includes the directive for setting up the measurement circuit using the measurement commutator of the unit for monitoring analog blocks and tuning the generator of sequences of test signals of the unit for monitoring logical blocks. When the universal directive is given, it is contemplated that all the instruments have the set of controlled parameters identified by symbolic names. Each parameter may assume a fixed series of values assigned by symbolic names or a continuous series of numerical values. The method of controlling the instrument is, therefore, entirely determined by the correspondence between the symbolic names or continuous numerical values of the parameters and the codes which arrive at the corresponding instrument. The

structures of system data that establish this correspondence are fully unified, which makes it possible to add new instruments, also controlled in the ZALP language, to the system in the configuration needed by the user.

The ZALP language has a comparison directive for programming different algorithms for processing results. This directive makes it possible to determine the relationship (larger, smaller, equal, not equal, and so on) between the quantities with which the system is operating. These quantities are divided into internal and external ones, and into numerical and coded quantities. The values of internal quantities are stored in standardized form in the computer memory. The external quantities are read from the measuring instruments and registers of the units for monitoring the analog and logical blocks in the characteristic form for these instruments.

Plainly assigned constants are a particular case of internal quantities. There are directives to convert quantities from code to numeric form and vice versa, directives to convert from external to internal forms, and directives to compute arithmetic expressions with internal numeric quantities and boolean expressions with internal coded quantities. The quantities are designated by symbolic names, called identifiers. For internal quantities the form of assignment as an array with a dimensionality of not more than three is allowed. The language also contains directives for outputting standardized and nonstandardized messages to the operator of the units for monitoring logical and analog blocks. There is a possible work regime where these messages are recorded as protocols on magnetic disks in a buffer file for the purpose of subsequent printing.

There is a group of directives to control the course of the program: setting the program marker, transfer to a program marker, and so on.

Any directive assigned by the operator of a unit to control a logical or analog block is taken as a terminal problem. It performs a syntactical analysis of the line received and determines if it belongs to the system of control directives of the terminal problem. If the result of the analysis is negative, the line is sent to the interpreter problem of the ZALP language. If the result is positive the directive is carried out immediately by the terminal problem, which includes modules for editing the text, controlling the call-up of programs, and setting the regime for running the programs.

The text editing module processes directives for inserting, excluding, and skipping test lines in the assigned file. By-character text editing is done by a DM-500 display in the autonomous mode. The module to control the call-up of programs is designed to switch the system from the interactive mode to the mode of running programs recorded in the external memory of the control computer complex. In conformity with the ideology adopted, the system is always at one of the permissible levels of enclosure of the stream of directives with respect to each of the terminals of the units for monitoring analog and logical blocks. The source of the stream of directives for each of the levels is determined dynamically. It may be either a terminal (of a unit for monitoring a logical or analog block) or a file recorded on a magnetic disk. In the initial state the system is at the zero level, for which a terminal is fixed as the source of the

stream of directives. The level of inclusion is raised by feeding a special command that indicates a new source, and it is lowered by the receipt of an appropriate command or by reaching the physical end of the file which is the current source of the stream of directives. The module to control the regime of running the programs processes the directives to set the work regime of the terminal (stopping for an error, putting messages for the operator in protocol form, and so on).

The terminal problem and interpreter of the ZALP language are multichannel units and may serve up to 16 streams of directives launched from different terminals in a time-sharing mode.

Thus, a program written by a user in the ZALP language, employing the control directives of the terminal problem if necessary, may be executed immediately in the interpretation mode. But work in this mode involves significant losses of system speed. Programs in ZALP are processed by a subsystem for preliminary preparation of test programs before execution to increase the speed. There are two levels of preliminary processing. With partial processing all the directives to control monitoring that do not contain internal quantities (with the exception of constants) are replaced by sequences of coded messages ready to transmit to the unit. With full processing the replacement operation is done for all types of directives. Furthermore, directives to switch to program markers have indicators of the location of the markers in the text of the program.

As a result, no time is lost interpreting many directives and searching for the program markers each time the program is run. The subsystem for preliminary preparation of test programs also contains means to formulate macrodefinitions and call up macrodirectives that consist of particular directives of the ZALP language and the terminal problem.

To work out the system configurations needed by the user, the system has a special package of programs that make it possible, by answering a "questionnaire" in the interactive mode, to indicate all the necessary data to include a new instrument in the system and to select the necessary values for other variable parameters of the KODIAK.

Thus, the system of KODIAK software offers a broad range of capabilities and provides a high level of service when the hardware of the complex is used. The complex is superior to known systems of similar purpose in that it has multiple channels and various means of working with files and because it can provide efficient preliminary processing of programs.

FOOTNOTES

1. E. I. Tsvetkov, "The Development of Work on Building Measurement-Computing Complexes," PRIBORY I SISTEMY UPRAVLENIYA, 1980, No 1.

2. S. I. Samarskiy, "The Organization of Efficient Control Systems Based on the SM-3 and SM-4 Control Computer Complexes Using Peripheral Equipment of the M-600, M-700, SM-1, and SM-2 Control Computer Complexes," PRIBORY I PRIBORY I SISTEMY UPRAVLENIYA, 1980, No 12.

3. I. F. Klistorin (editor), "Problemno-Oriyentirovannyy Yazyk Programmirovaniya TEST" [The TEST Program-Oriented Language], Kishinev, "Shtiintsa," 1978.

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CSO: 1863/191

COMPUTERS USED TO CALIBRATE INDUSTRIAL MASS SPECTROMETERS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 4, Apr 81 pp 19-21

[Article by A. K. Shokanov, candidate of chemical sciences and Ye. B. Plavinskiy, L. M. Malikov, Yu. I. Burgutin, V. F. Yur'yev, M. N. Bayraka and V. L. Dubinchuk, engineers: "Using Computers to Calibrate Industrial Mass Spectrometers"]

[Excerpts] Mass-spectrometric systems of gas analysis are employed in metallurgy to monitor and control technical production processes. Most widely used are steady-state multi-channel mass spectrometers (MS), which simultaneously record hydrogen, carbon monoxide, nitrogen, oxygen, argon and carbon dioxide.

It is to economic advantage to use computers to calibrate industrial MS, since this enhances the reliability of the measurements of gas-component concentrations and reduces expenditures of costly gas check mixtures. Introduction into ferrous metallurgy operations of a single gas-analysis system with computer-equipped MS will yield an annual saving of no less than 90,000 rubles.

8963
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AUTOMATION OF ROLLING MILLS

Moscow IZMERENIYA, KONTROL', AVTOMATIZATSIYA in Russian No 2, 1981 pp 57-64

[Article by engineers L. M. Drizovskiy, E. V. Kiseleva, T. A. Obukhova, and L. S. Morozova]

[Excerpts] Until recently primary attention in the USSR was devoted to building local systems for automatic regulation and programmed control. Among these systems are the following:

1. analog systems for automatic regulation of the thickness of the strip in continuous hot-rolling wide-strip mills such as the 2,000 mill at the Novolipetskiy Metallurgical Plant, the 1,700 mill at the Karaganda Metallurgical Combine, the 1,700 mill at the Zhdanov Metallurgical Plant imeni Il'ich, and others;

2. the analog system for automatic control of speed regimes during control of the finishing group of stands of the continuous hot-rolling wide-strip mills at the 2,000 mill of the Novolipetskiy plant;

3. the system for automatic regulation of the thickness and tension of the strip in continuous cold-rolling mills, the 1,700 mills of the Karaganda Metallurgical Combine and the Cherepovets Metallurgical Plant;

4. digital systems of programmed control over the mechanisms of reversing blooming mills, the 1,150 mill at the plant imeni Dzerzhinskiy, the 1,300 mills of the Krivoy Rog and Chelyabinsk metallurgical plants, and the 1,500 blooming mill of the Nizhniy Tagil' Combine;

5. analog systems to regulate the heat regime of the pit furnaces of blooming mills and the holding, heating furnaces of sheet and section mills (Plant imeni Dzerzhinskiy and Kommunarsk Plant).

The use of local systems to automate rolling mills produces a significant economic benefit; they pay for themselves quickly. For example, introduction of the system for automatic regulation of tension and the system to automatically regulate the thickness of the strip on the 2,000 mill at the Novolipetskiy plant insured high precision of regulating the thickness of the strip within a fairly broad range of length. At the same time new speed regimes were incorporated which helped to raise the productivity of the mill and obtain the assigned temperature at the end of rolling on thin strips. The annual economic impact from introduction of these systems was more than 1 million rubles.

Among such control systems are complexes of systems for automatic regulation of the thickness and tension of the strip, stabilization of the profile and shape of the strip, control of temperature and speed regimes, accelerated cooling of the strip, and determination of the theoretical weight of the strip based on an M6000 control computer complex and designated to control the 2,000 wide-strip mill of the Novolipetskiy Metallurgical Plant.

Another example can be the system set up on the basis of two control computers for the 2,000 mill of the Cherepovets Metallurgical Plant. The system controls the transportation of metal all the way to the plant beginning from loading into heating furnaces. It also controls temperature-speed and deformation regimes of rolling, the tension, cooling, and running off of the strip, and regulating the thickness and width of the strip [8-9].

Automated systems to control roughing regimes on the breakdown and finishing stands of the 2,230 plate mill of the Kommunarsk Metallurgical Plant are in industrial testing.

The automated control system for industrial processes of the six-stand 1,400 cold rolling mill is of particular interest. It was developed for the Karaganda combine. This mill is introducing the endless rolling technology; the mill is controlled from a central post. It is designed to roll extremely fine sheet iron 0.1-0.6 millimeters thick. The maximum rolling speed is 33.3 meters per second.

Digital-analog and digital regulation systems have been used to control the electric drives of the mechanisms that insure the assigned technological parameters of the mill. Among them are systems for positional control of the pressure devices, assignment of speed regimes, positional control of centering rollers, precise halting of coilers, and others.

The automated control system for industrial processes is built on the basis of a control computer complex consisting of three SM-2 control computers whose functions include initial setting of the mill (by issuing instructions to local automatic systems), tracking the progress of the metal, controlling speed regimes and subsidiary mechanisms, and collecting and processing data.

Display modules, specialized consoles, indicator panels, and printers are used for operator communication with the control computer complex.

The algorithms and programs of the system make it possible to calculate the optimal rolling regimes.

Automated control systems for industrial processes based on control computer complexes have also been developed for the 2,000 plate mill at the Volgograd Krasnyy Oktyabr' Metallurgical Plant, the 2,100 plate mill at the Rustavi Metallurgical Plant, the 2,500 continuous hot-rolling wide-sheet mill of the Magnitogorsk Metallurgical Combine, and the 2,000 continuous hot-rolling wide-sheet mill of the Novolipetskiy plant.

The greatest advances in setting up fully automated control systems based on computer technology (including minicomputers and microcomputers) have been made in automating cold-rolling mills. At the Nizhniy Tagil' Metallurgical Combine, for example, an automated control system for industrial processes (process control system) has been set up for a group of mills that roll wide-strip beams.

Automation covers all the primary industrial sections (the soaking pits, 1,500 stands, and hot-cutting shears at blooming mills; the sections of the holding furnaces, 1,300 stands, main universal stands, hot-cutting, and refrigeration at the universal beam mill).

The process control system of the 1,500 blooming mill does the following:

a. control the heating of ingots in the soaking pits;

b. control the movement of the ingot buggy and transportation of the metal on the roller table along the work line of the blooming mill;

c. programmed control of the roughing of ingots in the 1,500 stand during reverse rolling;

d. measuring the length of intermediate and semifinished pieces, calculating cutting plans, controlling the unsupported halting of intermediate pieces for cutting on hot-cutting shears;

e. control of the stamping and packaging of semifinished pieces.

The process control system of the universal beam mill provides the following:

a. control of the heating of semifinished pieces in the holding furnaces, transportation of the pieces to the furnaces, loading them at the assigned pace, movement in the furnace, unloading, and delivering the pieces to the stand section at an assigned rate;

b. control of the movement of the pressure mechanisms of the 1,300 reduction stand and control of the main universal

stands GUK-1, GUK-2, and GUK-3 and the auxiliary stands VK-1 and VK-2, including synchronization of the speeds of stands GUK-1, VK-1 and GUK-2, VK-2;

c. control of the roller tables of the section and the hydraulic scalebreaking setting, collection and processing of technological data necessary to improve the rolling process and its equipment;

d. measurement of the length of the strip after it is rolled in the universal stands, calculating the rational cutting plan; control of the arrangement of movable saws in conformity with the cutting plan and depending on the temperature of the metal;

e. control of the unsupported halting of the strip for cutting, feeding the saws, drawing off cut beams, stamping them, and delivering them to the refrigeration section;

f. control of the transportation of beams with a halt before the six refrigeration sections following an assigned loading plan, feeding the beams to the assembly zone, edging them, arranging them at the assigned interval, and moving batches of beams in the cooling zone.

The process control system has a hierarchical structure with information-control complexes at the top level and systems for local program-logical decentralized control at the lowest level.

The hardware of the process control system for the set of mills includes about 500 convertors of 20 types of primary industrial information, about 200 specialized devices of 50 types (program-logical control units, control consoles, panels, and the like), and six SM-1 or SM-2 control computer complexes.

The hardware is built on the modular principle, which makes it possible to build up the functional capabilities of the system during the process of its use.

The introduction of the process control system at the Nizhniy Tagil' Metallurgical Combine made it possible at the blooming mill to reduce the ingot feeding cycle by 3-5 percent, cut the time of the rolling cycle by two percent, and reduce production waste by one percent through rational cutting, while in the universal beam mill the productivity of the furnaces was raised by 20 percent, the productivity of the stands rose 20-25 percent, waste during cutting was reduced one percent, and so on [10].

As experience operating the systems shows, their introduction has the greatest impact where the development of the automated control system is done concurrently with development of production technology and the designing of industrial equipment. This permits maximum consideration of the precision and controllability requirements and coordination with automation equipment in the design of

the industrial equipment and, moreover, promotes standardization and refinement of the industrial process.

In the USSR today direct digital control is used in the process control system for rolling wide-strip beams introduced at the 1,500 universal beam mill of the Nizhniy Tagil' combine in 1978 and in the blooming automated control system of the same mill. SM-1 and SM-2 computers are used as the control computer complex.

When setting up the direct digital control systems for the units of the universal beam mill and the 1,500 blooming mill at the Nizhniy Tagil' combine, in addition to control computer complexes extensive use was made of simple and reliable specialized computers and program and logical units which control the industrial processes of rolling by settings and assignments issued by the control computers. Moreover, a control computer complex is kept on standby in the direct digital control regime.

The USSR is developing integrated control systems for several new rolling shops. The systems are being built on the hierarchical principle with three levels of control. The problems of calendar planning of shop production and formulating orders for rolled sheets are decided at the top level. The middle level handles problems of current planning and regulation of production, accounting, analysis of production, and information support for the control personnel of the shop.

The problems of controlling the industrial processes of heating, rolling, heat treating, and cutting the metal, information tracking of each unit of metal being worked, and control of transportation operations on the mill line are handled at the lower level.

Problems of Optimal Use of Equipment

With the steadily growing complexity of rolling production equipment and rise in the level of automation of the control process in recent years, the problem of optimal use of equipment becomes timely.

Monitoring the current state of the equipment has an important part in solving this problem. Such monitoring makes it possible:

a. to cut the average time required to restore mill equipment by localizing the point of trouble, constant monitoring of the readiness of the stand-by equipment, and timely notification when parameters go outside tolerances;

b. to carry out restoration work during industrial breaks;

c. to increase the working life of the equipment and reduce the number of accidents by timely notification of deviations from calculated work regimes.

The subsystem to diagnose the basic industrial equipment of a hot-rolling strip mill, developed by the Polish Mera Ster Science-Production Association, may serve as an example. It functions within the process control system of this mill [14], which is shown in the block diagram of Figure 7 below.

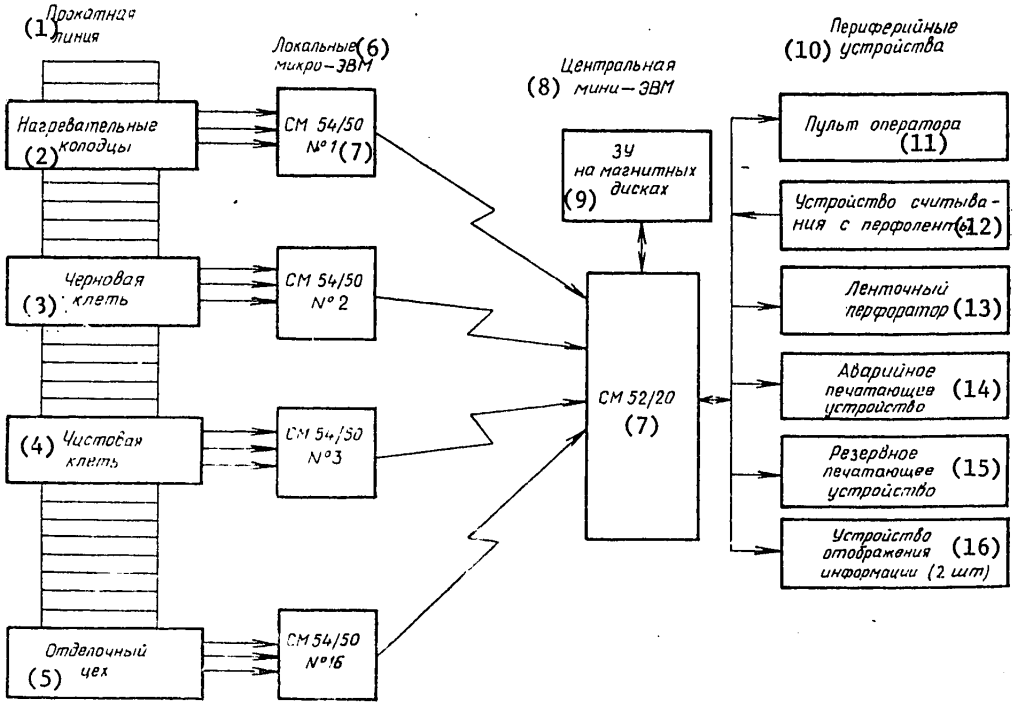

Figure 7. Block Diagram of the Equipment Diagnosis Subsystem

Key:
(1) Rolling Line;
(2) Soaking Pits;
(3) Breakdown Stand;
(4) Finishing Stand;
(5) Finishing Shop;
(6) Local Microcomputers;
(7) ["CM" = SM, e.g. SM 54/50];
(8) Central Minicomputer;
(9) Magnetic Disk Memory;
(10) Peripheral Units;
(11) Operator Console;
(12) Punched Tape Reader;
(13) Tape Punch;
(14) Emergency Printer;
(15) Reserve Printer;
(16) Data Display Units (Two).

The subsystem is designed to monitor the state of the electrical, mechanical, lubricating, and hydraulic equipment and provide timely notice of emergency situations. The local microcomputers are linked to the central minicomputer by

digital communications channels. Each equipment group is served by a separate microcomputer that plays the role of multiplexor and data concentrator. It scans all subordinate discrete signal inputs in order and compares their states with data stored in memory. If it detects a malfunction an emergency signal is formed and transmitted by the digital channel to the minicomputer. The job of the minicomputer is to transmit flows of data arriving from the microcomputers to the memory unit and to produce and output messages on emergency situations on the mosaic character printer and display. The printer outputs data on the time, place, and cause of occurrence of the trouble.

The use of microcomputers in the equipment diagnosis subsystem provides: a reduction in the load on the central minicomputer through preliminary data processing by local microcomputers; a reduction in system reaction time to warning messages; a reduction in the cost of cable by running discrete signals only to the local microcomputers located near the equipment being monitored; and improvement in the reliability of the system, thanks to the autonomously operating microcomputers which have comparatively large buffer memories.

The equipment diagnosis system is to be introduced at the metallurgical combine in the city of Katowice, Poland in 1980.

Another example might be the subsystem for diagnosis of equipment malfunctions at the 2,000 hot rolling mill of the Cherpovets Metallurgical Plant which operates within the process control system of that mill. The subsystem was designed by VNIPITyazhpromelektroproyekt [possibly All-Union Scientific Research and Planning Institute for Designing Electrical Systems Used in Heavy Industry] in Moscow on the basis of hardware and software developed by the Siemens Company. The Moscow institute used its experience with designing this system to design a malfunction diagnosis subsystem with broader functional capabilities.

The diagnosis subsystems that have been developed formulate and print out the following information about an emergency: the time of arrival of each signal (with a precision down to 0.01 seconds); the equipment that is the source of the signal; the place where this equipment is installed. The system provides for storing and constantly updating signals on changes in the work regime of the equipment in order to compile the early history of the emergency.

The Hardware and Software of Automated Control Systems

A broad assortment of hardware has been developed abroad to set up automated systems at rolling mills, including: sensors, industrial monitoring devices, computer equipment, data display and input equipment, and so on.

The distinctive feature of the newly built foreign hardware for automation is extensive use of microprocessors and setting them up on the basis of programmable controllers that make it possible to raise reliability and reduce the size and cost of hardware.

The use of programmable controllers that perform the functions of collection and initial processing of data, direct digital control, and others allows a

significant increase in the flexibility of control systems because it makes it possible to introduce various modifications in the control system without changing the hardware by simply reprogramming when the industrial equipment is turned off or disconnected. In addition to control functions the programmable controllers can perform regulation functions; the settings of the regulator may be changed either manually or by program.

Displays are widely used to show data on the course of the industrial process and to control it. In recent times there has been a trend to use colored graphic displays which enable the operator to receive graphic information on the course of the industrial process and to influence it actively.

At the present time the Special Design Bureau of Automated Control Systems in Khar'kov and the Special Design Bureau of Monitoring and Measuring Equipment in Kiev have developed a seven-color graphic display which is included in the LIUS-2 set of hardware.

The efficiency of automating rolling mills is determined in large part by the development of algorithms and programs which usually have modular structure. This makes it possible to expand and modify the functions of the control system by stages.

In the USSR system development time and cost are being reduced by a large-scale interdepartmental program of work that contemplates setting up a modular algorithm and program base for process control systems and, on this basis, a set of automated systems to generate software for the planned systems to automate industrial processes.

The first stage of the program was completed in 1978. This involved development of the first phase of collections of algorithm modules by industrial sectors. The specialized sectorial fund of algorithms and programs set up at the Kiev Planning and Design Bureau of Automated Control Systems received from participating organizations more than 1,000 algorithm modules that describe problem-solving techniques which occur during the design and operation of process control systems in different industrial sectors (power, ferrous and nonferrous metallurgy, chemicals, petrochemistry and petroleum refining, the coal industry, and others). At the present time, after analyzing the materials which were received by the fund, a collection of algorithm modules for general industrial use has been prepared and published. It is the foundation of the algorithm system for process control systems. By the end of the five-year plan a library of general industrial algorithm modules on machine media is to be established. This will make it possible to satisfy user requests quickly [15].

The problem of designing and shaping the program base for process control systems is being solved in a similar manner. At the same time systems that generate special (functional) software for process control systems relying on the program base are being developed.

Conclusions

The basic trends in automation of rolling mills are improving existing systems and developing new systems on the basis of contemporary principles of control and current hardware (microprocessors, microcomputers, programmable controllers, colored graphic displays, and the like) and software and industrializing the distribution of process control systems for comprehensive delivery of control systems together with basic hardware.

The appearance of microprocessors had a substantial impact on improving control systems and made it necessary to review practically all aspects of their design.

Until recently the development of control systems involved substantial centralization of the functions of data collection, processing, storage, and transmission and the functions of operational control. These were assigned to the central computer, which created a number of difficulties.

The appearance of microcomputers and development of various types of hardware on their basis made it possible to begin designing decentralized process control systems that differ from centralized ones not so much by the dispersed location of equipment as the distribution of monitoring and control functions [3, 16-18].

The use of microcomputers as the principal functional element in decentralized automated control systems gives the following advantages: simplification of programming; improvement in reliability; simplicity of interlinking with the computer existing at the enterprise; convenience of launching in operation; simplicity of expanding functions performed by the control system; and, a reduction in the cost of hardware thanks to the reduction in the total length of cable couplings.

One of the important directions of development of automation is the further refinement of integrated control systems. Experience with the design and operation of systems demonstrated that integrated control systems with direct digital control of industrial processes by means of microcomputers and programmable controllers based on microprocessors at the lowest level are highly promising. Adaptive (self-adjusting) systems are a further elaboration of direct digital control systems. Their distinguishing characteristic is the fact that they not only automate control of the object but also automate modeling and modification of the model of the object during the work process.

Another trend in the automation of rolling mills is the establishment of new technological units of contemporary industrial production, automated technological complexes (ATK's), which are the sets of process control systems and industrial equipment controlled. The automated technological complexes are designed and turned over for use with close cooperation among production technologists, machine builders, and specialists in automation. The 1,500 blooming mill at the Nizhniy Tagil' Metallurgical Combine is an example of an automated technological complex.

Work will also be continued to improve computer technology, information representation devices, and colored graphic displays.

11,176
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NETWORKS

UDC 681.324.012

ORGANIZING MULTIMACHINE COMPUTER SYSTEMS ORIENTED TOWARD COLLECTIVE USE OF COMPUTER EQUIPMENT

Unknown VYCHISLITEL'NYY TSENTR SO AN SSSR in Russian Preprint No 255, 1980 pp 1-23

EFROS, L. B.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B94]

[Text] The principles and regulations which a collective-use complex (center) should meet are formulated and justified with regard to specific proposals on the user, the nature of the problems solved and the principles of organizing information processing under collective-use conditions of computer equipment. The organizational structure and configuration of multimachine, territorial distribution of a collective-use computer complex (center) are proposed and discussed. Figures 2: references 10.

[182-6521]

UDC 681.3.008

TERRITORIALLY DISTRIBUTED MULTIMACHINE COLLECTIVE-USE COMPUTER CENTER OF SIBERIAN DEPARTMENT, USSR ACADEMY OF SCIENCES

Unknown VYCHISLITEL'NYY TSENTR SO AN SSSR in Russian Preprint No 245, 1980 pp 1-59

MARCHUK, G. I., YEREMIN, Yu. I., KARPACHEV, G. I., KUZNETSOV, Ye. P., METLYAYEV, Yu. V., MITROFANOV, Yu. I., MOSKALEV, O. V. AND EFROS, L. B.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B119 by O. F. Sergeyeva]

[Text] The main propositions of the plan for designing a territorially distributed multimachine collective-use computer center of the Siberian Department, USSR Academy of Sciences, are presented. The collective-use computer center of

the USSR Academy of Sciences is considered as a three-level hierarchical system. The basis of the collective-use computer center is a collective-use computer complex as single hardware and general network software. A collective-use computer complex with functioning applied program systems forms a collective-use computer system. A collective-use computer system placed under conditions of organizational-legal and production support is a collective-use computer center. A user of the complex may be a user station, terminal device, individual computer or a developed self-contained computer complex that meets the conditions of the technical and industrial interface of the collective-use computer center. The complex user is a source of both information receiver and control actions (directive) for a collective-use computer center. The technical base of a collective-use computer center is computers of BESM-6, YeS, El'brus MVK (used as basic computer complexes, minicomputers of type SM-2 and SM-4 (used as peripheral processing centers), connected processors of basic computer complex and terminals of the data transmission system) and also a number of special devices. It is assumed that a collective-use computer center should meet the needs of the information and calculating capacities of more than 2,000 users of various institutes of the Siberian Department of the USSR Academy of Sciences and other organizations. This center may be regarded as a computer network although it has a number of distinguishing features compared to known developed networks. References 14.

[182-6521]

UDC 681.322.004.15

PROBLEMS RELATED TO DEVELOPING COLLECTIVE-USE COMPUTER CENTERS

Novosibirsk MATERIALY KONFERENTSII, AKADEMGORODOK, 1978, CHAST' 1, PLENARNYYE DOKLADY VSESOYUZNOY KONFERENTSII VYCHISLITEL'NYYE SISTEMY, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA, VSS I TsKP-78 in Russian 1980 pp 6-12

MARCHUK, G. I.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 3, Mar 81 Abstract No 3B98 by T. M. Kuznetsova]

[Text] The typical hierarchical structure of the use of computer equipment when powerful computers or processors are in an information-computer systems center, when there are medium-class or specialized computers at the center and there are mini- or microcomputers on the periphery which provide an interface between the information-computer center and the experimental installations and other terminals, is considered. The close ties between the trends in development of the configuration of powerful computers and development of modern collective-use computer centers are emphasized. The trends and development of computers, systems and complexes are analyzed. The first is introduction of parallelism at all levels

of information processing in computers and increasing productivity by increasing the number of parallel-functioning processors, memory blocks and other devices. The next trends are decentralization of data processing and uniform distribution through all devices and levels of the system, asynchronous interaction of all computer components and asynchronous organization of calculating processes, virtualization of individual devices and of the entire system, development of specialization of system components, specifically, of processors, tagging or self-identification of data that permits recognition of the nature of information being transmitted or processed and modularity and rearrangeability of computer system configurations that provide more convenient adaptation of them to classes of user problems. The methodology of developing collective-use computer centers, the problem of forming data banks and the problem of standardizing collective-use hardware by using the CAMAC module system are analyzed. Problems of increasing the intellect of the terminal and development of independent software for each computer system level are considered.

UDC 681.324

SCIENTIFIC AND PRACTICAL PROBLEMS OF DEVELOPING COMPUTER NETWORKS AND COLLECTIVE-USE SYSTEMS

Novosibirsk MATERIALY KONFERENTSII AKADEMGORODOK, 1978, CHAST' 1, PLENARNYYE DOKLADI VSESOYUZNOY KONFERENTSII VYCHISLITEL'NYYE SISTEMI, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA, VSS I TSKP-78 in Russian 1980 pp 13-20

GLUSHKOV, V. M. and NIKITIN, A. I.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B84 by authors]

[Text] Some results of work in the field of collective access and computer networks carried out at the Institute of Cybernetics, Ukrainian SSR Academy of Sciences and the resulting problems are presented. References 5.

UDC 681.322.004.15

CENTRAL COMPUTER COMPLEX OF THE JOINT INSTITUTE OF NUCLEAR RESEARCH AND PROSPECTS OF DEVELOPING IT

Novosibirsk MATERIALY KONFERENTSII AKADEMGORODOK, 1978, CHAST' 1, PLENARNYYE DOKLADY VSESOYUZNOY KONFERENTSII VYCHISLITEL'NYYE SISTEMI, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA, VSS I TSKP-78 in Russian 1980 pp 21-30

BEZRUKOV, B. A., GOVORUN, N. N., KARLOV, A. A., MESHCHERYAKOV, M. G., SILIN, I. N., SHIRIKOV, V. P. and SHCHELEV, S. A.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B121 by T. M. Kuznetsova]

[Text] The central computer complex of the joint institute of nuclear research, which is a three-level hierarchical system, is described. The main task of the central computer complex is to provide adequate computing capabilities for scientific research. The main trends in development of a computer complex are an increase of the capacity of the central computer complex, improvement of the means and methods of direct user access to the computer center and development of a data and program bank. The expected state and subsequent development of the central computer complex are analyzed. It is suggested that the capacity be increased by introducing multiprocessor systems with developed internal and external storage and communications channels that permit organization of work in real time, connection to an auxiliary processor system and an increase of the internal storage. Further improvement and development of operating systems, translators, assemblers, information retrieval systems and data control systems, development of a standard program library, introduction of methods of analytical calculations using computers, further modernization and development of software for electronics experiments, development of a system for processing spectrometric information and work on automation of electronic apparatus design, specifically, of printed-circuit cards are indicated as the main trends for developing the software of the central computer complex. Figures 1; references 2.

UDC 681.322.01

CONFIGURATION OF PACK SWITCHING COMPUTER NETWORKS

Novosibirsk MATERIALY KONFERENTSII AKADEMGORODOK, 1978, CHAST' 1, PLENARNYYE DOKLADI VSESOYUZNOY KONFERENTSII VYCHISLITEL'NYYE SISTEMI, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA, VSS I TSKP-78 in Russian 1980 pp 40-63

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 4, Apr 81 Abstract No 4B12 by T. M. Kuznetsova]

[Text] The need to convert from the use of individual computers to information processing in multimachine associations distributed over a large area that gather, store, transmit, process and issue information is justified. Three types of multimachine associations: terminal complexes, computer complexes and computer networks, are considered. The methods of joining computers such as conversion of punch tape and magnetic tape, exchange of information through external devices, emulation, symmetrical interaction of equal machines and so on are enumerated. The main characteristics that determine a modern computer network are given. Two groups of machines combined into a computer network: user and auxiliary, and also a communications network that provides transmission or information between any pair of user machines are analyzed. The specifics of functioning of computer channel and message switching networks are explained in an example. The operating principles of pack switching networks that permit rapid joining of channels, a low level of errors and reliable and efficient functioning are considered. The services offered the user are presented. The logic physical and program structure of the computer network and also the protocol hierarchy are analyzed. The experimental network of the Latvian SSR Academy of Sciences is described. Figures 7; references 7.

[182-6521]

UDC 681.322.05.06

ORGANIZING PARALLEL CALCULATIONS AND THE STRUCTURES OF COMPUTER SYSTEMS

Novosibirsk MATERIALY KONFERENTSII, AKADEMGORODOK, 1978, CHAST' 1, PLENARNIYE DOKLADY VSESOYUZNOY KONFERENTSII VYCHISLITEL'NYYE SISTEMY, SETI I TSENTRY KOLLEKTIVNOGO POL'ZOVANIYA, VSS I TsKP-78 in Russian 1980 pp 64-77

KARTSEV, M. A.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 3, Mar 81 Abstract No 3B53 by T. M. Kuznetsova]

[Text] The timeliness of the problem of organizing parallel calculations and construction of computer systems with respect to problems that require greater computer capacity for solution than a computer of ordinary structure (with one

main processor) can provide is discussed. The requirements on the structure of computer systems and the parameters of estimating the capabilities of computer systems are formulated. Two typical situations: the use of computer systems in a collective-use computer center or in an automated control system for production, sector, academic process and so on: in this case there is efficient use of collectivized resources, conservation of the volume of information stored on external carriers and an increase of the viability of the collective-use center. The second typical situation includes the use of computer centers for real-time control of a complex production process or for solving large scientific or engineering problems; in this case all the resources of the computer center are made available if possible to one priority problem. Such concepts as nominal, real and user speed of systems, user effectiveness of computer systems and parallelism of independent branches of the problem, related operations and a set of facilities are analyzed. The numerical characteristics of the parallemum: the index of connectedness of related operations and the rank of the problem are considered, the software required to implement parallelism: operator programming languages and translators, is investigated and the capabilities of rearranging the processor lines are formulated. Figures 4; references 5.

[190-6521]

UDC 681.322.004.15

WORK OF THE SIBERIAN DEPARTMENT, USSR ACADEMY OF SCIENCES, IN DEVELOPING COMPUTER SYSTEMS AND COLLECTIVE-USE CENTERS

Novosibirsk RABOTY SO AN SSSR V OBLASTI SOZDANIYA VYCHISLITEL'NYKH SISTEM I TSENTROV KOLLEKTIVNOGO POL'ZOVANIYA in Russian 1980 pp 78-98

YERSHOV, A. P.

[From REFERATIVNYY ZHURNAL: AVTOMATIKA, TELEMEKHANIKA I VYCHISLITEL'NAYA TEKHNIKA No 3, Mar 81 Abstract No 3B97 by T. M. Kuznetsova]

[Text] A number of specific investigations in the field of developing computer systems, collective-use centers and computer networks, beginning in 1966, is surveyed. The initial prerequisites established in the AIST-O project--a multiprocessor collective-use system, and also the results of testing the software: the operating system, programs for pack handling of problems with remote input, a universal editor, data bases, DZhOSS dialogue programming language and game programs, are analyzed. The main propositions of developing a compatible CTSS time-sharing system and a system based on the PDP-1 machine (United States), the operating system of the Institute of Applied Mechanics, USSR Academy of Sciences, and ARPANET and CYCLAD systems (Great Britain) are considered. The DIAPAK

system, the KOP dialogue systems program, the CHAMELEON universal editing and archives system, the SETl high-level language dialogue realization and work on combining three BESM-6 computers are analyzed. The advantages of the multimachine territorial complex of the collective-use computer center of Novosibirsk Akademgorodok are noted and some technological principles of development: standardization and decentralization of functions and combined realization, are indicated. The problem of information collectivization with orientation toward a large number of nonprofessional users is posed. A block diagram of the computer complex of Akademgorodok, which contains a data transmission system with communications channels and switching processors than operate by the pack switching principle, basic computer complexes and peripheral processing centers based on minicomputers of type M-7000 or SM-2 are presented. The CAMAC constructives system is taken as a technological base. The topographical layout of the network of collective-use computer centers is commented on. Figures 6.

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NETWORKS AND SYSTEMS WITH COMMUTATION OF PACKAGES. PART 3

Moscow ZARUBEZHNAYA RADIOELEKTRONIKA in Russian No 5, May 81 pp 54-69

[Article by G. A. Shigin, candidate of technical sciences]

[Excerpts] 10. KOMET Commutation System for the DELTA Computer Network

According to [126], in the GDR the national DELTA computer network, intended to provide user access to the BESM-6 computer and improve the use of present computer resources, is being created. The network will service institutions of the Academy of Sciences, the Academy of Agricultural Sciences and institutions of higher education of the GDR. Elements of the computer network will be interconnected by a network with package commutation, for which the KOMET commutation system has been developed. The structural circuit of the KOMET system is presented in [126].

The hardware of the commutation units (or the "commutation computer") is constructed on the basis of the KRS-4201 mini-computer. Through three ASM adapters which accomplish the HDLC procedure, duplex communication channels with a transmission rate of 48 kbits/s are attached to the unit, connecting it with other network units. Connected to the commutation unit is the BESM-6 "working computer", by means of which other control functions of the DELTA network are accomplished (management of tasks, resources and data) and functions of the terminal processor--to provide for the work of the BESM-6 input-output device as network terminals.

Package network terminals are made up with KRS-4201 mini-computers. Through semi-duplex channels with a velocity of 1200 bits/s, formed by means of Yes-8006 modems and the YeS-8404 (MPD-4) multiplexor, the terminals are connected to a terminal interface processor (TIP). The YeS-1020 computer is used as the apparatus part of the TIP. The TIP is connected to the BESM-6 through a "channel-to-channel" adapter and a "YeS-adapter" developed especially for the BESM-6.

It is reported that in the KOMET system a datagram method of package transmission is realized. Information has not yet been made available regarding other communication methods and procedures.

Conclusion

A survey of the foreign literature and materials of the present work provide a basis for the following generalizations:

1. In the course of the 1970's data transmission networks with package commutation were developed and created in most highly developed capitalist countries. The appearance of class PD-KP [peredacha dannykh-kommutatsiya paketov--data transmission-package commutation] networks results from an objective need of large-scale modern production for improvement of information servicing with the use of distributed computer networks.

2. Characteristic of networks with package commutation is higher quality of the servicing (the delivery time is less than 0.5-1 s, as a rule, the probability of error is less than 10^{-8} to 10^{-10}, etc), the possibility and flexibility of connection of various classes of subscribers during simultaneous considerable reduction of the cost of equipment and of charges for use of the network.

3. A practically parallel process of development of a number of systems and networks with package commutation in various countries in the first half of the 1970's led to a variety of technical solutions, at times very original ones. Characteristic of the second half of that decade was a striving to adhere strictly to the acopted standards, of which Recommendation X.25 of the International Telegraph and Telephone Consultative Committee is basic.

4. The method of package transmission and commutation, called the "virtual channel," is widespread in PD-KP networks. The method is regulated by Recommendation X.25.

Along with that, in a number of networks the datagram method of commutation is used. It will be standardized at the end of 1980 and issued in the form of a supplement to Recommendation X.25.

5. High indicators of PD-KP networks for the criterion "effectivness-cost" are achieved not only through wide use of up-to-date technology (integrated circuit equipment is used in practically all systems) but also of special procedures for control of the data flow. This permitted sharply reducing the memory volume of central package commutation (in comparison with the memory of signal channel centers).

6. Much attention is given to questions of assuring the connection to networks with package commutation of various equipment of the user. Typical solutions are:

--connection of package terminals and computers, the communication records of which match those of the PD-KP, directly to the central package commutation (in various sources they are called IMP, TCO, PSE, etc);

--introduction of special coupling processors and concentrators (in various networks called TIP, TAC, CML, PMX, etc) which transform the formats and records of the user into formats and records of the PD-KP communications network;

--introduction of connected processors as interface devices during connection to the VMP network and other data transmission networks.

7. Of other "standard" solutions widely used in foreign PD-KP networks, the following should be mentioned:

a) wide application in most described networks of algorithms for adaptive routing;

b) introduction into the composition of the network of special centers for network monitoring and control (called NCC, PCL, etc, for short);

c) use for the organization of communications between centers and connection of VMP in most of the PD duplex channel networks under consideration with transmission rates of 48-64 kbits/s;

d) increasingly wide application of microprocessors in the equipment of central package commutation and package terminals (the Spanish RETD network and the Japan-est DDX-2 and NEDIX-510F systems), which permits additionally reducing equipment cost and dimensions and assuring a modular character of its construction;

e) wide use of group apparatus for signal conversion in the construction of package commutation (the TELENET and TRANSPAC systems, the NEDIX-510F system, etc) and also more powerful methods of protection against error. In particular, in a number of networks a polynomial of the 24th power is used.

8. Package commutation technology has surpassed the frameworks of data transmission networks and is finding application in the construction of present-day telephone communication networks and in the development of integrated communication networks.

9. In spite of the stormy process of development and introduction of systems and networks with package commutation, the leading foreign specialists are judiciously estimating the prospects of their development. Thus they assume that in the next decade about 15-20 percent of all subscribers transmitting data will use the services of PD-KP networks. On the whole that is not many if it is considered that the total number of data transmission terminals in the world reached 3.4 million in 1979 and there will be 5.7 million of them in 1985 [122].

The systems and networks with package commutation described in the survey do not exhaust the entire list of systems of that class, and the list of them is being constantly increased.

Some networks with package commutation which will be introduced into operation at the start are pointed out in [119, 121]. A number of countries (FRG, the Scandinavian countries, Belgium, etc) which adopted earlier the concept of networks with channel commutation have now re-examined their position and are developing their own networks with package commutation at accelerated rates [119].

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CONFERENCES

APPLICATIONS OF COMPUTER TECHNOLOGY IN SCIENTIFIC INVESTIGATIONS. CONFERENCE OF THE COMMISSION 'SCIENTIFIC QUESTIONS OF COMPUTER TECHNOLOGY OF THE ACADEMIES OF SCIENCES OF SOCIALIST COUNTRIES'

Kiev KIBERNETIKA in Russian No 2, Mar-Apr 81 pp 146-147

[Article by A. A. Stogniy and A. I. Kondrat'yev]

[Text] A conference of the Commission "Scientific Questions of Computer Technology of the Academies of Sciences of Socialist Countries" on "Applications of Computer Technology in Scientific Investigations" was held on 26-31 May 1980 in Liblice, CSSR. Present at the conference were 94 representatives of eight socialist countries: Bulgaria, Hungary, Vietnam, GDR, Cuba, Poland, the USSR and the CSSR. In five working days 42 scientific reports and presentations were read on these scientific directions: problems of technical and socio-economic investigations, problems of the automation of scientific investigations, data banks and image recognition.

We will dwell on some reports.

1. 26 May

The leader of the Soviet delegation, Academician A. A. Dorodnitsyn, in his report entitled "Experience in the use of computers in solving problems in the natural sciences. Difficulties and prospects of future development" noted that on the whole contemporary computer technology has permitted making the transition from unidimensional to bidimensional tasks. As for three-dimensional tasks, all the power of modern computers suffices only for the solution of simple tasks of that type. One can cite a number of examples of three-dimensional tasks which cannot be solved, not only on the best present-day computers but even on computers of the future with very optimistic estimates of the growth of their productivity. In concluding, A. A. Dorodnitsyn stressed that it is necessary to direct the main efforts toward the development of new methods and approaches to problem solving.

2. 27 May

Twelve scientific reports and presentations were delivered. H. Ettrich (GDR), in a report entitled "Language software for non-programmers during use of a data base control system," noted that thanks to the rapid development of data processing technique and technology computer technology is becoming more and more accessible to the workplace of the user. Considered in the report are questions of the

development of quasi-natural and relational languages of data bases and their investigation by means of experimental developments within the framework of a single data base control system with a multilevel architecture.

M. Cherny (CSSR) presented a report entitled "Experiments with a system model for medium-range planning." Experiments with a system model for medium-range planning were carried out in two stages. In the first stage the experiments were concentrated on a selected part of the system, consisting of subsystems of models of the reproduction of the population and the work force, social consumption and the nonproductive sphere, incomes and expenditures of the population and personal consumption, production and productive assets and the aggregate model. P. Stanchev (Bulgaria) in a report entitled "A method of decision making in the presence of several criteria which uses the theory of odd sets and its application in the task of the placement of motor stations in the planning of overhead transport," formulated the task of decision making in the presence of several criteria, reduced to the partial or complete ordering of a finite number of elements of an arbitrary character as a function of given estimates. A new method is proposed, one based on combination of a large number of target functions into one.

In the report of J. Nedom entitled "Information transfer in systems with a nonlinear structure" it is noted that in economic and information systems one often encounters the situation that the connection between two system elements is accomplished only in the presence of definite conditions having to do with the existence of other connections in the system. In the simplest case the accomplishment of the output connection of a given element depends on a definite combination of input connections. The structure of that system can be described by means of a multigraph with the addition of transformations of system elements. Even if one limits oneself to Boolean transformations, in the case of a system with conditional connections those transformations are nonlinear. This justifies calling it a "system with a nonlinear structure." The specific properties of nonlinear structures are manifested above all in the analysis of information transfer. Several concepts of the path are introduced: the possible, forced, theoretical path and the actual. A definition of those concepts is given by means of the summation of transformations. It is shown that the concept of the positive and forced path is transitive. Algorithms for finding paths makes use of results of the theory of logical networks.

In the report of J. Cirak entitled "Creation of general models of complex systems controlled according to several goals," it is proposed that each complex system controlled according to several goals can be represented by a large number of models, equal in dimensions to the number of goals. If the system is divided into controlled subsystems, each subsystem can be represented by a large number of models, equal in dimensions to the number of goals of the corresponding subsystem. An equilibrium model of the subsystem is examined and the subsystems are interconnected by carriers of purposive properties (ingredients). The properties of ingredients do not vary in connections, but vary in subsystems. The model of a complex system is described in the form of a set of equations and limitations of subsystems and the connections between them.

In the report of Milan Vlakh entitled "Complexity of tasks of ordering for one machine" it is noted that during the mathematical simulation of processes of decision making a number of problems arise which are important for science and

practice. These are tasks of scheduling and operational control. In practice and in theory it is important to know the estimates of the labor-intensity of solution of those problems. In speaking of the estimate of labor-intensity of an algorithm, an estimate above the number of actions, asymptotic in relation to the dimensionality of the problem, is understood. Recent results of the theory of complexity of computations permit in a fairly reasonable sense distinguishing "easy" and "hard" tasks. M. Vlakh gave a survey of the computational complexity of ordering tasks for determined systems of servicing with one instrument and cited tasks with still unknown computational complexity.

3. 28 May

Professor Yu. I. Zhuravlev (USSR), in a report entitled "Algebraic methods in tasks of image recognition," examined the task of image recognition in a standard formulation. It is known that the set of allowable objects is the sum of a finite number of classes, perhaps intersecting. Each allowable object is represented in the form of a description with components of metric or semi-metric spaces. The structure of the recognition algorithm represents the successive product of a recognizing operator on a decisive rule. On the set of recognizing operators a set of operations is introduced: multiplication by a scalar, addition and component multiplication of elements of the matrix first introduced by J. Adamar. Various properties of the thus introduced algebraic and linear closures of the set of recognizing algorithms are examined.

In the report of Z. Shidak entitled "Cluster analysis", two groups of questions were examined: 1) hierarchic cluster procedures and 2) functionals of the quality of subdivision.

On the subdivision of the totality of objects into clusters it is possible to impose various intuitively reasonable requirements which reflect the degree of closeness of objects within clusters, the sameness of the distribution of objects within clusters, uniformity of the distribution of objects by clusters, etc.

In the report of M. Kuzhinski entitled "Multistage image recognition and its application in medical diagnosis," questions of successive decision making are examined. The concept of multistage recognition is presented and an optimum strategy is developed which minimizes the total probability of erroneous classification. The author examines the case of recognition with learning, for which various rules have been constructed for decision making in separate states of classification, rules which use a teaching dequence. An algorithm is proposed for the selection of important signs in individual stages of multistage image recognition. The method of multistage image recognition can be especially useful in the algorithmization of medical diagnosis. The results of practical use of the method of multistage image recognition in the diagnosis of some groups of occupational diseases are presented in the report.

4. 29 May

Z. Knut (Hungary), in a report entitled "The SDLA system," noted the great interest in the problem of planning complex systems and in connection with that the possibilities of describing and analyzing the structure of a planned system in a certain

language which can be interpreted by a computer. The SDLA system is a two-level system. To determine the language in the SDLA a meta-language with a simple structure is proposed. After the language has been fixed the second SDLA level is the level of description, which is used as the system for interpretation of an ordinary language of description. The description perceived by the system is verified for syntactic correctness, the correspondence of types and also the observance of some semantic rules set on the meta-language. After that analysis the description is put in a special data base. By simple instructions it is possible to obtain listings regarding the description, to supplement it (the system favors a descending method of planning) and to readily introduce changes.

Interest was aroused by the report of P. Eckhardt (CSSR) entitled "Structures of data for an information system with access in a natural language."

Several interesting reports were presented on the GUHA system, developed in the Mathematical Center of biological institutes of the CSSR Academy of Sciences.

In the report of A. Rzhig entitled "Questions about the realization of a system for interaction with a data base in a natural language," questions regarding creation of an automated information system capable of answering questions given in the form of sentences in a natural language, in most cases of definite assignment of an area of communication, appear on the system input. For other regions the system is applicable only after modification. The number of necessary modifications is a subject of further investigations. The system becomes simpler if only complete mutually independent inquiries are allowed. At first they are translated into operators of a formalized language of inquiries, and then an answer is obtained by means of the data base control system. From the inquiry is selected only the information necessary for correct response of the system. The necessary characteristics are sought in the dictionary and refined or corrected as a function of the structure of the inquiry. A response can be obtained, for example, by substitution of data in a previously prepared text of the reply.

In a report entitled "Non-numerical applications in scientific research and their software," S. Vokhnik divided computer applications into three kinds: scientific-technical computation, statistical-economic computations and mass data processing.

Computer use in those areas is sufficiently well provided with programming languages and software. Problems of non-numerical programming still are not receiving sufficient attention. Investigations have contributed to the emergence of new programming languages oriented toward the processing of complex information structures.

Most such investiagations are accompanied by the development of new or modification of present-day programming languages oriented toward the processing of lists. It must be noted that the problems of computer processing of non-numerical data had already arisen in connection with the formation of operating systems. But the requirements of social practice in the area of automation of intellectual activity alone contributed to the development of non-numerical programming as a special discipline.

5. 30 May

The report of Corresponding Member of the UkSSR Academy of Sciences A. A. Stogniy (USSR) entitled "On spheres of application of data banks" presented a list of the

main spheres of application of data banks and an attempt to classify them, starting from the user aspect of their consideration. The principal data base structure for automation of the providing of information about various aspects of man's activity is described. Interest was aroused by the report of G. K. Stolyarov (USSR) entitled "Purpose and functional possibilities of the 'ASPID-3' information retrieval system." The "ASPID-3" system is intended for the creation of information retrieval systems of a descriptor type with a lexicon normalized on a semi-hierarchic multi-language thesaurus, an inverted retrieval file and the main criterion of output in intensity of the Boolean expression from the descriptors on the retrieval form of the document. The system includes three languages and 11 programs which assure the creation and maintenance of the thesaurus, the document file and the inverted retrieval file, and also retrospective or selective retrieval with respect to profiles of the interests of subscribers catalogued in the archives. The areas of application are: narrowly-subject information retrieval, systems for scientific and technical literature, documentation and patents, various specialized systems in scientific-research and planning and design organizations and enterprises of various sectors of the economy.

In the report of P. Sgall entitled "Automatic formation of data bases on the basis of the input text and output rules" there was a description of an experiment in automatic compilation of data bases and responses to factographic questions, prepared by the linguistic group of the Physics and Mathemathematics Faculty of Charles University (CSSR). The software consists of the following procedures for the YeS-1040 computer.

1. A syntactic and semantic analyzer of Czech sentences, one which translates the sentences of an input text and users' questions into an unequivocal recording on the level of linguistic values; the recording has the form of a planning tree with an apex; the set of trees of dependences can be defined as a contextless Khomskiy language.

2. The output rules are formulated in the language of the level of values;

3. Retrieval of a complete or partial response to a given question;

4. Synthesis of a response conciding with the synthesis of a machine translation from English into Czech.

The experiments are still limited due to the volume of the dictionary, which contains a total of several tens of words.

In the report of N. V. Shvertner entitled "Means of verifying data reliability during renewal" the main principles of data monitoring during renewal in data base control systems are examined.

1. The means of control are declarative. This means that there exist specially developed linguistic means for describing a subject area and reflecting laws and limitations characterizing it. They are simple and convenient.

2. Means of reflection of rules and limitations reflecting a subject area have sufficient expressive force. It is possible with them to present sufficiently complex rules and limitations.

3. The user can obtain information about the types of limitations and checks of separate data bank elements.

4. Various users are presented the possibility of including their own sets of monitoring limitations and rules, that is, of having its own view of monitoring during data base renewal. Means of dynamic control of monitoring parameters have been worked out. The user can dynamically vary the sets of limitations by summoning other sets from the system files, and also dynamically switch monitoring on or off for the given element of data bank recordings.

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SCHOOL-SYMPOSIUM ON 'INVESTIGATION AND PLANNING OF COMPLEX SYSTEMS'

Kiev KIBERNETIKA in Russian No 2, Mar-Apr 81 pp 142-145

[Article by Ya. A. Dubrov]

[Text] A school-symposium on "Investigation and Planning of Complex Systems" was held on 19-24 February at Slavsko, L'vovskaya Oblast. It was organized by the Scientific Council for the Problem "Cybernetics" of the UkSSR Academy of Sciences, the Western Scientific Center of the UkSSR Academy of Sciences, the Section of Mathematical Cybernetics and Problems of Control and the L'vov Polytechnic Institute jointly with the Institute of Mathematics of the UkSSR Academy of Sciences, the Institute of Cybernetics of the UkSSR Academy of Sciences, the L'vovskaya Oblast Management of the Scientific and Technical Society of Radio Engineering, Electronics and Communications imeni A. S. Popov and the L'vovskaya Oblast House of Technology of the Scientific and Technical Society.

Participating in the work of the school-symposium were more than 70 specialists from 34 organizations of Kiev, L'vov, Moscow, Leningrad, Novosibirsk, Khar'kov, Donetsk, Riga, Vilnius, Minsk and other cities. Among them were representatives of academic institutions, universities and other VUZ's, scientific research institutes, computer centers and production associations.

In the course of the work of the school-symposium five plenary and nine sectional reports were presented, and also 31 sectional presentations. The sectional reports and presentations were distributed between two sections, "Mathematical and Applied Theory of Systems" and "Theoretical and System Programming."

Plenary Reports

The report of Academician of the UkSSR Academy of Sciences V. S. Korolyuk [1] was devoted to the presentation of a number of results obtained in the development and use of the method of consolidation of complex systems for Markov recovery processes. It is known that the algorithms of phase consolidation of complex systems are effective for systems similar to the ergodically cleavable. However, it has been established that the algorithms of phase consolidation also have another content: they determine the phase consolidation of ergodic Markov recovery processes under steady-state conditions. In the report a theorem is formulated which substantiates the acceptability of formulas of phase consolidation during arbitrary cleavage of the phase space of the states. Recommendations important for applications follow from that theorem.

A complex of questions connected with the organization of multi-level operating systems was examined in the report of Professor A. N. Kostovskiy [2]. In particular, analyses were made of urgent problems and the prospects of development of industrial systems for the production of mobile produce, the development of self-virtualizing multi-level machines, and also of questions of getting out of recursive clinches. Considerable attention was given to the principles of creation of open complexes of operating systems which have possibilities of expanding with preservation of the properties of a virtual machine monitor.

Professor A. I. Nikitin [3] dwelt on problems in the construction of collective-use computer centers and computer networks which are necessary for the effective satisfaction of the needs of various organizations for computing and data processing work. The author discussed the basic principles of the construction of collective-use computer centers, problems of the optimum distribution of work during the interaction of users in the process of solving major problems, questions of the effective functioning of collective-use computer centers, the characteristics of the distribution of operating systems for computer networks, etc.

The report of G. Ye. Tseytlin [4] was devoted to the consideration of abstract models of multiprocessors accomplishing synchronous, asynchronous, conveyer and carousel strategies of parallel computations, which are the basic design structures of parallel programming. Associated with those abstract models are algorithmic algebra systems and modifications of them oriented toward formalization of parallel computations. A characterization is given of the principal results in the schematology of structural parallel programming, for which the apparatus of algorithmic algebra systems forms the basis. Then the reporter developed the theory of grammatical and automatic models of formal languages oriented toward the solution of tasks of symbolic multi-processing. In connection with that the concept was given of a synchronous grammar which combines the apparatus of modified algorithmic algebra systems with abstract memory structures. Grammatical and automatic models of formal languages are proposed, based on a strategy of bilateral symbolic multiprocessing. Proof is presented for a theorem that the upper estimate of temporary complexity of parallel algorithms of syntactic analysis of context-free languages on multi-dimensional homogeneous structures is proportional to the length of the analyzed chains.

Ya. A. Dubrov [5] described a program for the construction of a formalized axiomatic variant of a mathematical theory of systems which is based on the concept of a hierarchic model (system). Used as a formal language of the axiomatic theory of systems is a language of higher degrees or a language of graduated computation of predicates. The consideration of specific axiomatics which are satisfied by a hierarchic model makes it possible to construct a theory of specific classes of systems (structural-functionsl systems, weak structures, linear T-variant systems, etc. Investigated in the report were the properties of some operations (theoretical-multiple, composition, inversion, etc) on multi-base polyrelatives, which are a natural generalization of relational systems, which in the mathematical theory of systems coincides with the concept of an abstract system.

At thematic sessions there were discussions of questions relating to a mathematical and applied theory of systems, and also to the problematics of theoretical and system programming.

Mathematical and Applied Theory of Systems

Two reports [6, 7] and three presentations [8-10] were devoted to questions of systems theory. In particular, in [6] some properties of a dibasic heterogeneous algebra constructed on a set of numbers and a class of diffuse sets were studied. In that algebra the operations of addition and multiplication of diffuse sets are non-distributive. The principal properties of operations of the algebra are described. The proposed algebra is considered as a particular case of dibasic hierarchic algebra of numbers and diffuse sets, on the first level of which the operations of addition and multiplication of non-negative real numbers and the supplementations and intersections of diffuse sets are determined, and on the second level, the operation of set combination and the question of multiplication of a number by a set. A connection has been established between the algebras under consideration with continuous logics and probability theory. A report [7] is devoted to the construction of an algorithm for synthesis of structures of operating systems, one which uses syntactic analysis in a grammar of precedence with fixation of the used reduction. The algorithm was realized in the language PL/1. In [8] a theoretical-set model is proposed for the structure of a system, in which a concept of the edge and interior of the structure is used which are derivatives of the concept of closeness of structural elements. The latter is introduced on each level of a hierarchy and relates to single-level elements (substructures). In that case it is advisable to consider the covering of the structure by substructures, and not the breakdown of the structure into substructures. A connection is established between the introduced concepts and a number of concepts of theoretiset topology.

Presentation [9] was devoted to the construction of a productive function for the enumeration of structures of systems representing non-isomorphous oriented locally limited multigraphs with loops. Graphs with a given number of internal apices and poles were examined; this permitted enumerating structures with a fixed number of inputs and outputs.

In [10] it is demonstrated that one of the tasks of systems theory is the search for formal languages for existing models of real systems. This problem is the reverse of the one solved in model theory. The status of the linguistic elements of a language is revealed by establishing the connections between the thing, the property and the relation according to A. Uyemov and the denotation, concept and sign according to H. Frege. A particular criterion of identity of words in meaning was formulated.

Report [11] was devoted to an examination of questions connected with the automation of reliability planning of complex systems and the principles of construction of an automated system of reliability planning of ASU's, and also of elements of the corresponding mathematical and program software, which includes a complex of meaningful algorithms and a special operating system which assures interaction of the developer and the computer in an interactive mode. In [12] the necessary and sufficient conditions are established under which the remembering of intermediate information in a reliable memory in the process of solution of some problem can be used to increase the productivity of the system. Work [13] was devoted to describing the procedure for optimizing technological processes of the production of electrovacuum instruments simulated in the form of stochastic processes. In [14] and [15] some tasks in the optimization of ASU's under indeterminate conditions

were studied. In [15] a cluster algorithm is proposed for the construction and analysis of histograms, one used in the analysis of space multizonal video information, and also the classification of observations by clusters. A description of an automated design system intended for optimization of the structure and selection of the elementary base of complex systems with consideration of the reliability criterion was given in [17]. On the program level the automated design system made for work in a YeS computer operating system consists of two parts, the problem and the control.

Report [18] described elements of an unformalized axiomatic theory of problem-resource control developed by the authors on the basis of development of methods of purposive and situational control. In particular, "effective-resource" and "quality-resources" diagrams were described which permit giving an approximate operative evaluation of quality and effectiveness. In [19] a model of investigation of the effectiveness of the process of operation of various aviation systems is proposed, and in [20] an imitation model of a drainage basin in the form of a homogeneous elementary area with irregularities of identical form which was realized in the PL/1 language in a YeS computer operating system.

Report [21] describes use of the concept of the planning situation and probabilistic determination of the production system for the development of methods of organizing an adaptive planning system, which enhance the possibilities of forming more precise planning tasks in comparison with the rules of traditional methods. In [22] a definition was given of the production-qualitative function, which describes the dependence of the quantity and indicators of quality of production on the quantity and indicators of quality of the used resources. Some properties of that function were investigated; general methods of their construction were proposed, methods based on the concept of the associative mean. The possibility of extending that function to the case where the resources and production are linguistic variables was examined. Report [23] describes a production technological complex for the manufacture of kinescope screens, simulated as a dynamic multistage system, each stage of which is described by a system of differential equations with definite limitations. Tasks of structural and functional optimization of simulated systems are also investigated there. Report [24] was devoted to the numerical solution of the problem of computing the plane and axisymmetric electrostatic field created by a system of electrodes of complex configuration. The problem was solved by the method of self-regulation, realized in the form of a program complex. In [25] data obtained in the investigation of some classes of linear systems described by differential equations unsolved with respect to the derivatives are presented. In [26] an analysis is given of problems of the transition from an automated regime of designer planning to the automatic planning of radioelectronic apparatus. In presentation [27] an attempt was made to simulate some ecological rhythms characteristic of natural complexes which have been subjected to periodic local glaciation (for example, complexes of the high Carpathians). Report [28] generalizes experimental data on determination of the activity of cholinesterase during the stimulation of certain animal organs. In [29] one conceptual approach to integration of organization and control into a single process is analyzed.

Theoretical and Systems Programming

In [30], for the analysis and conversion of informational and functional structures of both successive and parallel algorithms, a special system of algorithm algebras is introduced and some of its properties are investigated.

In [31] and [35] some properties of effectively open sets (super-language represented by automata are investigated, and applications of the theory of super-languages to the analysis of the functioning of programs are examined. In [31] are investigated closure in relation to operations of pseudo-Boolean algebra and some other properties of classes of super-languages repreented by magazines and determined magazines of automata. In [35] a description is given of one approach to realization of the diagnostics of the looping of FORTRAN programs, based on the theory of super-languages represented by finite automata.

Report [32] gives a certain generalization of M. Rabin's theorem on the solvability of the problem of emptiness for finite automat on infinite trees, that is, he demonstrates that that problem is also solvable for finite automata on infinite graphs, which are a recursive closing of finite acyclic graphs.

In [33] the application of the Floyd method for verification of complex technical information conversion systems, including radio engineering systems, integrated circuits, etc, is examined. In [34] a method of constructing inductive proposals used in verifying the correctness of programs is proposed.

Report [36] and a number of presentations were devoted to problems in the development of programming technology. In [36] the plan of an interactive system for the construction of programs with the use of blanks of syntactic structures of the language is described. The system makes it possible for the programmer to present the program in terms of fairly large concepts corresponding to the meta-variable grammar of the programming language. Possible variants of detailization of the introduced concepts are selected from the data base. In [37] there was discussion of the problem of creating a rational technology for translator construction. It was noted that the solution of that problem is made easier by explicit assignment of the projection (reflection of the translator inputs in the outputs). It was proposed to describe the projection in V-language (an applied language of correlations). In [38] the application of a V-language to describe contextual conditions of languages resembling ALGOL was examined. The possibilities of a program-verifier which verifies correspondence of the set program with the standard of the FORTRAN language are described in [39]. The verifier was realized on a BESM-6 computer within the framework of the "Dubna" monitor system. The ideology and principles of construction of the software of the mini-Mars specialized processor are described in [41].

Presentations [40], [42] and [43] were devoted to the investigation of various aspects of the development of data bases. The realization of a compiler from the RYaOD to the PL/1 language was described in [40]. The RyaOD language is one of the languages close to relational algebra, when the RYaOD program is translated by a compiler into the language of the macroprocessor PL/1, and the macroprocessor then generates a PL/1 program. The compiler itself is written in the PL/1 language. In presentation [42] the principles of realization of domains of the relational data base for YeS operating systems are presented. The domain is given a name, type and set of predicates intended for data monitoring. When any element is introduced into a data base it is verified that it can be put in the corresponding domain. In [43] questions of the organization of user communication with the data base are discussed. In the processing of an inquiry it was proposed to use a thesaurus of the hierarchic structure, which would permit forming the inquiry in stages in an interactive mode. The hierarchic structure of the thesaurus is accomplished by means of circuit connections.

Presentations [44] and [45] were devoted to problems in the creation of packages of applied programs. In [45] the possibilities of a package of programs for solution of the general problem of convex quadratic programming were described. If the matrix of the target function has been positively determined, then the package will construct an optimum plan without any sort of assumptions of the type of non-degeneracy of the reference plan.

In the process of work of the school-symposium useful contacts were made and ideas were also exchanged between specialists on mathematical systems theory and theoretical programming. In the resolution of the school-symposium recommendations were given on the further development of specific system methods of investigating and planning complex objects. It was decided to conduct the next symposium in 1981.

List of Reports

Plenary Reports

1. Korolyuk, V. S. (Kiev). "On the Development of a Method of Consolidating Complex Systems."

2. Kostovskiy, A. N. (L'vov). "Problems in the Organization of Multi-level Operating Systems."

3. Nikitin, A. I. (Kiev). "Principles of Construction of Collective-use Computer Centers and Computer Networks."

4. Tseytlin, G. Ye. (Kiev). "Formal Models of Langugage Multi-processors."

5. Dubrov, Ya. A. (L'vov). Algebras of Multi-base Polyrelatives."

Mathematical and Applied Systems Theory

6. Dubrov, Ya. A. (L'vov). "Biaxial Algebra of Diffuse Sets and Non-negative Real Numbers."

7. Leshchinskiy, V. A. (L'vov). "Grammatical Method of Synthesizing Oriented Systems."

8. Dubrov, Ya. A., and Plakhta, L. P. (L'vov). "One Approach to the Description of System Structures."

9. Potyagaylo, Z. D. (L'vov). "Construction of a Productive Function for System Structures."

10. Dombrovskiy, B. T., and Dubrov, Ya. A. (L'vov). Systems Theory: Dialectics and Semiotics."

11. Zarenin, Yu. G. (Kiev). Investigation and Assurance of Reliability of Complex Control Systems."

12. Brodetskiy, G. L. (Kiev). "The Question of the Use of Temporary Redundancy in a Unreliable Memory."

13. Cholopets, V. I. (L'vov). "Optimization of Complex Stochastic Systems."

14. Pavlov, F. A. (Kiev). "Optimization of Control Systems Under Indeterminate Conditions."

15. Asmus, V. V., and Tishchenko, A. P. (Moscow). "Nonparametric Cluster Analysis Algorithm."

16. Pavlov, F. A. (Kiev). "Selection of Local Extremes of the Indicator of Quality of an Automated Control System."

17. Bondarchuk, Yu. V., and Pozdnyakov, Yu. M. (Kiev). "Interactive System for Planning Complex Systems for the Criterion of Reliability."

18. Ignatov, V. A., and Kas'yanov, V. A. (Kiev). "Axiomatic Theory of Problem-resource Control in Hierarchic Systems."

19. Nitsay, V. Ye., and Kurganskiy, O. A. (Kiev). "Planning Complex Systems With Consideration of Operating Requirements."

20. Gissovskiy, V. B., and Zhuk, P. A. (L'vov). "Imitation Model of Surface Runoff on an Elementary Area."

21. Zabrodskiy, V. A. (Khar'kov). "Questions of Organization of Adaptive Planning Systems."

22. Dubrov, Ya. A. (L'vov). "Production-qualitative Functions and Their Properties."

23. Pereyaslova, T. S. (L'vov). "Mathematical Simulation of Some Processes in the Manufacture of Kinescopes as Dynamic Multi-stage Systems."

24. Romanyuk, T. T. (L'vov). "On One Method of Designing Electron-Optical Systems."

25. Rutkas, A. G. (Khar'kov). "Linear Systems With Control Unsolved With Respect to Derivatives."

26. Rozhankovskiy, V. R. (L'vov). "Problems of the Transition From Automated to Automatic Planning."

27. Tretyak, P. R. (L'vov). "Some Problems in Investigating Rhythmics on the Example of Retroanalysis of the Dynamics of Natural Complexes of the High Carpathians."

28. Panasyuk, Ye. N., Okhrimenko, Yu. N., and Tret'yak, K. P. (L'vov). "On One Regressional Model of Cholinergic Mechanisms."

29. Gittik, Yu. L. (L'vov). "On One Conception of the System Analysis of Processes of Organization and Control."

Theoretical and System Programming

30. Vodop'yanov, V. Yu. (Khar'kov). "Automatic Models of Analytical Expressions."

31. Kostovskiy, V. A. (L'vov). "On the Properties of Effectively Open Sets Represented by Some Classes of Magazine Automata."

32. Red'ko, S. Ye. (Kiev). "Finite Automata on Recursive Closure of Finite Graphs."

33. Anisimov, A. V., and Gaibovets, N. N. (Kiev). "On Verification of Complex Systems for Processing Data Flows."

34. Kostyrko, V. S. (L'vov). "On the Construction of Inductive Proposals for Programs."

35. Kostovskiy, V. A., Dolinskaya, N. A., and Romanyuk, T. T. (L'vov). On One Approach to Analysis of the Looping of FORTRAN-Programs."

36. Zhogolev, Ye. A. (Moscow). "Syntactically Controlled Construction of Texts."

37. Kaufman, V. Sh. (Moscow). "Projection Approach to Transistor Creation."

38. Lebedeva, N. B. (Moscow). "Classification of Context Conditions in Programming Languages."

39. Aleksandrov, A. L. (Moscow). "Program Support of the FORTRAN Standard."

40. Bezrukov, N. N. (Kiev). Principles of Complication of the RYaOD Language."

41. Marchuk, A. G. (Novosibirsk). "On the Software of One Class of Specialized Processors."

42. Gavin, A. Z. (Riga). "Realization of Domains in a Relational System of Data Base Control."

43. Yarokh, A. I. (Khar'kov). "Means of Description of the Semantic Structure of a Data Base and Their Use in the Formation of Inquiries."

44. Korolevich, V. A. (L'vov). "Development of Service Means of Servicing Packages of Applied Probrams."

45. Raketskiy, V. M. (Minsk). "Package of Programs for Solving Problems of Quadratic Programming."

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THIRTEENTH UKRAINIAN SCHOOL-SEMINAR ON 'QUESTIONS OF COMPUTATION OPTIMIZATION'

Kiev KIBERNETIKA in Russian No 2, Mar-Apr 81 p 145

[Article by M. D. Babich and V. K. Zadiraka]

[Text] The 13th UkSSR school seminar on "Questions of Computation Optimization" was held on 20-21 October 1980 in the Institute of Cybernetics of the UkSSR Academy of Sciences. It was organized on the basis of three seminars of the Scientific Council of the UkSSR Academy of Sciences for the Problem "Cybernetics": "Automated Data Processing System Software and Packages of Applied Programs" (leaders: Academician V. M. Glushkov and Corresponding Member of the UkSSR Academy of Sciences I. V. Sergiyenko), "Theory of Optimum Solutions" (leaders: Academician of the UkSSR Academy of Sciences V. S. Mikhalevich and Doctor of Physical and Mathematical Sciences N. Z. Shor) and "Optimization of Computations" (leaders: Doctor of Physical and Mathematical Sciences V. V. Ivanov and Candidate of Physical and Mathematical Sciences V. K. Zadiraka).

The purpose of the school-seminar was to discuss questions of the optimization of computational algorithms and the creation on the basis of them of corresponding special software (libraries and packages of applied programs) for the solution of standard classes of tasks of computational and applied mathematics.

Participating in the work of the school were 50 representatives of a number of scientific research and educational institutions of the UkSSR: the Institute of Cybernetics, the Institute of Mathematics and the Institute of Electrodynamics (all of the UkSSR Academy of Sciences), Kiev and Odessa state universities, Kiev and L'vov polytechnic institutes, etc.

In his welcoming address Professor V. V. Ivanov turned attention toward the importance of investigations in the area of construction of qualitative and effective software for the solution of scientific, technical and national economic problems.

The working part of the school-seminar program began with the lecture of Academician of the UkSSR Academy of Sciences V. S. Mikhalevich and Doctor of Physical and Mathematical Sciences N. Z. Shor, in which important questions of the effectiveness of solution of problems of mathematical programming by contemporary methods were explained.

The lecture of Professor V. V. Ivanov was devoted to optimization of sets of basic questions and automation of the optimization of algorithms.

Candidates of Physical and Mathematical Sciences V. K. Zadiraka, P. I. Bodnarchuk, M. D. Babich and A. I. Berezovskiy, and also S. S. Mel'nikova, L. B. Shevchuk and G. N. Kotenkova presented reports dealing with some new results in the theory of Fourier integrals, applications of branching chain fractions and the solution of rigid systems of ordinary differential equations, the numerical realization of one algorithm for approximate solution of systems of nonlinear equations and characteristic properties of one class of parabolic splines and optimum algorithms for solution of special integral equations.

The development and prospects of development of packages of programs were illustrated on the example of the VEKTOR-2 package to solve problems of combinatory optimization in the lecture of Corresponding Member of the UkSSR Academy of Sciences and L. F. Gulyanitskiy.

Professor V. V. Ivanov, candidates of physical and mathematical sciences V. K. Zadiraka, A. I. Berezovskiy, M. D. Babich and P. N. Besarab, and also V. A. Lyudvichenko and L. D. Zdorenko examined questions of the quality of functional filling of a package of programs for the solution of some classes of problems of computational mathematics.

Systems of packages of applied programs and the interactive preparation of programs were discussed in the lecture of Corresponding Member of the UkSSR Academy of Sciences I. V. Sergiyenko and candidates of physical and mathematical sciences A. S. Stukalo and A. P. Mitropan.

Candidates of physical and mathematical sciences N. I. Tukalevskaya, A. Yu. Luchka, V. Yu. Kudrinskiy, V. Ye. Truten', P. N. Besarab and M. F. Beyko, and also V. A. Lyudvichenko and O. E. Noshchenko presented reports on the results of development of a number of specific packages of applied programs for the solution of linear integral equations, systems of linear algebraic equations and the numerical realization of dynamic models of V. M. Glushkov.

An essential difference of the present school-seminar from preceding ones was the fact that most of the presented investigations were reduced to program realization in the form of separate programs, libraries of programs and packages of programs.

The Institute of Cybernetics of the UkSSR Academy of Sciences prepared for the school-seminar a collection entitled "Optimization of Computations and Numerical Analysis," in which materials on the presented lectures were published.

At the concluding session note was made of the high level of the presented lectures and a resolution was adopted in which, in particular, it was pointed out that the goal of the school-seminar had been achieved and hopes were expressed regarding the organization and conducting of the 14th school-seminar in 1981.

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