CYBERNETICS, COMPUTERS AND
AUTOMATION TECHNOLOGY

4 OCTOBER 1979 (FOUO 2/79) 1 OF 1

JPRS L/8698

4 October 1979

USSR Report

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

(FOUO 2/79)

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

For further information on report content call (703) 351-2938 (economic); 3468 (political, sociological, military); 2726 (life sciences); 2725 (physical sciences).

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000100100007-2

JPRS L/8698

4 October 1979

USSR REPORT

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

(FOUO 2/79)

This serial publication contains articles, abstracts of articles and news items from USSR scientific and technical journals on the specific subjects reflected in the table of contents.

Photoduplications of foreign-language sources may be obtained from the Photoduplication Service, Library of Congress, Washington, D. C. 20540. Requests should provide adequate identification both as to the source and the individual article(s) desired.

CONTENTS PAGE

CONTENTS (Continued)

I. DEVELOPMENT AND PRODUCTION OF COMPUTERS AND CONTROL EQUIPMENT

A. Problem Areas

CONSTRUCTION OF ROOM INTERIORS FOR COMPUTERS

Moscow IZOBRETATEL' I RATSIONALIZATOR in Russian No 11, 1978 pp 45-47

[Article by A. Valentinov: "Computers on a Pea"]

[Text] The discovery had ripened. It remained only to confirm with dry mathematics the daring takeoff of scientific thought. Standing with the chest in front of the chief bookkeeper's cash box, they made room and urgently acquired the best computer: 1 million operations per second. They started the machine, entered the program and, without waiting for results, they sent the most fleet-footed Menes to the Goskomizobreteniy [State Committee for Inventions and Discoveries] to take his place in line for discoveries. Losing patience, the director of the institute darted to the computer, leaving his deputies behind, and in a run pressed the pink button so that the machine would issue the results of calculations.

But the computer does not yield them. It is silent like an inanimate object. It had either decided to take a holiday from work without a day of rest or it had simply become exhausted.

Following the director, all the deputies, including the deputy for cost accounting, pressed the button -- the machine even ignored him.

"I have a television set just like this at home," said one candidate of sciences. "Until you tap it with your finger, it won't budge."

They tapped with their finger and then with their fist, all in vain!

"And what if the machine itself decided to make an application for the discovery in its own name?" the deputy for cost accounting said in horror.

"Ah, so!" The director flew into a rage. "Get three of the very strongest and drag out a collection of our institute's works. We will show it."

The threat had an effect. The machine blinked its lights and printed out the tape with the results. They grabbed the tape and began to read, decoding in a chorus:

"Line two! First create an interior."

The scientists looked at each other and no one understood. What kind of interior was being talked about? Perhaps they had incorrectly deciphered it? They read from the end to the beginning -- the same result. They then looked in the instruction manual. And everything became clear: a modern computer is a delicate machine like the princess sitting on a pea. You have to place a downy featherbed for her, otherwise she will become exhausted!

Let us say, the floor should be double: a second floor, which is called a false floor, should be above the ordinary floor. The walls and ceiling should also be decorated in a special manner. This is what interior means! And the scientists read again in the instruction manual that they should appeal to TsNIIpromzdaniy [Central Scientific Research, Planning and Experimental Institute of Industrial Buildings and Structures] on problems of the interior.

They appealed to the organization. And there they received a cold shower.

"No one in the country yet does complete interiors. But we do have false floors for any taste. You can select either a steel or aluminum. The Experimental Machine Plant of the Mosgorispolkom produces steel floors, but the waiting time there is several years. We recommend a false floor of aluminum. The Riga Plant Metallist makes it simply. Naturally, from the customer's material. There is also a waiting period -- only 5 years. True, the plant produces sheets but you can cut and assemble them yourselves -- you have many scientists. Educated people will manage to cope. So then, go to it!"

The director did not wish to go to it -- this was beyond his profile. He came to the editorial board and begged: Rescue me! Find out what is going on on the computer front.

They began to make an analysis.

"Nothing special is going on," the chief engineer of planning of TsNIIpromzdaniy V. Markelov calmed him down. "You need interiors so we will have a try."

"And have you been trying long?"

"Yes about 10 years."

They made a check: everything is precise -- they have been trying for 10 years. Since the very moment when they obtained the building to develop a worthy interior for computers.

The saddened scientists took heart: a computer center had been equipped in one of the Moscow organizations -- a real treat. They went to look at it. The entire interior was of aluminum: both the false floor, the walls and ceiling. Whether you were in the cabin of a spacecraft or in a tin can -- it was quite modern!

"This is what we need!" the investigators from TsNIIpromzdaniy exclaimed and created their own interior, also from winged metal and also corresponding wholly to progress. When they made calculations (even without using a computer), it turned out that this toy would cost 196 rubles per square meter. The area of the computer center is approximately 300 meters. So the scales are as follows: no less than 10 tons of aluminum for 1 false floor -- more than for any aircraft!

It was easy to calculate without the help of the same computer what this enterprise would cost if there were more than 500 computer centers in the country.

"The more the better: we will not split hairs," they gestured at TsNIIpromzdaniy and sent a paper to Gosplan of the USSR: Allocate 20,000 tons of aluminum annually for interiors.

"And what about Gosplan? Did they like the finding!" they asked V. Markelov.

"They looked at us a bit strangely and thought about it some more."

"Well and what happened?"

"Finally, they thought -- this is our profession," the chief engineer of the project modestly cast down his eyes. "They developed another false floor from steel. For ages!"

There is only one strange thing: the interiors at the Institute of Atomic Energy imeni Kurchatov, at VDNKh [Exhibition of Achievements of the National Economy] of the USSR and at the L'vov Association Elektron are all of hardboard sheets and the computers have coped excellently with their duties!

"What about aluminum? What about steel?" I became excited at VDNKh and at the Institute imeni Kurchatova. "You cannot satisfy with your hardboard interior."

"We do make out with them," they told me. "The entire world has already rejected steel and aluminum for interiors."

"And which institute developed the interior for you?" I still could not make sense of it.

"No institute, but an individual inventor, engineer I. Khmel'nitskiy. He has author's certificate No. 468983 on his account (IR, No. 9, 1976)."

I did not hear my colleagues and rushed to TsNIIpromzdaniy: you have to stop and warn the scientists so that they do not rush into anything.

"Yes, we know about Khmel'nitskiy's invention, we have known about it long ago," V. Markelov pulled my heels. "Only we rejected a wood design: it is not modern."

"And you know more than the entire world?"

"More than the entire world. For some reason everyone rejected aluminum and converted to wood. But we will not reject it!"

No, stubborn people are not working at TsNIIpromzdaniy. They are goal-oriented. They do not wish to slide off the point of scientific and technical progress. Let the entire world do what it wants, but they consulted among themselves and decided to provide the country with a complete aluminum interior. Or steel.

And what do you think--they promise it! They set to work. The institute is already working out the technical assignment for construction of an experimental plant for complex equipping of computer centers. And there is the optimistic idea of constructing the plant by 1985. Not 20,000 tons of aluminum will then be required annually, but more: the plant has been expanded!

And as it turned out, I also have my own optimistic idea: let us begin to produce our aircraft from hardboard sheets. So that we can increase the stocks of aluminum for TsNIIpromzdaniy. Let the institute comrades go at it.

6521
CSO: 1863

B. Hardware

UDC 681.324:681.323-181.4.001.4

CONTROL COMPUTER COMPLEXES BASED ON ELEKTRONIKA-S5 MICROCOMPUTERS

Moscow ELEKTROTEKHNIKA in Russian No 4, 1979 pp 16-20 manuscript received 27 Oct 78

[Article by M. B. Stel!mashenko, engineer, and M. Ya. Tanayev, candidate in technical sciences]

[Text] A fundamentally new class of computers--microcomputers--has emerged owing to the vigorous growth of computer engineering and semiconductor electronics. Microcomputers are based on a small, but relatively universal ensemble of large-scale integrated (LSI) microcircuits, while at the same time preserving programming control. Programming control of the computation process in the equipment is exactly what makes possible converting to broad use of computers in industrial control installations. One hallmark of microcomputers and microprocessors is their high impression run and low costs: this breaks new ground for application in mass-level control systems with characteristics not inferior to minicomputer characteristics.

Microcomputers of the Elektronika-S5 series are the first microcomputers [1] in the USSR that have been brought up to full mass production. These are machines with p-channel technology, operating at 10,000 operations per second. Naturally, the low speed of these microcomputers is a deficiency of grave concern, narrowing the scope of application; but examining the list of tasks in industrial process control discloses that a large number of tasks can be handled with low-speed computers. Classed with this, quite "slow," industrial electrotechnical equipment is, in particular, electrothermal equipment: two computer complexes are being built to operate as part of their automatic control system.

The UVK-0 control computer complex is built on the base of a single-board Elektronika S5-11 (S5-12) microcomputer. This control computer complex has limited features and a small set of peripherals, since essentially it is a programmable controller. The second complex (UVK-1) has an expanded set of peripherals and is based on the mutiboard universal Elektronika S5-01 (S5-02) microcomputer and can be used for controlling quite complex processes. Corresponding to this first application of the UVK-0 is service in control systems for series electric furnaces (for example, ionic nitriding and induction

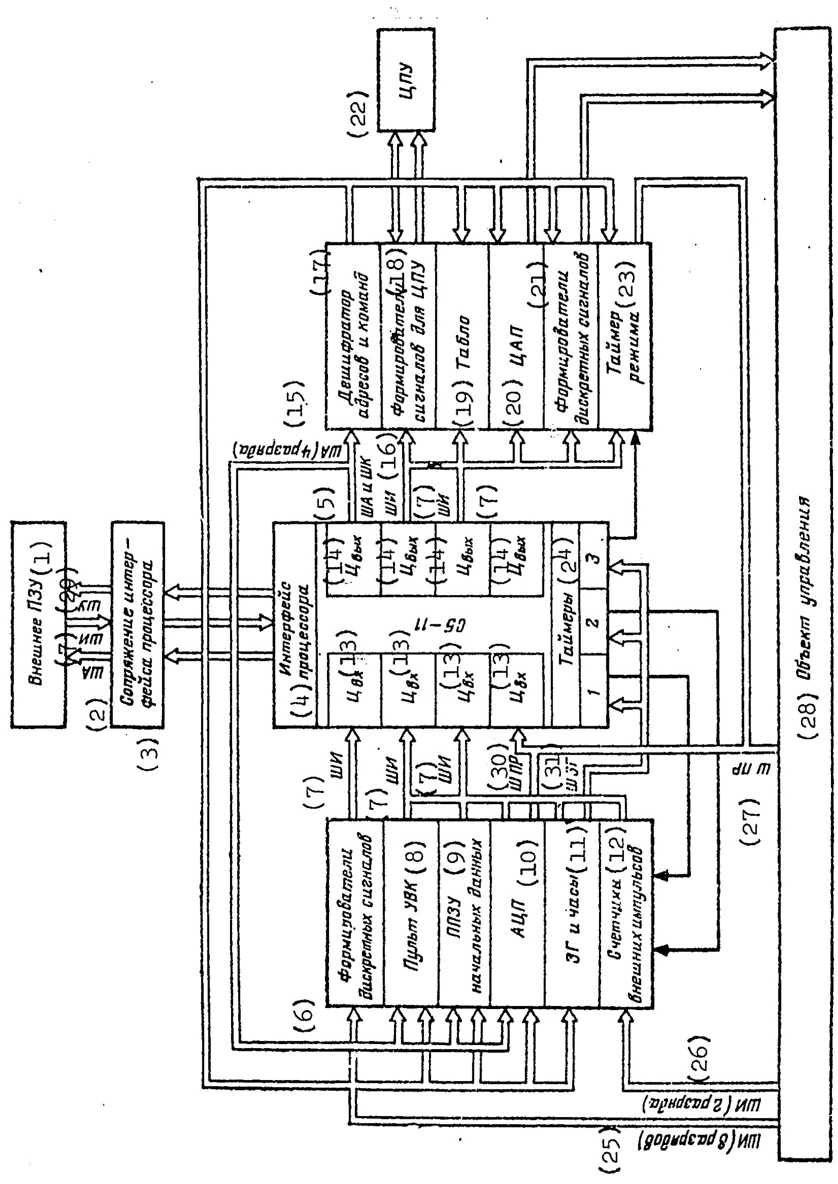


Fig. 1 Block diagram of UVK-0 control computer complex
[Key on the following page]

[Key to Figure 1 on preceding page]

1. External permanent storage
2. Address bus
3. Joining with processor interface
4. Processor interface
5. Address bus and command bus
6. Discrete signal shaper
7. Data bus
8. Console of control computer complex
9. Initial-data semipermanent storage
10. Analog-to-digital converter
11. Master oscillator and clock
12. External pulse scalers
13. Digital-input channel
14. Digital-output channel
15. Address bus (4 bits)
16. Address bus and command bus
17. Address and command decoder
18. Digital-storage-signal
19. Display
20. Digital-to-analog converter
21. Discrete-signal shapers
22. Digital storage
23. Mode timer
24. Timers
25. Data bus (8 bits)
26. Data bus (2 bits)
27. Interrupt bus
28. Controlled object

furnaces), but the UVK-1 will be used for controlling these complex and unique electrothermal intallations, such as electroslag remelting furnaces, vacuum-arc furnaces and so on. Naturally, the scope of application of the above-described computer complexes cannot be limited to electrothermy. These advantages of the UVK based on microcomputers and microprocessors--high reliability and small dimensions, low cost, high information content and simplicity of operation--provide the prerequisites for using the UVK in different sectors of the national economy. So this UVK-0 complex will be installed in control systems of automatic operators of coating galvanization lines and printed assembly board production lines; systems of automated climatic control in greenhouses and grain driers of agricultural projects will also be constructed based on the complex. A task has been posed of applying the UVK-0 as a local commutator as part of automated technical process management systems (ASUTP) of hot rolling stands. The scope of application of the UVK has reached also the mill: a data acquisition, observation and control system is being built for clinical operations; the UVK-0 will also be used as the main control, computing and recording unit. This listing is a graphic illustration of the range of uses for the UVK constructed on the basis of microcomputers.

For broader scope of application, in developing both complexes the aim was to make them standardized, suitable for service as part of automatic control systems of any purpose. To do this, in the complexes the parameters of input and output signals were standardized, as were structural members, circuits of a series of assemblies and so on. Electronic assemblies of complexes were constructed of series K155 microcircuits of a small or medium degree of integration, also using semiconductor numerical displays and light-emitting diodes, operational amplifiers and so on.

Software for complexes, in addition to the standard software supplied with the microcomputers (checking and microcommand system, test system, dispatcher system and autonomous input/output program), includes programs for interchanging information in the complex units, as well as the necessary test and debugging programs. Applied process control programs for specific projects are under development and are being debugged by computer complex users. Debugging of these programs is possible with modeling programs on general-purpose BESM-6 and Minsk-32 computers.

Functional capabilities of computer complexes UVK-0 and UVK-1. The control computer complexes UVK-0 and UVK-1 are intended for automatic control of parameters, represented by voltage, and for automatic management of technical processes. They perform the following:

successive interrogation and measurement of the voltage of analog-signal transducers

parallel interrogation of discrete-(binary)-signal transducers

program processing of interrogation results and the shaping of analog and discrete control actions on the actuating parts of the control system

automatic print-out with coupling to elapsed time for data on the readiness of the process installation for operation, unacceptable deviations of the monitored parameters, the presence of emergency situations, manual intervention by the operator and so on

automatic print-out and automatic presentation on a visual display, with coupling to elapsed time of data characterizing the performance of the process installation

reading of time integrals with given period

reading of number of pulses arriving from the process installation and comparison of the result with the set point.

The UVK-1 complex, in addition, can perform the following:

manual initiation of any of 15 process control routines during the carrying out of the main program

(1) Технические характеристики	(2) УВК-0	(3) УВК-1
Контролируемые аналоговые датчики: (4)		
количество (5)	15	15
частота опроса, каналов/с (6)	8	8
диапазон измерения, В (7)	−10...0...+10	−10...0...+10
погрешность измерения, % (8)	(9) Менее 0,4	(9) Менее 0,4
Контролируемые дискретные датчики: (10)		
количество (5)	8	24
вид датчика (11)	(12) „сухой контакт" либо источник тока 10 мА	
Гальванически развязанные выходные аналоговые управляющие сигналы: (13)		
количество сигналов (14)	4	8
диапазон напряжения, В (15)	0—10	0—10
Гальванически развязанные выходные дискретные управляющие сигналы (типа „сухой контакт"): (16)		
количество каналов (17)	16	16
мощность сигнала (18)	(19) 0,1 А при 220 В	
Цифровое табло отображения технологических параметров: (20)		
количество строк (21)	1	8
разрядность (22)	4	6
Емкость часов текущего времени, ч (23)	24	100
количество отображаемых разрядов	4	6
Количество каналов таймеров	1	4
диапазон отсчета (24)	(25) до 12 ч	до 59 мин (26)
Количество каналов счетчиков внешних импульсов (27)	2	4
емкость счетчика, импульсов (28)	2^8	2^{16}
Объем запоминающих устройств (29)		
постоянной памяти ЭВМ, байт (30)	2K	6K
оперативной памяти ЭВМ, байт (31)	256	8K
оперативной внешней памяти, байт (32)	Нет	20K
Количество внешних прерываний (33)	8	20
Наличие периферийных устройств (34)		
фотосчитыватель (35)	(38) Нет	R40B
перфоратор (36)	Нет	EP35
телеграфный аппарат (37)	Нет	РТА-6
Питание комплекса (39)		
напряжение сети, В (40)	220	380/220
потребляемая мощность, кВ·А (41)	0,3	1,2

[Key to Table is on the following page]

[Key to Table presented on preceding page]

1. Technical characteristics
2. UVK-0
3. UVK-1
4. Monitored analog transducers
5. number
6. Interrogation frequency, channels per second
7. range of measurement, volts
8. error of measurement, percent
9. Less than 0.4
10. Monitored discrete transducers
11. kind of transducer
12. "dry contact" or 10 mA current source
13. Galvanically decoupled output analog control signals
14. number of signals
15. voltage range, volts
16. Galvanically decoupled output discrete control signals (of the "dry contact" type)
17. number of channels
18. signal strength
19. 0.1 A at 220 V
20. Digital display panel of process parameters
21. number of lines
22. bit length
23. Capacity of elapsed-time clock, hours, number of bits represented
24. Number of timer channels, reading range
25. up to 12 hours
26. up to 59 minutes
27. Number of channels of external pulse scalers
28. scaler capacity, pulses
29. Capacity of storage units
30. permanent computer storage, bytes
31. internal computer storage, bytes
32. external immediate-access storage, bytes
33. Number of external interrupts
34. Inclusion of peripherals
35. photoreader
36. key punch
37. telegraph set
38. No
39. Power supply of complex
40. line voltage, volts
41. power consumption, kVA

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000100100007-2

printout on punched tape of any file of the program in the storage

updating of the course of the industrial process by inputting a directive manually by telegraph.

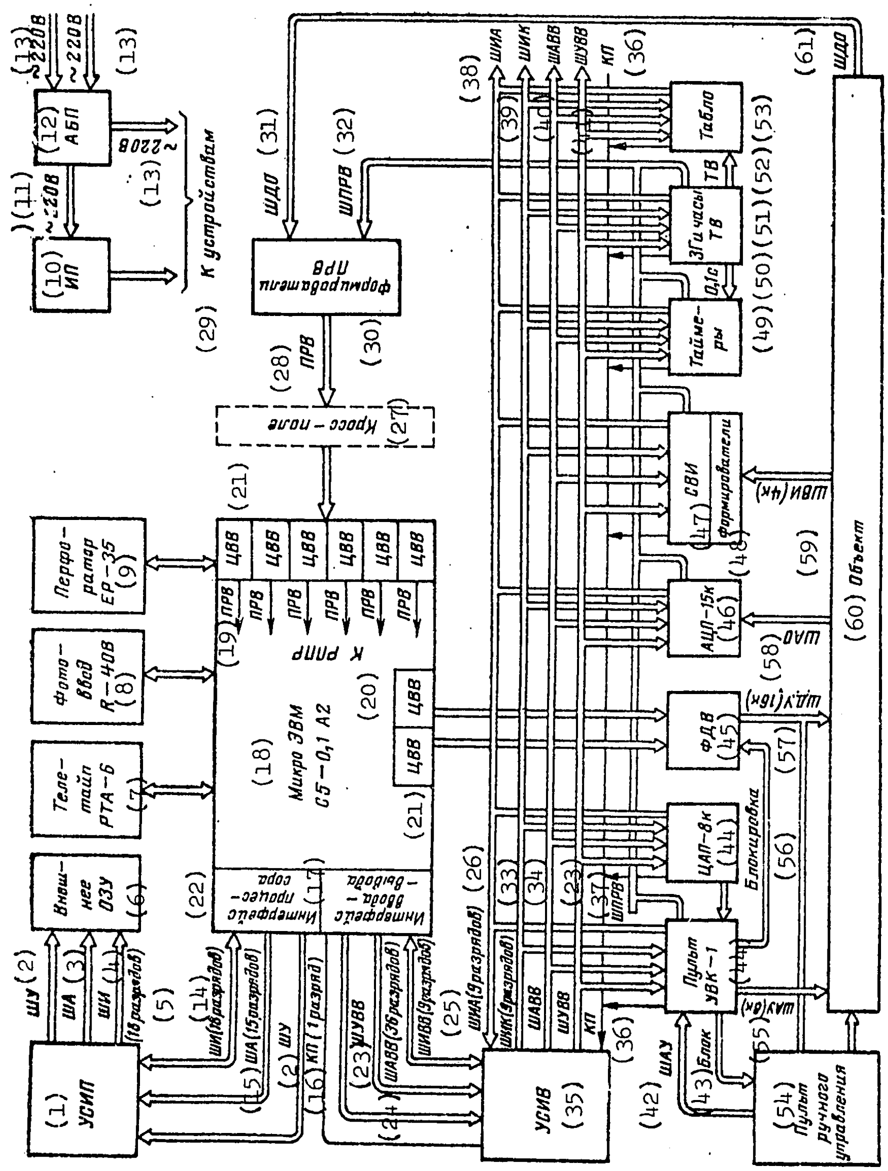
Comparative technical characteristics of the UVK-0 and UVK-1 are given in the table.

UVK-0 architecture and description. The UVK-0 complex is built on a model S5-11A microcomputer. Multichannel analog-to-digital and digital-to-analog converters (ATsP and TsAP), a semipermanent storage PPZU for input of initial data and other peripherals--shown in the block diagram (Fig. 1)--(except for the external permanent storage ZU) are connected to the microcomputer through digital input/output channels (Ts_{vkh} and Ts_{vykh}). The limited number of channels required building auxiliary address and command systems of peripherals with address buses ShA, data buses ShI and command buses ShK. Data are exchanged with the controlled object over the data buses ShI and the interrupt buses ShPR.

The possibility of connecting the external storage was realized directly through the processor interface with control buses ShU, data buses ShI and address buses ShA, using a special interfacer; the necessity of connecting the external storage (immediate-accessor semipermanent) inevitably occurs in the debugging of industrial process programs. Connection of the RTA-6 telegraph set is provided as a recording instrument. All the parts of the complex (except for the external storage and the RTA-6) are housed in a single 480x475x240 mm block, which can be built into standard control cabinets.

UVK-1 architecture and description. Basic to the complex is an S5-01 microcomputer, modification A4, with a teletype version of the dispatcher system and with the addition of a photoinput and key punch control board (Fig. 2). A 15-channel analog-to-digital converter ATsP-15K, an 8-channel digital-to-analog converter TsAP-8K, a master oscillator and an elapsed-time clock, an external pulse scaler SVI and other peripherals (in addition to discrete output drivers FDV) are connected to the microcomputer through an input/output interfacer USIV. With the USIV the potential levels and the time ratios of the components of the peripherals and the microcomputer are matched; interfacing is also carried out with a two-way data bus of the microcomputer with two one-way buses for the peripherals ShIA and ShIK.

At the base of organizing interchange with the microcomputer, just as with the S5-01 itself, is the bus principle with parallel connection of the peripherals. Included in the input/output interface is a one-byte data bus ShIVV, address buses ShAVV, control buses ShUVV, as well as one-bit reply bus KP. The external immediate-access storage VOZU, with a capacity of 10K 16-bit words, using a processor interfacer USIP is connected directly through the microcomputer processor interface with the buses ShU, ShA and ShI.



[Key to Figure is given on the following page]

[Key to Figure presented on the preceding page]

1. Input/output interfacer
2. Control bus
3. Address bus
4. Data Bus
5. (18 bits)
6. External immediate-access storage
7. RTA-6 teletype
8. R-40V photo-input
9. YeR-35 key punch
10. Power supply
11. Approximately 220 volts
12. Automatic power supply
13. Approximately 220 volts
14. Data bus (18 bits)
15. Address bus (15 bits)
16. Command device
17. Input/output interface
18. S5-0.1 A2 microcomputer
19. Input interrupt
20. To RPPR [expansion unknown]
21. Digital input/output
22. Processor interface
23. One-byte control bus
24. One-byte address bus
25. One-byte data bus
26. Address data bus
27. Cross-field
28. Input interrupt
29. To devices
30. Input interrupt drivers
31. Stepping-motor bus
32. Input interrupt bus
33. Command data bus
34. One-byte address bus
35. Input/output interface
36. One-bit reply bus
37. Input interrupt bus
38. Address data bus
39. Command data bus
40. One-byte address bus
41. One-byte control bus
42. Control address bus
43. Block
44. UVK-1 console
45. Discrete output driver
46. Analog-to-digital converter, 15K
47. External pulse scaler
48. Shapers
49. Timers
50. 0.1 second
51. Master oscillator and clock, output transformer
52. Output transformer
53. Display
54. Working control console
55. Control address bus (8k)
56. Interlocking
57. Control motor bus (16k)
58. Common address bus
59. Input data bus
60. Object
61. Stepping-motor bus

Interrupt drivers PRV, like FDV, are connected to the microcomputer through digital input/outputs TsVV. The interrupt system provides for the multi-programming mode of problem-solving. The number of priority levels is 5, with the option of constructing a queue of up to eight tasks at each level. Task-calling is done either by an external call signal over PRV buses, or by programming means.

The real-time mode is executed with an elapsed-time clock with a capacity of up to 100 h and also with four autonomous channels of timers with a maximum reading time of up to 59 min each. Supply of the complex with DC and AC voltages is organized from a secondary power source IP.

When the UVK-1 is used in conditions of power troughs and large (up to ±30 percent) instability of the industrial line current, it is possible for the complex to operate from an uninterrupted power supply (ABP) unit specifically constructed for this purpose, based on an SGV-2/1500 synchronous generator. In this case the ABP is powered from one of two independent feeds with power consumption up to 3 kVA.

The UVK-1 complex was built by design in the form of five standard blocks; they can be housed in a support, a special pedestal with the telegraph set and a Prepamat (YeS-9021) table, where the photoreader and the key punch are placed.

Complexes of the UVK-1 equipment developed and manufactured in 1977 underwent debugging and testing in 1978 [2]; at the same time the applied and test software programs were debugged in order to use the complex as part of the automatic control system (SAU) for electroslag remelting furnaces. At the close of 1978 one UVK-1 complex was installed and introduced into pilot-plant service in the SAU of a 40-ton electroslag remelting furnace at one of the machine building plants.

Already the first melts of steel conducted using the UVK-1 in the data mode strikingly demonstrated the advantages of the complex: operator labor was made easier through automation of computations; accuracy of measurements and calculations of process parameters was somewhat upgraded; major conveniences came to light for the operators, associated with the high information content and the vividness of representation of the operational information and with the accuracy and objectivity of recording the course of the industrial process.

BIBLIOGRAPHY

1. Gal'perin, M. P.; Zhulov, Ye. I.; Kuznetsov, V. Ya. et al "Family of Domestic Broad-Spectrum Microcomputers," UPRAVLYAYUSHCHIYE SISTEMY I MASHINY, No 6, 1976.

2. Vinogradov, L. S.; Medvedev, V. S.; and Stel'mashenko, M. B. "UVK-1 Control Computer Complex based on Elektronika S5-01 Microcomputers," Elektronnaya Promyshlennost', No 10 (70), 1978.

10123
CSO: 1863

C. Programming and Software

UDC 681.3.068

UNIFIED COMPUTER SYSTEM MICROPROCESSOR SOFTWARE DEBUGGING SYSTEM

Kiev KIBERNETIKA in Russian No 6, Nov/Dec 78 p 141

[Article by G. I. Korniyenko, Ya. I. Barsuk, Z. A. Pikh, A. N. Kolesnikov and A. L. Reyzin, submitted 4 May 78]

[Text] An effective means of reducing the cost and development time of microprocessor computing systems is the use of cross programming devices which use large and medium capacity all-purpose computers as an instrumental computer.

Cross devices are intended for design, simulation and debugging of systems and applied software programs, as well as for simulation and evaluation of algorithms during the development and operation microprocessor systems.

The broad equipment and programming possibilities of large all-purpose computers make it possible to design cross software using high level languages and utilize the powerful debugging means of these computers. This reduces the cost and raises the reliability of cross devices themselves as compared with resident devices designed using microprocessor systems.

This article deals with questions of designing cross packages and in particular, a description of debugging packages of the cross system for microprocessor complexes which use Unified Computer System computers as an instrumental machine.

The program debugging system assures the possibility of effective control of the debugging process and makes it possible for the developer to initiate program operation of a simulated system. The debugging process may be done in the interactive mode or in package mode where the entire debugging process is pre-planned by the developer. The following type instructions are included for effective use of the system.

STOP type instructions indicate those conditions of the simulation process where model operation ceases and a user-communication mode is established. In other words, these instructions sort of set "traps" permitting cut-off of the process under certain conditions.

TRACE type instructions describe conditions where in the simulation process operative information is put out on the state of certain system objects (registers, memory segments, I/O devices, etc.) without stopping model operation. The instructions thus make it possible to establish the state of elements of the microprocessor system during simulated operation of its programs.

LOOK type instructions make it possible to inspect various objects of the system model in a static state, i.e., after stopping model operation for one reason or another.

ESTABLISH type instructions permit the developer to alter certain objects of the model in a static state.

EXECUTE type instructions initialize simulation of execution of certain sections of the system program. Program simulation media are summoned at that time.

The types of instructions, depending on the features of the specific system and requirements of developers, including instructions which implement the following functions:

- load programming modules into interpretative memory;

- replace certain simulation and debugging modes;

- work with initial program's symbol array;

- put out debugged programs in form required for loading into a real system;

- media permitting recall of the state of the simulated system at an arbitrary moment with possiblity of subsequent recovery of this state (realization of control point apparatus).

For operational intervention in the simulation process using debugging systems, the external interruption device of the instrumental computer is utilized. This device makes it possible, if necessary, to stop the process of model operation at any instant and insert instructions required for further operation.

The simulation block includes programming devices for operation of microprocessors and peripheral devices and the debugging system is called forth when the appropriate user instructions are received.

The I/O simulation system, by using the model of the microprocessor interruption device, simulates information exchange between the microprocessor and peripheral devices. A subroutine which simulates its operation corresponds to each device.

The simulation programs of peripheral device operation may be written by the user and can describe the operation of devices having the most arbitrary characteristics.

The chief function of the statistics collection unit is to take into account the real time of execution of the debugged simulated program and its separate fragments.

Furthermore, variables are specified for storage of a quantity of encounters of specific instructions, access to various devices, etc. During operation of the debugged model of the system, the necessary statistics are collected; on that basis a conclusion is drawn on the quality of the instruction system, on device loading, on operating efficiency of software in a given configuration of the microprocessor system.

Fragments of a software debugging protocol for a microprocessor computer are cited which illustrate the possibilities of a cross media debugging system.

8617
CSO:1863

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000100100007-2

II. GENERAL INFORMATION

A. Conferences

THIRD INTERNATIONAL SUMMER SCHOOL ON THEORY OF PROBABILITIES AND MATHEMATICAL STATISTICS

Kiev KIBERNETIKA in Russian No 6, Nov/Dec 78 p 144

[Article by A. M. Zakharin]

[Text] The Third International Summer School on Theory of Probabilities and Mathematical Statistics was held from the 10th through the 20th of May, 1978 at the Creative House of the Bulgarian Academy of Sciences (Varna, Bulgaria): participants included mathematicians specializing in theoretical and applied probabilities from socialist countries.

The international schools in probability theory and mathematical statistics held by the Bulgarian Academy of Sciences are aimed at informing specialists from socialist countries in the fields of probability theory, mathematical statistics and their applied uses of the latest research fidings of their colleagues, and at developing scientific contacts between probability theoreticians and applied mathematicians. The Third School of 1978 consisted of 129 mathematician from nine socialist countries and three capitalist countries. The USSR Academy of Sciences delegation consisted of six persons.

Nine lecture cycles were given by noted mathematicians from Hungary, East Germany, Poland, Rumania, Czechoslovakia and the Soviet Union.

Professor M. Arato (Budapest) presented a series of problems and results concerning questions of optimum planning, design and operation of computing systems in a cycle of lectures entitled "Probability models in computing systems".

Lectures of professor R. Bartoszinski (Warsaw), "Stochastic models in biology" mainly dealt with an examination of dynamic probability models of the interaction of two populations, assuming a random change in their makeup.

The lecture topic of professor M. Iosifescu (Bucharest) was the latest achievements in the theory of addition of intermixed random quantities.

In the lectures of professor K. Mathes (Berlin), "Generalized Gibbs' distribution and similar problems of the theory of point processes", some questions were examined on the theory of Gibbsian distribution and theory of point processes as well as their application, primarily in the field of theoretical physics.

The investigation of robust (i.e., stable with small alterations of the model) statistical procedures was covered in a cycle of lectures of professor J. Jureckova (Prague) "Robust statistical derivations in linear regression models. Asymptotic behavior of linear rank statistics".

Four cycles of lectures were given by Soviet mathematicians.

In lectures of professor I. A. Ibragimov (Leningrad), "Some nonparametric problems of the theory of estimation", the main focus was on questions of asymptotic behavior of statistical estimates of an infinite number of parameters.

Academician V. S. Korolyuk of the UkSSR Academy of Sciences (Kiev) in lectures entitled "Resolvent of a uniform process with independent increments with intercept on the semiaxis" examined several interesting findings obtained by himself and his students for both theoretical and applied uses.

The cycle of lectures of professor V. V. Sazonov (Moscow), "Estimates of the rate of convergence in a central limiting theorem" dealt with the study of complex questions of classical theory of estimation of the rate of convergence in a central limiting theorem for the case of finite-dimensional spaces.

The head of the USSR Academy of Sciences' delegation, Academician V. A. Statulyavichyus (Vil'nyus) gave a cycle of lectures "On methods of investigating distributions of sums of dependent random quantities, multiple stochastic integrals and polylinear forms from random processes" in which were presented several results obtained by V. A. Statulyavichyus and his subordinates in this field of the Lithuanian school of probabilities.

An extremely successful and utile measure of the Third School was a poster session run by the organizational committee in which 37 mathematicians participated. The poster session was organized as follows: in a specially set aside area were hung the reports of all participants desiring so, with the time when the results could be discussed with the author. The poster session greatly activated the activities of most of the attendees of the Third School, making them active participants. This considerably expanded the framework of the school and established closer scientific contacts among its participants.

In addition to pre-planned measures, the organizational committee of the third School made it possible for the Program Committee of the 11th European Conference of Statisticians to set up several fruitful meetings from the 16th through the 18th of May. The conference is planned for September, 1979 in Varna.

The organizational committee of the Third School felt it was possible to permit members of the Program Committee of the 12th European Conference of Statisticians to give hour-long reports. Professor A. Smith (England), chairman of the Program Committee, gave a report entitled "Sequential classification in the event of uncontrolled instruction". Reports were also read by professor P. Hensler (West Germany), "Selected questions of the theory of empirical processes" and Z. Sidak (Czechoslovakia), "Stable procedures of ordering and selection".

The lecturs and numerous scientific conversations permitted participants of the Third School in the theory of probabilities and mathematical statistics to obtain a grat deal of useful information on the state of the art.

The Third International Summer School on the theory of probabilities and mathematical statistics was wonderfully organized; consequently, the atmosphere was business-like and exceptionally friendly. This fact makes it possible to give the highest evaluation to the activities of the organizational committee of the Third School, headed by professor A. Obretenov, the famous scholar.

8617
CSO:1863

THEORY OF RAPID LINEAR DISCRETE TRANSFORMATIONS: SEMINAR SCHOOL IN KIEV

Kiev KIBERNETIKA in Russian No 6, Nov/Dec 78 pp 145-147

[Article by V. K. Zadiraka]

[Text] Since 1965 many studies dealing with the theory of rapid linear discrete transformations have appeared both here and abroad. These studies are aimed at reducing (by an order) the number of computational losses and rounding error estimations in the computation of discrete transformations, to permit factorization of transformation matrices. The number of operations is reduced from N^2 to $N\log_2 N$ (by $N/\log_2 N$ times), where N is the dimension of input information. This fact generated much interest among specialists in the theory of rapid lienar discrete transformations and the incorporation of the corresponding algorithms and programs in solving a wide range of problems: spectral and correlational analysis of random processes; digital simulation of filters, analysis of seismograms, analysis and synthesis of speech signals, processing of two-dimensional images, simulation of optical systems and synthetic holograms, solution of boundary problems for partial derivative equations, numerical integration, etc.

In view of the urgency of these themes for familization of a wide range of specialists with the latest achievements in the field of research and accelerated incorporation of research findings in the national economy, as well as to coordinate research, the UkSSR Academy of Sciences in collaboration with the Republican House of Economic and Scientific and Technical Propaganda conducted a seminar school in Kiev from the 16th through the 19th of May, 1978 entitled "Theory of rapid linear discrete transformations", the first such school on these topics in the USSR.

The seminar was oriented toward scientific coworkers of computing centers, scientific research institutions and instructors of educational institutions.

Representatives of 35 scientific research and educational institutions of our country took part in its work. Among these were the following: Institute of Cybernetics of the UkSSR Academy of Sciences, Lvov branch of the Institute of Mathematics of the UkSSR Academy of Sciences, Institute of Problems of Materials Technology of the UkSSR Academy of Sciences, Institute of Electrodynamics of the USSR Academy of Sciences, Moscow Institute of Electronic and Computer Technology, Moscow Institute of

Engineers of Civil Aviation, Institute of Electronics and Computer Technology of the Latvian Academy of Sciences, Institute of Oceanology of the USSR Academy of Sciences, Moscow, Kiev, Belorussian, Lvov State Universities and others.

A total of 100 persons participated in the seminar. These included the following: one corresponding member, three doctors of sciences, 28 candidates of sciences; others: scientific coworkers, instructors of educational institutions and engineers.

Leading specialists of the country in the field of theory of linear discrete transformations and their applications were invited to give courses. The basic work of the seminar consisted in giving lectures with subsequent discussion and talks by participants on the pertinent topics.

By the start of the seminar, a collection "Theory of rapid linear discrete transformations" (Izd. Znaniye, Kiev, 1978) had been prepared; it covered questions in general theory, algorithms and programs, use of rapid linear discrete transformations, and specialized computer devices. The collection contains lecture summaries.

Attention was focused on questions of effectiveness of proposed algorithms and programs, and construction of optimum speed algorithms for computing discrete transformations.

The welcoming speech to participants of the seminar was given by V. K. Zadiraka, senior scientific coworker. He emphasized the urgency of the seminar, the import of its themes; he defined its basic tendency and the direct relationship to enhancing the quality and effectiveness of solving national economic problems.

The working portion of the program of the seminar was begun with a series of lectures by professor V. V. Ivanov, in which he touched upon elements of general theory of optimum computer algorithms and gave a detailed examination of optimum speed computing algorithms.

Lectures of V. M. Amerbayev, corresponding member of the Kazakh SSR Academy of Sciences, were entitled "Some questions of Fourier calculus"; they covered the structure of rapid Fourier transformation in a chain of residues in terms of a constituent modulus, organization of high-speed computations based on methods of Fourier calculus and the use of rapid Fourier transformation for numerical transformation of the Laplace transform via a Laguerre series and Neumann series in terms of Bessel functions.

The possible acceleration of matrix and vector operations was covered in talks by professor Z. L. Rabinovich and senior research coworker V. A. Vyshinskiy. The proposed method is based on the representation of matrix and vector operands as actual numbers. This employs the device of associative and commutative hypercomplex numbers.

The lecture series of V. K. Zadiraka, senior scientific coworker, was devoted to the construction of optimum accuracy quadrature formula of calculating integrals from rapidly fluctuating functions of varying degrees of smoothness, optimum comparative analysis and optimization of rapid Fourier transformation programs, and economic algorithms of calculating an estimate of the autocorrelation function of an ergodic stationary random process by the sectionalizing method. Attention was focused on questions of constructing optimum (accuracy and/or speed) algorithms and comparison of the corresponding programs with domestic and foreign analogues known to the author on such characteristics as accuracy, memory and time.

A. A. Skripiy gave a talk about optimum speed algorithms for calculating complex derivatives and estimates beneath the volume of computational losses.

Grid systems, which are discrete cluster-type dynamic systems assigned in a finite number were covered in the report of T. E. Krenkel'. This spectral approach to the detection of states of the grid system is based on the theory of linear algebras of finite rank and permits a linkage of the concept of shift, cluster, system of basic functions and their corresponding rapid linear discrete transformation.

In the speech of L. L. Boyko, "Rapid orthogonal transformations from the viewpoint of theory of groups", algorithms of "fast" orthogonal transformations of the rapid Fourier transformation type and Khaar type were considered from a theoretical and group point of view. It was shown that the basis for the existence of "rapid" algorithms is the presence of a "long" compositional series in some finite commutative group.

Professor A. V. Yefimov spoke of the multiplicative Fourier integral and its quantization, on computation and application of discrete multiplicative transformations. In particular, he noted the use of discrete multiplicative transformations for problems of information compression and their economy.

New requirements for algorithms and programs to solve problems of computational mathematics were covered in a speech by M. D. Babich, senior scientific coworker. He particularly noted that programs contained in libraries should be reliable and stable in operations, computer-independent, portable and should have evaluative modules and underlying description.

Docent V. A. Morozov spoke on the subroutine package--"Analysis and synthesis of series. Rapid transformations"--and about several applications of rapid Fourier transformations in computational mathematics. Information was given on algorithms and programs developed at the Laboratory of Numerical Analysis of the Computer Center Science Institute of Moscow University dealing with rapid Fourier transformation and BPU contained in the Library of Numerical Analysis of the Computer Center Science Institute; comparative characteristics of speed and memory of algorithms were cited. The following applications of rapid Fourier transformation were presented: for analytic presentation of discrete data, solution of some antenna problems, integral Fredholm equations of the first type with nucleus from the different of arguments and problems of wave physics. The results of numerical experiments were cited.

S. S. Vasilenko's lecture concerned a library of computational and evaluative modules for rapid Fourier transformation which has been developed in the Division of Theory of Computations of the Institute of Cybernetics of the UkSSR Academy of Sciences which is based on the use of modification of the rapid Fourier transform algorithm: it employs a special preliminary preparation of required transform matrix elements. The distinctive feature of this library is the optimization of algorithms in terms of the number of operations and the presence of evaluative modules which estimate error of the proposed algorithms, memory and computer realization time.

Three program libraries--computation of discrete Fourier transforms, estimates of correlation functions and spectral densities of stationary random processes and solution of the problem of detecting covert cycles--developed at the Institute of Cybernetics of the UkSSR Academy of Sciences were discussed by N. P. Novitskaya.

L. M. Soroko, candidate in physico mathematical sciences, gave an overview of work on modern algorithms of pseudo-conversion of linear transforms and also presented the rapid algorithms of Viner and Carnoonen and Loewy.

The use of rapid transforms in problems of computation of bilinear forms was discussed in the report of O. M. Makarov, candidate in technical sciences. The author examined various algorithms of accelerated computation of cyclical and acyclical clusters, multiplication of polyvalent numbers, polynomials, matrices using algorithms of rapid Fourier transformation and Adamar transformation. Estimates under the complexity of computation of bilinear forms are cited.

L. P. Yaroslavskiy, candidate in technical sciences, talked about displaced discrete Fourier transforms and their application.

The logic construction of sensing a two-dimensional data bank using a two-dimensional system of Khaar functions grouped in pairs was discussed in a lecture by G. D. Tolstykh, candidate of technical sciences.

A. I. Derevyanko, candidate in physico mathematical sciences, devoted his talk to the use of a definition of a dyad derivative for simulation of systems possessing invariance to dyad displacement. In proposed algorithms, the speed of the realization program is increased by eliminating procedures of binary inversion and Grey's code.

In talks given by Yu. F. Koval', P. M. Siverskiy, S. O. Derum and V. I. Sumkin, candidates in technical sciences, "On one special processor of rapid Fourier transforms," the subject concerned one version of a rapid Fourier transform processor in which the following computation procedures are presented:

- forward and reverse discrete Fourier transformation (DFT);
- multiplication of time realization by "data window;"
- division of DFT coefficients with simultaneous processing two actual signals;
- squaring of DFT coefficients.

In this processor, speed in the computational mode is defined by the access time in main storage with input and output of results of intermediate computations. Computations are performed in parallel on four multipliers and adder/subtracters. Computation time of 1024 complex DFT coefficients is under 50 m/sec.

Specialized processor of the rapid Walsh transform were discussed in the speech given by V. V. Losev, candidate in technical sciences, A. A. Bud'ko and V. D. Dvornikov. The authors gave an overview of the basic methods of constructing specialized BPU (rapid Walsh transform) processors and spoke of the classes of BPU special processors and the structure of processors of these classes.

The lecture of V. V. Losev, candidate in technical sciences, was devoted to the use of rapid transformations for decoding correction codes, which are intended for detection and correction of errors occurring in the transmission between various objects. The most effective (from the viewpoint of minimized probability of error) method of decoding a code is the method of the maximum likelihood. The process of computation is accelerated by factoring the transform matrix. Various possibilities of factoring were discussed.

The use of rapid algorithms for detecting polynomial representation of functions over finite fields was discussed by A. K. Frolov, Yu. A. Galis and V. A. Pashchenko. The authors investigated a polynomial approximation of function of n variables, defined and using values in some finite Galois field. Coefficients of the polynomial are defined by the corresponding forward transformation; it is computed with the aid of rapid algorithms similar to those of Kuli-Taki and Good for DFT. This method is applicable in synthesis of combinatory schemes of bivalent and polyvalent logic.

The program of the seminar envisaged speeches by participants and discussions on these talks. Reports were given by T. E. Krenkel', S. P. Ushakov, A. V. Zelenkov. Taking part in the discussions were V. A. Morozov, S. B. Vaysman, V. V. Losev, V. K. Zadiraka, etc.

Original studies and results were widely discussed during the seminar and personal contacts were formed. Young scientists were able to become familiar with the latest achievements in the theory of rapid linear discrete transformations, to find out some new theoretical problems and possible trends in their research.

In summing up the work of the seminar, it can be noted that it was conducted on a high scientific level, and was useful and interesting.

A resolution was adopted at the final session of the seminar:

1. An expansion of the front of studies in theory of rapid linear discrete transformations and their application to the solution of various classes of problems, the creation of program packages and specialized processors is now being observed.

2. The series of lectures given at the seminar were meaningful and scientifically profound. They will surely promote the expansion of studies in the country to develop and improve methods and algorithms for solving many classes of problems on computer and enhancement of quality and effectiveness of the corresponding computations.

3. The chief goal of the seminar was to study questions of accuracy and effectiveness of proposed algorithms, construction of optimum speed algorithms for computation of discrete transformations--we may consider that this was achieved.

4. In considering the urgency of topics of the seminar, it should be considered advisable to have other seminars on the theory of rapid linear discrete transformations: the second seminar on these topics will be held in 1980.

5. The organizing committee of the Second Seminar and School should receive the recommendation to attract specialists from large scientific centers of the country as lecturers.

6. If it is possible during the seminar schools, a concourse of programs of rapid conversions should be organized after the algorithm language and computer are established.

7. It is advisable to organize a division on rapid linear discrete transformations in the Republic Bank of Algorithms and Programs (Special Design Bureau of the Institute of Cybernetics, UkSSR Academy of Sciences).

8. The program of seminar schools should have more time for speeches by participants and discussions.

9. Gratitude should be expressed to the Order of Lenin Institute of Cybernetics of the Ukrainian Academy of Sciences and the organizing committee of the seminar school for its organization and conduct.

8617
CSO: 1863

THIRD ALL-UNION CONFERENCE ON OPERATIONS RESEARCH

Kiev KIBERNETIKA in Russian No 6, Nov/Dec 78 p 147

[Article by the Organizing Committee]

[Text] From the 24th through the 28th of May, 1978 in Gor'kiy was held the Third All-Union Conference of Operations Research; it was combined with the Fourth Conference on the Theory of Games. The conference was organized by the USSR Ministry of Higher and Middle Education, USSR Academy of Sciences, Gor'kiy State University imeni Lobachevskiy and the USSR Academy of Sciences' Computer Center. The organizing committee, headed by N. N. Moiseyev, corresponding member of the USSR Academy of Sciences, included noted Soviet scientists. Leading specialists from Moscow, Leningrad, Kiev, Novosibirsk, Gor'kiy and other science centers of the country participated in the conference (a total of about 250 participants). N. N. Moiseyev, corresponding member of the USSR Academy of Sciences, gave a welcoming speech on the state of the art and developmental trends of operations research in his function as chairman of the organizing committee.

The work of the conference was divided into five sections.

1. Models and methods of operations research in planning problems.

2. Models and methods of operations research in problems of control of industrial and economic systems.

3. Models of decision making.

4. Methods of optimization.

5. Theory of games.

At joint sessions of sections on basic trends of operations research, the following lectures were given.

A. B. Kurzhanskiy (Sverdlovsk): "Control and evaluation of parameters of dynamic systems under conditions of indefinability".

A. V. Sergiyevskiy (Gor'kiy) "On studies of the Scientific Research Institute of PMK [expansion unknown] on models and methods of decision making."

D. I. Batishchev (Gor'kiy): "Dialogue optimization".

O. N. Bondareva (Leningrad): "Development of theoretical and game methods of optimization in cooperative games and their application to multicriterial problems".

V. A. Gorelik, F. I. Yereshko, A. F. Kononenko and N. N. Moiseyev (Moscow): "Information theory of hierarchical systems".

Yu. M. Yermol'yev, V. S. Mikhalevich, B. N. Pshenichnyy and N. Z. Shor (Kiev): "Problems of minimization of nondifferentiated functions".

R. G. Strongin (Gor'kiy): "Construction of algorithms for numerical solution of multiextremum problems".

V. F. Dem'yanov and V. K. Shomesova (Leningrad): "Conditional subdifferentials of convex functions and their application".

A. A. Korbut, I. Kh. Sigal and Yu. Yu. Finkel'shteyn (Leningrad, Moscow): "On the effectiveness of combinatorial methods in discrete programming".

The Kiev school of optimization, in addition to the plenary report, presented the following reports: "Decomposition in problems of structural planning of complex systems in terms of reliability" (Volkovich, V.L., Voloshin, A.F. and Pozdnyakov, Yu. M., Institute of Cybernetics, Ukrainian Academy of Sciences, Kiev State University; "Some optimization problems of organization of container shipments in maritime transportation" (Krivets, T.A., Institute of Cybernetics, Ukrainian Academy of Sciences); "Automated models of research and optimization of complex systems" (Kostina, N.I., Institute of Cybernetics, Ukrainian Academy of Sciences); "Some modifications of sequential algorithms of optimization" (Zak, Yu. A., Ukrainian Scientific Research Institute TsBP)*; "On direct methods of stochastic programming with constant spacing" (Yermol'yev, Yu. M. and Kaniovskiy, Yu. M., Institute of Cybernetics, Ukrainian Academy of Sciences); "Conditions of optimacy in stochastic programming and their applications" (Yastremskiy, A. I. and Golovko, V.I., Kiev State University); "On asymptotic behavior of some methods of stochastic programming" (Knopov, P.S. and Kaniovskiy, Yu. M., Institute of Cybernetics, Ukrainian Academy of Sciences); Dialogue means for solving some classes of extremal problems" (Raspopov, V. B., Institute of Cybernetics, Ukrainian Academy of Sciences); "Global similarity of the method of linearization for one problem of convex programming" (Panin, V.M., Institute of Cybernetics, Ukrainian Academy of Sciences); "Retrieval of extremal strategies in one general conflict situation with non-contradictory interests" (Beyko, I.V. and Yasinskiy, V.V., Ukrainian Academy of Sciences Institute of Mathematics); "On runaway conditions in a nonlinear differential game: (Chikriy, A.A., Institute of Cybernetics, Ukrainian Academy of Sciences) and others.

*Expansion unknown. Possibly "Central Weather Bureau"]

In conclusion a general discussion was conducted, during which a series of questions on theory and practice of operations research was discussed. During the conference an exchange of work experience, ideas and views on key problems of operations research, theory of optimum control in differential games took place; this surely facilitates further intensive development of these important trends of modern applied mathematics.

8617
CSO: 1863

UDC /061.3:/801:62//(478.9)

ENGINEERING LINGUISTICS -- INTROSPECTION AND PERSPECTIVE

Moscow NAUCHNO-TEKHNICHESKAYA INFORMATSIYA, SERIYA 2, INFORMATSIONNYYE PROTSESSY I SISTEMY in Russian No 5, 1979 pp 9, 29-30

[Article by Kh. A. Arzikulov and R. Yu. Kobrin]

[Text] The Second All-Union Conference "Automation Processing of Text by Applied Linguistic Methods," organized by the Ministry of Higher and Secondary Specialized Education of the USSR, the Ministry of National Education of the Moldavian SSR and the Kishinev Polytechnical Institute imeni S. Lazo, was held in Kishinev in the fall of 1977. Methodological problems of engineering linguistics, the linguistic aspects of artificial intelligence and robot technology were discussed at the conference. A great deal of attention was devoted to development and realization of machine translation algorithms, linguistic support of ASU [automated management system] and IPS [Information retrieval system], problems of man-machine dialogue, thesaurus referencing of scientific-technical texts on computers and problems of engineering-statistical linguodidactics.

More than 200 linguists, mathematicians and specialists in the field of computer technology from 86 VUZ's, scientific research institutes and design institutions of Moscow, Kishinev, Leningrad, Kiev, Alma-Ata, Minsk, Gor'kiy, Samarkand and other cities of our country participated in the work of the conference.

R. G. Piotrovskiy's report (Leningrad) "Automatic Processing of Text: Theory, Experiment and Introduction," was heard at the first plenary session, in which it was emphasized that the fundamental theoretical problems of engineering linguistics at its modern stage consists in working out the theory of reproducing engineering-linguistic models capable of reproducing linguistic objects or simplified analogs of them on the computer.

D. A. Pospelov's plenary session report (Moscow) "Semiotic Models and Dialogue Systems," in which the main creative problems solved in man-machine systems were considered, evoked great interest.

Important questions of the relationship of information languages (IYa) and natural language (YeYa) were analyzed in G. G. Belonogov's report (Moscow) "Methods of Providing Compatibility of Information Languages."

V. I. Perebeynos (Kiev) emphasized that solving the paradox of the openness of natural language and the closed nature of information languages should rest on construction of a baseline language which includes a minimum of those language devices which are necessary and sufficient to describe the given subject area with a given degree of accuracy. This language can be developed only on the basis of terminological analysis of texts and a system of concepts of the given subject area.

Theoretical and practical problems of developing machine translation systems were actively discussed at the conference. The direct relationship of machine translation problems and problems of terminological analysis were pointed out in V. N. Gerasimov and Yu. N. Marchuk's report (Moscow, All-Union Translations Center) "The Terminological Service of Translations and Automatic Information Processing." Reports devoted to machine translation may conditionally be divided into two groups: 1) reports in which general theoretical and problem areas of machine translation were considered--the report of V. V. Goncharenko et al "The Systems Approach to Solving Machine Translation Problems;" A. I. Chapli and G. S. Osipov's report (Makhachkala) "On the Problem of Formal Recognition of the Meaning of a Text;" the report of N. M. Ivanova (Leningrad) et al "The General Structure of Syntactic Analysis and Synthesis in the Machine Translation Algorithm;" and 2) reports containing a description of specific machine translation algorithms--the report of K. B. Bektayev (Chimkent), L. N. Belyayeva (Leningrad), V. S. Krisevich (Minsk) et al "The Experience of Realizing Industrial Machine Translation of English Texts to the Russian Language," the report of S. M. Shevchenko (Moscow) et al "Word by Word Machine Translation of Japanese Chemical Texts into Russian," the report of B. D. Tikhomirov (Moscow) et al "Program Realization of Interediting in Machine Translation Systems," and also the reports and communications of L. I. Belotserkovskaya (Alma-Ata), A. V. Zubov (Minsk), Ye. M. Luk'yanova (Leningrad), I. V. Mikhaylova (Irkutsk) and others.

P. M. Alekseyev and V. Bychkov (Leningrad), R. Yu. Kobrin (Gor'kiy) and others reported about statistical-distributive methods of text analysis.

Reports devoted to thesaurus referencing of scientific-technical texts and to the theoretical prospects for development of man-machine dialogue systems (Z. F. Marashlets and A. N. Popeskul--Kishinev; Ye. V. Vertel'--Minsk; Ye. M. Leonova,D. L. Spivak and Ye. A. Shingarev--Leningrad; E. V. Zinov'yev and A. A. Maslak--Riga; and Kh. A. Arzikulov--Samarkand) evoked great interest.

M. F. Tolstopyatova's report (Moscow) "Semantic Means of Translation from Natural Language to Explication Language," in which the structure of metalanguages based on algorithms for semantic text analysis not realizable on a computer (such metalanguages are being developed at MGU [Moscow State University] under the supervision of B. Yu. Gorodetskiy) was related, evoked discussion.

The reports of A. S. Chistovich (Khabarovsk), B. A. Avdeyev and V. V. Borodin (Gor'kiy) and others were devoted to linguistic support of ASU and IPS.

A discussion on problems of linguodidactics showed that it does not adequately utilize mathematical and engineering-statistical methods in optimization of language teaching.

This exchange of opinions between linguists, mathematicians, logicians and cyberneticists, according to general opinion, contributed to an increase of the effectiveness in developing industrial machine translation systems, automatic annotation and referencing systems, linguistic support of ASU and IPS and also stimulated investigations of the linguistic aspects of artificial intelligence.

The range of new problems requiring analysis and discussion was determined at the Kishinev conference. These are primarily the bank method of presenting linguistic data, making linguistic support of dialogue systems more specific, making the "frame" concept more specific and attempts to utilize this concept to interpret the meaning of text and also the principal capabilities of natural language "understanding systems." These problems require detailed discussion since it is difficult to count on development of industrial machine translation algorithms, man-machine dialogue systems and also specific advances in the field of robot technology and construction of artificial intelligence systems without solving them.

These problems were supposed to be discussed at the school-seminar on applied and engineering linguistics held from 3 through 14 July 1978 at the Dagestan State University imeni V. I. Lenin. The school-seminar was organized by Minvuz [Ministry of Higher Educational Institutions] of the RSFSR, DGU imeni V. I. Lenin jointly with the All-Union Translations Center of GKNT [State Committee for Science and Technology] of the USSR and the All-Union "Speech Statistics" Group; more than 80 linguists, mathematicians, engineering-programmers and psychologists from higher educational institutions, institutes of the USSR Academy of Sciences and republic academies and other organizations of the country participated in the school.

The work of the school-seminar was carried out at two plenary sessions and at 20 sectional meetings within the framework of 8 topical sections:

general problems of applied and engineering linguistics, programming of linguistic problems, automatic dictionaries and grammatical analysis of text, linguostatistics and optimization of foreign language teaching, industrial machine translation, thesaurus representation of semantic information, dialogue systems and the frame method of interpreting the meaning of text and linguistic support of ASU and IPS.

Four working seminars functioned within the framework of the school:

-- "The Bank Method of Presenting Linguistic Data,"

-- "The Algebra of Ratios,"

-- "The Statistical-Probability Structure of Text,"

-- "Machine Translation of French Patent Texts."

The report of R. G. Piotrovskiy (Leningrad) and A. I. Chapli (Makhachkala) "Linguistic Automatons and Engineering Linguistics" was heard at the first plenary session. It was noted in the report that engineering linguistics is concerned with the construction of those models which, being realized on the computer, are capable of generating real linguistic objects. The fundamental task of modern engineering linguistics is to develop linguistic automatons.

The plenary report of D. A. Pospelov and L. F. Pospelova (Moscow) "Time and Space in Artificial Intelligence Systems and in Language," in which the main ideas of organizing the space-time concept in linguistic automatons were outlined, evoked special interest of the school-seminar participants.

Development of machine translation systems, including working out its theory, experimental check of the theory and introduction of results into practice, is one of the most timely problems of engineering and applied linguistics. The lively discussion of engineering-linguistic and sociological problems of mass machine translation indicates the elevated interest in this important cybernetics, engineering-linguistics and general linguistics problem, which has been under development in our country for more than 20 years. The history of the development of machine translation in our country, the current state of the art and prospects were briefly outlined in the plenary report of Yu. N. Marchuk (Moscow) "Machine Translation Based on Translation Conformity." Specifically, the reporter noted that during the initial period of work on machine translation within the framework of studying the similarity and differences of intellectual and machine translation, the hypothesis was made that translation can be divided into purely translation and interpretation. It is paradoxical, but interpretation emerged to the forefront during development of investigations on machine translation, while translation according to translation conformities was of little interest to specialists. Moreover, it is probable that the solution to the problem of constructing operating machine translation systems can be found in the very method of translation modelling in the natural sense of the word. An example of the practical approach to the problem of machine translation was the first USSR industrial machine translation system of English and Japanese texts, prepared by the "Speech Statistics" Group, which is operating at the Chimkent Pedagogical Institute of the LGPI [Leningrad State Pedagogical Institute] imeni A. I. Gertsen. The technology of industrial machine translation was illuminated, its results were demonstrated and problems of improving the algorithms were posed in the reports of representatives of the Chimkent group, headed by K. B. Bektayev and P. V. Sadchikova. The section reports of T. A. Apollonskaya, L. N. Belyayeva, Z. G. Manukov et al were devoted to compilation of automatic dictionaries and grammatical analysis algorithms for machine translation in material of different languages.

The reports of S. M. Shevchenko (Moscow) "The Use of Context in Interpretation of Japanese Written Characters" and of T. N. Koroleva (Leningrad) "Representation of Japanese Texts on Carriers and Experimental-Industrial Machine Translation," in which the different approaches to representation of the idiographic writing on machine carriers were related, evoked a lively discussion.

High quality of translation cannot be achieved without actualizing the values of lexical units and without removing morphological-syntactic and syntactic-semantic ambiguity. These problems were considered in the reports of V. N. Bilan (Minsk), V. V. Kolesnikova and Yu. I. Gorbunov (Makhachkala), M. I. Vasil'yeva and M. Yu. Popova (Leningrad) and others.

Some capabilities of theoretical developments in these fields and some completely unexpected relationships of engineering linguistics were shown during discussion of the general problems of engineering and applied linguistics. Thus, the need to develop automated retrieval systems for Buddhist texts, specifically, the engineering problem of "cleaning up" the texts written in ideographs and syllabic writing, was justified in the report of A. N. Kondratov (Leningrad) "Engineering Linguistics and Buddhology."

Problems of mathematical support of different linguistic problems solved on computers of the unified series were subjected to especially detailed discussion. The reports of A. V. Zubov (Minsk), Ye. M. Luk'yanova (Leningrad), Ye. V. Vertel' and G. L. Gorlin (Minsk), D. M. Skitnevskiy, L. G. Obukhova and A. G. Obukhov (Irkutsk), O. G. Abakarov and G. S. Osipov (Makhachkala) and others were devoted to this problem.

Linguistic support of ASU and IPS of different types was the topic of the reports of A. A. Piotrovskaya (Leningrad) "The Indexer of Russian Titles in the AIPS [Automated information retrieval system] 'Petrochemistry'," N. Yu. Rusova et al (Gor'kiy) "Linguistic Support of ASNTI [Automated systems for scientific and technical information] of the Construction Materials Industry"," L. P. Kolusheva and F. I. Rybakov (Moscow) "Organization of the Main Means of Communication in ASU" and others.

The mathematical model of the thesaurus semantic system designed in the "Speech Statistics" Group on material of different languages was considered in the report of Ye. K. Kozlova (Leningrad) et al "Combining Thesauri." One of the varieties of reproducing engineering-linguistics models (VILM) -- thesaurus annotation of a scientific-technical document, which utilizes the thesaurus semantic system, was described in the report of Kh. A. Arzikulov and Zh. Kh. Arzikulova (Samarkand) "What is a VILM?" Information language based on the thesaurus semantic system was the topic of Ye. A. Shingareva's report "Artificial Languages of Object-Subject Type and a Quasi-Referencing Dialogue System."

V. M. Bryabrin (Moscow) in a report "Processing Natural Language in the DILOS System" considered the DILOS system, which consists of linguistic, information-retrieval, computer and logic processors and is based on the frame idea.

The reports of I. V. Mikhailova (Irkutsk), F. I. Rybakov, Ye. A. Rudnev and V. A. Grigor'yev (Moscow) and Ye. M. Leonova and R. D. Kozhamberdina (Leningrad) were devoted to the theoretical prospects for development of "man-machine" dialogue systems operating on the basis of natural language.

Problems of constructing reproducing engineering-linguistic models (VILM), related to solution of a number of complex problems of a general methodological nature, were subjected to detailed discussion. Thus, the question arises -- on the basis of what principles should a VILM be constructed? Should one rely on the linguist's introspection and then derive from it by deduction one or another formalized linguistic scheme or should one proceed from the information which can be extracted from real texts? P. M. Alekseyev, Yu. K. Orlov, R. Ya. Chitashvili, T. G. Gagechiladze, K. T. Mikaladze, T. P. Tsilosani (Tbilisi), Yu. G. Novikova (Krasnoyarsk), B. Ya. Slepak (Kirovograd) and others came out in favor of the second approach, related to the statistical-distributive method of extracting the required information from text. The plenary report of R. Yu. Kobrin (Gor'kiy) "The Statistical Distribution of Term Models," in which the hypothesis significant to construction of the VILM was advanced, according to which term models, unlike the terms themselves, have normal distribution, was devoted to this approach. D. A. Pospelov, who gave a talk in discussing the reports, noted that mathematicians and engineering-programmers are beginning to understand the entire complexity of natural language, and, therefore, the participation of linguistic specialists in development of information systems in absolutely necessary.

Interaction between engineering lingustics and linguodidactics, during which objective methods of selecting language material for optimization of natural language teaching are being worked out, has recently been manifested more appreciably. Problems of engineering-statistical linguodidactics were considered in the reports of Associate Professor Kh. G. Azayev, S. G. Chapli, V. A. Yegorova, A. A. Zamanskiy, N. P. Abramova (Makhachkala) and others.

A number of fundamental features which occur during mathematical modelling of a system and normal natural language and also during construction of machine algorithms and text-forming programs was determined as a result of discussion at the school-seminar. A method of algorithmization of linguistic problems, relying on network models, methods of information-statistical modelling of text and the thesaurus method of interpreting the meaning of text, was formulated. Attention was turned in some reports to facts of terminological ambiguity arising upon introduction of the "frame" concept. It was noted that the method which utilizes the frame concept largely repeats the facet analysis methods and also different methods of constructing so-called "positional" grammars. It was emphasized that the first domestic experimental automated systems having linguistic support for working in the dialogue mode (the DILOS system realized at the VTs [Computer Center] of the USSR Academy of Sciences, the TAND and "Otvet" systems constructed at the Tishinev, Minsk, Leningrad and Samarkand collectives of the "Speech Statistics" Group) have now been developed. Special attention was devoted in the decision of the school-seminar to the need to expand investigations in the field of engineering linguistics, linguistics for robots and development of programs which realize grammatical processes. In summarizing the results, the school-seminar in applied and engineering linguistics noted that the main task of the seminar, consisting in exchange of scientific ideas and methodical experience and also in coordination of efforts in the field of engineering linguistics, was fulfilled. The model organization of the school-seminar was also noted.

6521
CSO: 1863

B. Publications

SCIENTIFIC AND TECHNOLOGICAL FORECASTING

Kiev NAUCHNO-TEKHNICHESKOYE PROGNOZIROVANIYE I YEGO INFORMATSIONNOYE OBESPECHENIYE (OPYT ORGANIZATSII) [Scientific and Technological Forecasting and Its Provision for Information (Experience in Organization)] in Russian 1978 signed to press 6 Apr 78 pp 2, 110-118, 121, and 127

[Annotation, table of contents, Section 3 of Chapter 3 and Appendix 2 from book by Larisa Georgiyevna Khromchenko and Ernst L'vovich Lortikyan, "Vishcha shkola," 3,000 copies, 127 pages]

[Text] The monograph is devoted to the question of scientific-technological and socio-economic forecasting in the system of socialist planning and administration and represents an attempt at a concentrated account of the main achievements in the area of forecasting in general and scientific and technological forecasting in particular. In it, experience in the organizing of forecasting in the USSR and abroad is generalized, the first experience in the preparation of forecasts in our country is investigated, and particularly in the Ukraine in the years in which the Soviet planned economy was being established, and various views on forecasting advanced in contemporary published works are evaluated.

A special place is given to examination of the information means of scientific and technological forecasting, the sources used in the preparation of forecasts by various methods are characterized, a procedure is given for analyzing the structure of information flows and the role of the information and patent services in the forecasting of technological progress by information means is shown.

The monograph is intended for students and graduate students of VUZ's who are studying problems of scientific and technological information and forecasting, and also for specialists of the national economy.

Contents

Chapter III, Section 3

The role and importance of information in the system "forecasting-planning-administration" are indisputable. The use of the latest scientific and technological achievements in the national economy is regarded not only as one of the main economic tasks but also as a very important political task.

An important condition of the solution of that task is improvement of the scientific and technological information system in the country. The attention of the party and government to these questions is constant.

In the CPSU Program adopted by the 22nd Party Congress it was noted that the party will contribute in every way possible to an exemplary organization of scientific and technological information and the study and distribution of soviet and foreign advanced experience [5, p 127].

In the last 10-15 years in our country a unified state scientific and technological information system [obshchegosudarstvennaya sistema nauchno-tekhnicheskoy informatsii--GSNTI] has been created for the first time in the world. Today a staff of over 150,000 is working in that system. Its makeup is determined by all-union, sector and intersector information organs and the information services of enterprises and organizations. Scientific and technical libraries and technical offices at individual enterprises and houses of technology should also be classed as information organs.

The division of functions among organs of scientific and technological information in our country is based on distinctive features of the processing of data flows. All scientific information sources published periodically or once (books, journals, patents, standards, reports on scientific research and experimental design work) and technological and technical information on practical experience in industry, construction and transport and other branches of the national economy are divided into two independent information flows. One of them, obtained by centralized processing of the world scientific and technological literature and the results of Soviet scientific research work, has been called descending. All-union and sector centers and intersector organs of scientific and technological information participate in the creation of that flow and the dissemination of its results.

The second flow is formed by unpublished documents in which are reflected the results of scientific research and experimental design work, technological experience, rationalizers' suggestions, created and arriving, as a rule, from lower scientific and technological information organs. This flow has been called ascending. The documents of this flow, as a rule, have a service character. When they arrive at the central sector organs from the lower cells they are synthesized and published in the information organ of the given branch.

Starting from the principal division of flows of information sources the activity between separate GSNTI links has been coordinated.

Directly connected with the VNTITsentr is the activity of the All-Union Scientific-Research Institute of Intersector Information [Vsesoyuznyy nauchnoissledovatel'skiy institut mezhotraslevoy informatsii--VIMI], created somewhat later, which, like the VNTITsentr, is engaged in the collection and processing of information on advanced scientific, technological and production experience of an intersector character.

The All-Union Scientific Research Institute of Information, Classification and Coding does much work on information in the areas of standardization, metrology and measuring equipment. The institute publishes indices of state standards and specifications and thematic bibliographic surveys of the foreign literature on questions of standardization, metrology, classification and coding.

The all-union center of information about soviet and foreign inventions is the Central Scientific Research Institute of Patent Information [Tsentral'nyy nauchno-issledovatel'skiy institut patentnoy informatsii--TsNIIPI]. It investigates the technological and economic effectiveness of Soviet and foreign discoveries and inventions, completely processes patent collections and spreads information about production and technological achievements reflected in authors' certificates and patents.

The TsNIIPI publishes and distributes specifications for authors' certificates for Soviet inventions, translations into Russian of a number of foreign periodicals on foreign patents and information about foreign patents currently arriving and summaries of patent specifications. The All-Union Patent and Technical Library, on the base of which the TsNIIPI works, provides bibliographic information on patent publications and makes photocopies of patent specifications and distributes them at the request of users*.

One of the oldest organizations engaged in providing scientific and technical information is the All-Union Book House [Vsesoyuznaya knizhnaya palata--VKP]. The VKP issues publications of current bibliographic information and summary bibliographic reference works. Its most important publications are: "Knizhnaya letopis" [Book Chronicle], "Letopis' periodicheskikh izdaniy [Chronicle of Periodical Publications], "Letopis' zhurnalnykh statey" [Chronicle of Journal Articles], etc.

The Institute of Scientific Information on the Social Sciences [Institut nauchnoy informatsii po obshchestvennym naukam--INION] collects, generalizes and analyzes scientific information on the social sciences. The main ascending information flows are provided by the publication of abstract journals, express-information, scientific and analytical surveys of individual problems

*The "Patent" Polygraphic Production Enterprise also makes copies of patent documents upon request.

and the results of development of the social sciences, bibliographic bulletins and retrospective bibliographic indices.

The State Public Scientific and Technical Library [Gosudarstvennaya publichnaya nauchno-tekhnicheskaya biblioteka--GPNTB] is the leading multibranch library in industry. It has the country's largest collection of scientific and technical literature and documentation, including foreign and domestic industrial catalogs, a unique collection of literature published by ministries and departments in small printings, and algorithms and programs for electronic computers.

The GPNTB publishes the bibliographic index "Novosti tekhnicheskoy literatury" [News of the Technical Literature], indices of translations of technical literature, a catalog of bibliographic indices for technology, compiled by USSR Libraries, indices of foreign periodicals issued by organizations of the country, etc.

In accordance with the program for the further intensification and improvement of collaboration and the development of the socialist economic integration of CEMA-member countries, an International Center of Scientific and Technical Information [Mezhdunarodnyy tsentr nauchnoy i tekhnicheskoy informatsii--MTsNTI] has been created in Moscow and publishes abstract collections for all branches of science and technology that are published in separate branch series in Russian. In those collections information is given about completed discoveries of scientific research work and dissertations defended in the socialist CEMA-member countries*.

An important place is occupied in the organization of the descending flow of informational documents by sector and interbranch centers.

The main task of sector information centers is the processing and preparation of information about achievements of enterprises, scientific research and planning organizations. For that purpose they make a direct connection with all organizations of the sector and provide centralized publication of informational materials and the collection and systematization of unified reference information collections.

The sector information centers publish bibliographic, abstract and survey information on the most important questions of the branch.

A number of circumstances brought about the creation of the intersector centers. A considerable number of industrial enterprises that are subordinate to ministries of republics and kray and oblast councils are in practice not serviced by the sector centers. In addition, the efficient obtaining of informational materials by those organizations is made difficult by distance. In a number of cases information must be prepared in national languages.

*Except work done in the USSR, as information about that work is published in publications of the VNTITsentr and VIMI.

Intersector organs of scientific and technological information are institutes of scientific and technological information of the republics and the territorial NTI centers of the autonomous republics, krays and oblasts.

Institutes of the republics organize reference information collections with consideration of distinctive features of the economic development of the republic, conduct technical and economic investigations of problems of great importance to the development of the national economy of the republic and issue informational publications. Translations of materials published by the branch centers are issued in the national languages. Materials of scientific councils, republic scientific and technological conferences, meetings and seminars and separate surveys on problems of the leading organs of the republic are published in Russian.

The intersector territorial centers perform functions similar to those of the republic institutes of information, but the scales of their work and their publishing activity are more limited.

Each year the all-union, central, sector and intersector NTI organs publish over 140,000 publisher's sheets of informational publications reflecting in various forms data on all the information sources which can and must be used in scientific and technological forecasting.

An important role in the organization of the use of those materials by researchers is played by lower organs of scientific and technological information--divisions of scientific research institutes or planning organizations and technological information bureaus of enterprises. They participate in the planning and organization of investigations and developments, providing them with the documental information needed for scientific and technological progress. That work can be done by:

-- analysis and generalization on the basis of study of information flows (periodicals, patents and company publications) in order to determine trends in the development of science and technology and the inclusion of the most promising and urgent themes in the plans of organizations;

-- the accumulation of scientific information about the main directions of the activity of an organization in the process of creating reference information collections*;

-- the discovery of ways new in principle to solve problems arising on the borders of adjacent disciplines, and sometimes between disciplines very far from one another;

*The aggregate of primary and all secondary documents on a selected problem.

-- the coordination of scientific investigations and developments;

-- the establishment of business and creative relations between organizations and enterprises related in profile and themes;

-- retrieval, processing and transmission of required scientific and technological information.

In connection with the broad expansion of work on forecasting and the improvement of planning and administration of the national economy the State Committee for Science and Technology under the USSR Council of Ministers and the USSR Gosplan in February 1972 adopted a special resolution determining the procedure in the presentation by organs of scientific and technological information to planning organs, ministries, departments and managers of enterprises and organizations of informational materials on the most important Soviet achievements in the areas of science, technology and production and their consideration and use. In accordance with that resolution, information organs of all units are obliged, on the basis of the processing, analysis and generalization of arriving information, to compile reports reflecting the data on the most important achievements in the areas of science and technology which must be taken into account in the preparation and examination of plans.

Of all-union centers those obligations were entrusted to the VNTITsensor, VINITI, VNIIKI and TsNIIPI, and also to all sector, territorial and lower NTI organs.

In that connection the information organs of the main sector scientific research institutes have greater responsibility for the organization of work connected with the establishment of forecast information.

As is known, work on forecasting, embracing different areas of creative and production activity, is done on different levels. Thus, the managing and planning organs of ministries require forecasts of the development of their sector as a whole and its principal areas. If forecasting on the whole for the sector can be accomplished by the technical administration jointly with the sector institute of information, then the preparation of forecasts on individual directions as a whole is entrusted to the sector scientific research institutes. Hence the task of each institute is to determine the prospectiveness of created technology, designate on the basis of formed trends the main directions of development and consider and analyze thoroughly the most important competing areas of technology.

The management of an institute needs forecasts on each thematic direction in preparing thematic plans of scientific research work. The leaders of thematic directions require forecasts characterizing the prospectiveness of the articles being developed and knowledge of the trends in investigations of the thematic direction.

The solution of these tasks will depend to a considerable degree on the organizational of scientific information work as a whole, and especially survey analytical work.

The participation of information organs in the preparation of forecast information requires the introduction into survey analytical work of statistical methods of information analysis, which assures it great purposefulness. An analysis of the scientific and technical achievements according to literature sources is acquiring great importance. In those sources one can often find a direct indication of the development of new promising directions or changes in scientific and productive orientation.

A large place is also occupied by analysis and generalization of materials of scientific and technological conferences, meetings and symposiums where specialists in the course of exchange of experience often express judgments about the prospectiveness of a given problem. Of special value are conferences conducted on the international level, and also in countries where a given problem has received very great development.

Until recently information organs were limited only to the extraction from those materials of the most interesting solutions from the point of view of their own institutes. Today those materials must be thoroughly studied, especially for the purpose of discovering new ideas and trends in the development of the given area of science or technology. The accumulation, systematization of that material and its comparison with the data of statistical analysis serve as the basis for the preparation of documents for management by the information division.

The preparation and publication of survey analytical materials created by information organs jointly with eminent scientists and specialists is becoming one of the most important forms of scientific information activity. Thanks to it, especially when the principle of continuity is observed in the preparation of such materials, information divisions must prepare with sufficient objectivity materials on trends and paths of development of the corresponding area of science, technology and production.

Observation of that principle, and also the continuous character of the work of an information division on the discovery of trends in the development of science and technology permit recording and evaluating any changes in the scientific and productive orientation of a given area. It is important to objectively shed light on the actual situation; to a considerable degree this results from the fact that in the information analysis conducted by an NTI organ, side by side with published material factual data also are used that reflect the dynamics of investigations and production in the area under investigation.

The work of NTI organs on scientific and technological forecasting does not propose final decisions on trends in the development of science, technology or production. Its task is to discover in time the systems of varying or formed trends and extract and systematize the statements of specialists. The final estimate of the results of analysis and conclusions are made by scientific forecasters, investigators and management.

The reference information collections form the basis of qualitative discovery of forecasting information by NTI organs. A unified system of reference information collections has been created in the country one which permits obtaining complete information on any question of interest.

In scientific research and planning institutes various subdivisions can be a part of the reference information collections: technical files, standardization divisions, patent subdivision collections, etc.

In that case not only the completeness of the collections of primary and secondary documents but also the system of organization of retrieval of necessary information is very important. In accordance with the latter, at the present time the development of mechanized and automated information retrieval systems of a documental, and especially of a factographic character, is acquiring great urgency [56].

In addition, the organization of work on finding forecasting information by NTI organs requires no special reorganization. A need arises only to reinforce with qualified personnel the subdivisions engaged in the analysis and generalization of information, and the style of activity and approach to work with information sources changes.

At the present time an engineer curator in examining the literature is limited, as a rule, only to making clear the correspondence of the information source to the subject under investigation. A general concept of the content of the material is sufficient for that.

Intensified working of the material, assuming the extraction from the source of factual data, the stated points of view of specialists, etc, is necessary in the selection of forecasting information. It becomes necessary to study the economic information. It was no accident that in 1967 the NTI divisions of the leading scientific research institutes began to be called NTI divisions also of technical and economic investigations*.

Many information services and patent organs in our country and abroad, along with the performance of traditional functions in providing current information about scientific research work and special design work, to some degree participate in work on forecasting.

*In the same year the supplement "technical and economic investigations" was introduced into the names of branch and republic institutes of information.

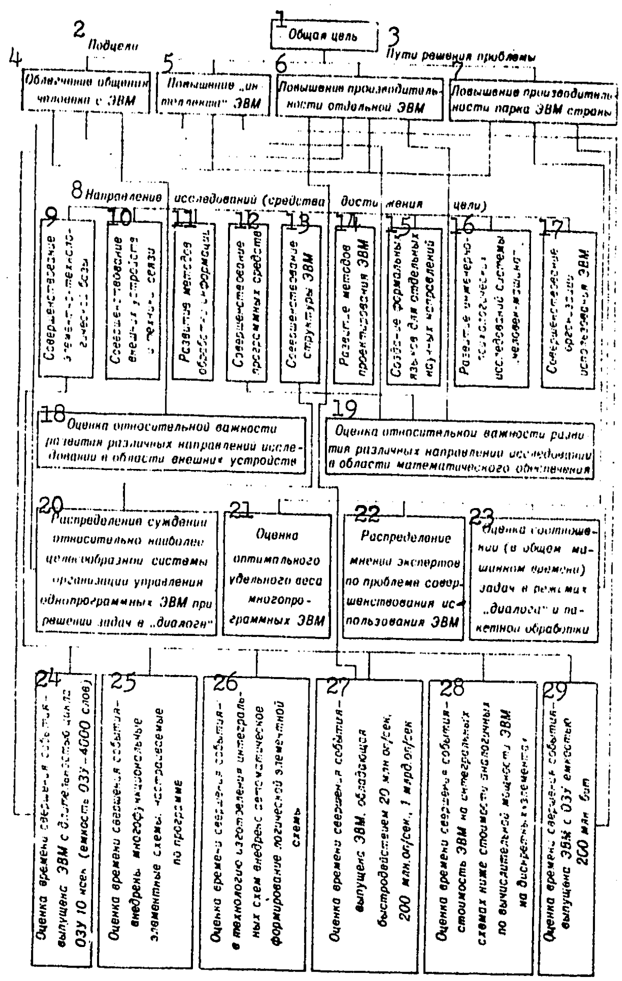
The entrustment to the information and patent services of functions connected with the forecasting of the development of science, technology and production stimulates a creative attitude of their specialists toward work with information sources, increases purposefulness and specificity in the organization of retrieval of necessary materials and assures the participation of those subdivisions in one of the most important processes in the organization of science and production.

The degree of participation of information organs is increasing still more in connection with the creation of automated forecasting systems. In accordance with the plans of such systems that are being prepared [69, pp 165-166] it is proposed that prepared sector forecasts, after being approved in the glavk, be sent to the corresponding sector information institutes. There the forecasts are unitized, supplemented with new information and directed to the sector computer centers, where the forecast models are stored. Those models are corrected on the basis of new information and in unitized form arrive at the ministry for final approval.

After approval by the ministry they are directed to the appropriate glavks, institutes and enterprises. At the same time those models will be sent to the VNTITsentr, where they will be combined with the forecast models of other branches. Then they can be directed to directive and planning organs through the State Committee for Science and Technology under the USSR Council of Ministers.

The successful implementation of these plans even now requires from information organs high-quality functioning of the system of reference information collections and the development of effective means of information retrieval.

Appendix 2 Structural multilevel diagram of the construction of tables of expert estimation of the prospects of development of computer technology



Key: 1 -- General goal
2 -- Subgoal
3 -- Ways to solve a problem
4 -- Facilitation of man-computer communication
5 -- Increase of the electronic computer's "intellect"
6 -- Increase of the capacity of an individual electronic computer
7 -- Increase of the capacity of the country's electronic computer pool

8 -- Directions of investigations (means of attaining the goal)
9 -- Improvement of the element-technological base
10 -- Improvement of peripherals and communication technology
11 -- Development of data processing methods
12 -- Improvement of programming means
13 -- Improvement of the electronic computer structure
14 -- Development of methods of planning electronic computers
15 -- Creation of formal languages for separate scientific directions
16 -- Development of engineering psychological investigations of the system "man-machine"
17 -- Improvement of the organization of use of electronic computers
18 -- Estimate of the relative importance of the development of different directions of investigations in the area of peripherals
19 -- Estimate of the relative importance of the development of different directions of investigations in the area of software
20 -- Distribution of statements regarding the most advisable system of organization of the control of single-program electronic computers in solving problems in a "dialog"
21 -- Estimate of the optimum proportion of multi-program electronic computers
22 -- Distribution of expert opinions on the problem of improving the use of electronic computers
23 -- Estimate of the correlation (in total machine time) of problems in "dialog" and bath processing regimes
24 -- Estimate of the time required for completion of an event--production of an electronic computer with a cycle length of the main storage of 10 nanoseconds (main storage capacity--4,000 words)
25 -- Estimate of the time required for completion of an event--multifunctional element circuits adjusted to a program were introduced
26 -- Estimate of the time required for completion of an event--automatic formation of a logical elemental circuit was introduced into integrated circuit manufacturing technology
27 -- Estimate of the time required for completion of an event--production of an electronic computer having a speed of 20 million operations per second, 200 million operations per second and 1 billion operations per second
28 -- Estimate of the time required for completion of an event--cost of integrated circuit electronic computers below the cost of discrete-element electronic computers with a similar capacity
29 -- Estimate of the time required for completion of an event--production of electronic computers with a main storage capacity of 200 million bits

2174
CSO: 1870

COMPUTER RELIABILITY AND CHECKING

Moscow NADEZHNOST' I KONTROL' EVM (Computer Reliability and Checking) in Russian 1978 signed to press 25 Apr 78 pp 2-4, 415-416

[Annotation, foreward and table of contents from book by Yuliy Pavlovich Zhuravlev, Leonid Arkad'yevich Kotelyuk and Nikolay Ivanovich Tsiklinskiy, Izdatel'stvo Sovetskoye Radio, 9,000 copies, 416 pages]

[Text] Methods of calculating the indices of computer reliability based on probability theory and the theory of semimarkov processes are outlined. The general principles of organizing apparatus and program checking of computer functioning are considered. Analyses of the effect of various methods of checking on indicators of reliability, productivity and complexity of computer equipment are presented. Some aspects of the problem of systems planning of single- and multiprocessor computer reliability are outlined and problems of information security in the memory of technical systems and during transmission over communications lines are discussed.

The book is intended for engineering-technical and scientific personnel and also for instructors and students of technical VUZ's.

Foreword

Electronic computers (EVM) are finding ever greater application with each year in all spheres of activity. They are used in computer centers, automated management systems (ASU), information retrieval systems (IPS) and so on: therefore, increased requirements on ensuring reliable functioning and high dependability of the results of problems solved by computers are placed on them.

Various types of mathematical apparatus, each of which is adapted for analyzing computer dependability with specific assumptions and limitations, are now utilized to calculate the reliability of complex systems to which computers are related. Correct selection of the method and the initial assumptions permits one to increase the dependability of the results.

The methods of checking calculations and the correctness of functioning used have a significant effect on the indicators of computer reliability and especially on the dependability of the results issued by them. Each of the methods affects in its own way the indices of computer efficiency. Combined use of various methods of checking in many cases makes it possible to achieve a compromise between expenditures for the monitoring system on the one hand and expenditures for computer productivity and the dependability of results on the other hand.

Knowing how to correctly analyze the effect of one or another monitoring system on the dependability of the results of solving problems by a computer, to select the corresponding method and to calculate its indices of reliability is especially required of computer systems developers. At the stage of systems planning when only a concept about a future computer is being formed, problems related to distribution of the norms of reliability between its constituent parts, selection of the relations of the efficiency of various components of the monitoring system, optimization of the frequency of including various types of monitoring into the work and so on are solved. The specifics of the computer and its sphere of future application must be taken into account in this case.

The book offered to the attention of readers has the purpose of illuminating a number of problems, knowledge of which the specialist requires in development and operation of modern highly reliable computers equipped with various means for enhancing their efficiency.

The material of the book reflects current scientific and technical views in the field of computer reliability and control. Sections 4-8 are based on original results of the authors' work. Section 3.1 was written by N. I. Tsiklinskiy and the remaining material was written by all the authors jointly.

The authors express gratitude to A. I. Dolgov and to I. I. Burovikov for a number of comments which contributed to improving the contents of the book.

Table of Contents

Systems Planning of Computer Reliability

6521
CSO: 1870

MANAGING THE EFFICIENCY OF SCIENTIFIC ACTIVITY

Kiev UPRAVLENIYE EFFEKTIVNOST'YU NAUCHNOY DEYATEL'NOSTI (Managing the Efficiency of Scientific Activity) in Russian 1978 signed to press 11 May 78 pp 2-5, 239-240

/Annotation, foreword, list of abbreviations and table of contents from book by Gennadiy Mikhaylovich Dobrov, Eduard Mikhaylovich Zadorozhnyy and Taisiya Ivanovna Shchedrina, Naukova Dumka, 3,200 copies, 240 pages/

/Text/ The monograph is devoted to problems of increasing the efficiency of the activity of scientific research institutions and of improving planning practice. The results of investigations are contained in it and a number of problems for improving future and current planning is formulated. Progressive methods and procedures are suggested for justifying the topics of scientific research and experimental-design elements and of analyzing the efficiency of the results of scientific activity. Methods for improving the quality and efficiency of scientific activity by well-founded forecasting support of the strategy of science, improvement of the technical-economic justification of research and development and reasoned analysis of the efficiency of scientific investigations and analysis of the activity of scientific institutions are considered.

The book is intended for specialists of planning-economic bodies of scientific research organizations and also for scientific and engineering-technical personnel interested in the problems of planning the work of scientific research institutions.

Foreword

Improving the efficiency of research and development and fulfillment of its social mission by Soviet science at the current stage of development of socialist society require transition from extensive methods of conducting scientific affairs to intensive methods and of intensifying the effectiveness of the unified state scientific and technical policy at all levels of its formation and implementation. A methodical and information systems revolution of the practice of managing the "research-development-adoption of innovations" cycle becomes necessary in this regard.

During the past decade, Soviet scientific managers have formulated a specific theoretical and methodical base which makes postulation of the outlined problem real. The richest experience of planned development of Soviet science and the worldwide experience of improving the organizational forms of research may contribute to solution of it. An important prerequisite for successfull development of the systems and systems eningeering trend in scientific management are the scientific methods of investigating specific operations during the past few years, combined under the name "Organization and Management of Scientific Research and Experimental-Design Developments" (NIOKR). The analytical and calculating methods, the models and algorithms for justifying solutions and methods of utilizing modern electronic data processing equipment contained in them are passing an experimental check in different fields of the practice of forecasting, planning and analysis of the efficiency of scientific activity.

The theory and practice of socialist planning regard forecasting as a pre-planning stage and auxiliary tool called upon to continuously orient the planning process. This is the essence of an integrated approach to future planning. With this approach, the results of forecasts create specific boundaries for planning with the necessary quantitative analyses. The function of planning is to select those problems from the list of fore-casted problems which may and can be solved during the considered planned period, based on its tasks and available resources.

Forecasting, future and current planning and also analysis of the efficiency of scientific activity are the links of a unified chain. Problems of man-aging the development of science and new technology cannot be solved by relying only on one of these links -- a system of managing scientific and technical progress must be created in which forecasting, future and current planning and analysis of the efficiency of scientific activity are combined into a unified whole.

The authors of the monograph have not set themselves the goal of considering all the existing problems of managing the efficiency of scientific activity and all the possible methods of enhancing it. Attention was concentrated only on those problems which, from their viewpoint, are especially impor-tant and correspond most of all to their professional interests.

Results obtained during the past several years were used in the paper. They reflect to a specific degree the need to manage the efficiency of scientific activity. In this regard the contents of a number of sections are outlined in the form of methodical recommendations which may be employed in the prac-tice of managing scientific activity.

An attempt was made in the book to institute a systems approach to consid-eration of the problems of analyzing the efficiency of scientific activity. The systems approach was provided in the very structure of the problems touched upon and it is also typical for the proposed aggregate of steps-problems of processes for creation and use of methods of analyzing the efficiency of scientific activity. The systems approach is one toward solution of some problems, for example, problems of formulation and ordering of evaluating features. A manifestation of the systems approach may be regarded as coordination of methodical recommendations related to different objects of analysis (investigations proposed for inclusion into the plan, completed investigations and the results of the activity of scientific collectives during a specific time period).

We hope that the monograph will be useful to scientific and engineering-technical personnel, to specialists of planning bodies and scientific-organizing services of scientific institutions and will contribute to increasing the quality and efficiency of future and current planning of NIOKR and also in managing the activity of scientific collectives. We express gratitude to V. N. Arkhangel'skiy and to A. I. Omel'chenko for useful advice on improving the contents of this book.

List of Abbreviations

ASPR	-- automated system for planning calculations
ASAS	-- automated situations analysis system
ASUNT	-- automated science and technology management system
VINITI	-- All-Union Institute of Scientific and Technical Information
VNITITsentr	-- All-Union Scientific and Technical Information Center
GKNT	-- State Committee of the USSR Council of Ministers on Science and Technology
INPROGS	-- information-forecasting system
ISTOK	-- information system for thematic orientation and complexing
KO	-- coordinating body
KTB	-- complex creative brigade
NII	-- scientific research institute
NIO	-- scientific research organization
NIOKR	-- scientific research and experimental-design development
NIR	-- scientific research development
NIU	-- scientific research institution
NPO	-- scientific production association
NTP	-- scientific and technical forecasting
OGAS	-- State-Wide Automated System
OP	-- experimental production
OKR	-- experimental-design work
ONTI	-- department of scientific and technical information
PKTO	-- planning-design and production organizations
RFAP	-- republic bank of algorithms and programs
SPU	-- programmed evaluation and review
SEV	-- Council for Mutual Economic Assistance
TEO	-- technical-economic justification
TsNIIPI	-- Central Scientific Research Institute of Patent Information
TsOTI	-- Center for Exchange of Current Information
TsSU	-- Central Statistical Administration
TsEMI AN SSSR	-- Central Economic-Mathematical Institute of the USSR Academy of Sciences

Table of Contents

6521
CSO: 1870

CONTROL OF THE COMPUTING PROCESS IN COMPUTERS

Moscow UPRAVLENIYE VYCHISLITEL'NYM PROTSESSOM V EVM (Control of the Computing Process in Computers) in Russian 1978 signed to press 24 Aug 78 pp 4, 5, 6-8, 240

[Annotation, foreward, introduction, and table of contents from book by Oleg Ivanovich Aven and Yakov Afroimovich Kogan, Izdatel'stvo "Energiya," 12,000 copies, 240 pp]

[Text] [Annotation] This work examines the theoretical and technical problems that have arisen in the development of control mechanisms in modern electronic computers. Control models and algorithms for allocating three basic computer resources--central processing unit (CPU) time, internal (core) storage time, and secondary (external) storage time--are studied. The book is intended for specialists in computer technology, applied probability theory, developers of computer software, and computer programmers. It is also useful to undergraduate and graduate students in these specialties.

Foreword

The problems of controlling the computing process, examined in this work, have appeared in the implementation of multiprogramming and time-sharing.

The problem of efficient use of computer capacities, built into the design of a computer through control of the computing process, arose in the early stages of their use. With the creation of the third generation of computers the problem became particularly critical. Problems in simultaneously allocating computer resources among many programs were encountered in the designing of these computers and stimulated many studies, associated with various aspects of the theory of control of the computing process. The completeness of data, obtained recently, makes an attempt to explain the basic divisions of this theory from a common perspective worthwhile.

This work systematically organizes the findings on key problems in controlling the allocation of basic computer resources. The complexity of even a simplified, analytical description of how a computer operates in general will not enable one to investigate the algorithms for allocating various resources within the framework of one general model. Queing models are applied in the analysis of resource time utilization, while problems in storage allocation are formulated on the basis of various program behavior models. Specific features of the control algorithms being examined and the need to compute nontraditional criteria for them resulted in the creation of new branches in queuing theory, the theory of stochastic automatic machines and digital optimization.

The book's material reflects the nonuniform state of research on these problems. Research connected with the coordinated allocation of several computer resources is furthest from completion. However, it is here that one can expect the most interesting theoretical results in the years ahead.

Introduction

From the point of view of control of the computing process, the electronic computer is a combination of resources which are subject to allocation between programs, users, and processes. The control system for allocating computer resources must regulate their use by programs when the time for program entry and the number of resources using them are not known in advance and fluctuate within a broad range. Such operating conditions and the presence of a significant number of controllable parameters make it possible to assign the control systems under examination here to a special class of large systems--a task comparable in complexity to investigating economic or organizational systems.

The principal difficulties, which one of necessity encounters in the development of mechanisms for allocating computer resources, arise from two contradictory requirements, to which the organization of the computing process must respond. Efficient use of a computer assumes that downtime of its resources is minimized, requiring the creation of a non-vanishing queue for each of them. At the same time providing an assigned time to solve problems of a definite category of users requires accelerated processing of their programs, which superfluous queues prevent. Thus, the control system, first, must support non-vanishing queues to the computer resources; secondly, service queues with as much carrying capacity as possible, and, finally, take into account the time limits for completing a program. Let us look at the kinds of problems these demands create in the development of algorithms for allocating basic computer resources--CPU time, internal (core) and external (secondary) storage.

The CPU is the fastest part of the computer. For constant loading of the CPU, the internal storage must carry a queue of programs, on-line for processing. A new program from the secondary storage area must take the place of the program, whose processing has finished. This is how the computing process in a multiprogrammed computer is organized. However, the simplest algorithm for allocating CPU time, in which programs are processed in the order of their entry, is extremely unsatisfactory from the point of view of the majority of users. With such a programming algorithm, a program, requiring a lot of time, delays the completion of subsequent programs. It would be much fairer to allocate CPU time in such a way that its rapid operation would be evenly divided between all programs, on-line for processing in the internal and secndary storage areas. As long as at the moment of program entry into the computer execution time is unknown, the realization of a fair allocation of CPU time will result in quantum processing of the programs. The simplest algorithm of the type, in which a program, having obtained a quantum of CPU time, is moved to the end of the existing queue, results in an excessive number of exchanges between internal and secondary storage, which lowers the carrying capacity of the computer. To reduce the frequency of these exchanges it is advisable to lower the priority of programs after reception of the next quantum of time, and, if possible, augment each new quantum a program can receive. An investigation of the basic characteristics of this type of algorithm for allocating CPU time makes up the contents of Chapter 1.

Basic problems in allocating internal storage space are connected with meeting the following two requirements. In order to avoid CPU downtime, internal storage must hold a sufficient reserve of programs, awaiting processing. From this flows the second requirement: for efficient storage use internal storage must preserve only that part of each program which will be processed next. The rule determining the part of a program to be kept in internal storage is called a replacement algorithm. The theory of replacement algorithms is presented in Chapter 2. It turns out that even for sufficiently simple models of program behavior an evaluation and comparison of the performance of various replacement algorithms will lead to problems of enormous dimensions. A way out has been found by creating nonparametric methods of analysis, which make it possible to determine the limits of applicability of the algorithms under study.

Intensive use of secondary storage is one of the basic characteristics of the organization of the computing process in modern computers. Under such conditions the carrying capacity of the computer is, to a large degree, determined by actual speed of secondary storage, i.e., by the mean time to process a single inquiry. Chapter 3 analyzes the rules of accommodating inquiries to secondary storage, which increase the real high speed response of the secondary storage because of a review of the entire queue and the rules for establishing the order of inquiry, which reduces the total passage time of the read-write heads.

Optimization in the placement of data files in secondary storage also pursues the goal of minimizing the total transit time and distance of the read-write head in the case of magnetic disks, and in the case of magnetic tapes--minimization of the frequency of changes. Effective methods of solving the problems of combined programming that arise here are examined in Chapter 4.

To solve the problem of allocating computer resources, examined in the first four chapters, mathematical models have been developed which distribute each resource individually. The interrelation between other resources is included in these models by the assignment of corresponding quality criteria or by the introduction of additional parameters. However, not all problems in allocating computer resources can be formulated in this way. One of the most important among them is the problem, already mentioned, of allocating internal storage between several programs. The number of programs, simultaneously kept in internal storage, is called the multiple programming level.

The models, examined in Chapter 5, reflect the compatability of allocating three basic computer resources--CPU time, internal and secondary storage capacities--and make it possible to establish the dependence of the CPU load factor and time for executing a program on the multiple programming level.

In general, it should be stressed that this book deals with the methods of investigating algorithms for allocating computer resources. The area of application of these methods is hardly restricted to the scope of the models examined here; many of them can be applied in solving problems of controlling the computing process in multicomputer and multiprocessing computer complexes and networks.

Contents

8506
CSO: 1870

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000100100007-2

ELECTRONIC KEYBOARD CALCULATORS WITH PROGRAM CONTROL DESCRIBED

Moscow KLAVISHNYYE VYCHISLITEL'NYYE MASHINY (KONSTRUKTSIYA I TECHNICHESKOYE OBSLUZHIVANIYE) [Keyboard Calculators (Design and Technical Servicing)] in Russian 1978 signed to press 19 Sep 78 pp 2, 5-7, 454-456

[Annotation, Section 1 of Chapter 1, and table of contents from book by Aleksandr Gavrilovich Borbov, Vladimir Nikolayevich Dumov and Valeriy Ivanovich Kasterin, released by Main Administration of Educational Instruction of Ministry of Railways, Izdatel'stvo Statistika, 20,000 copies, 456 pages]

[Text] The textbook examines the bases of the construction, the principles of operation and the technical and operational potential and questions about technical servicing of mechanical and electronic calculators based upon discrete elements (Part I) and also of electronic billing machines with and without digital information output on punched tape (Part II).

The textbook was written in accordance with the program of course, "Keyboard Calculators," and is intended for students in tekhnikums for the No 0643 specialty and also for practical VU [computer device] workers.

Part I. Calculators.

Chapter 1. General Information.

Section 1.1. Classification of KVM's [keyboard calculators] and EKVM's [electronic keyboard calculators].

GOST [State All-Union Standard] 16346-70, "Machines, Keyboard, Calculating, Mechanical," was disseminated for machines with manual and electrical drive.

They are divided into five groups, according to operating purpose:

first group--adding machines;
second group--calculating machines without recording of numbers;
third group--calculating machines with recording of numbers;
fourth group--bookkeeping machines; and
fifth group--billing machines.

The groups of machines are subdivided into the following types:

a) According to the design of the devices for numerical input:

machines with full keyboard (or multiple keyboards);
machines with ten-key numerical keyboard; and
lever machines;

b) According to the nature of the information introduced:

digital machines; and
textual (and alphanumeric) machines; and

v) According to the degree of automation of control of the actuating mechanisms' operation:

automatic machines;
semiautomatic machines; and
nonautomatic machines.

In accordance with GOST 15816-70, "Machines, Calculating, Electronic Keyboard," these machines are divided into types, groups and classes. All EKVM's are made in two types.

The first type includes machines without program control that are intended for carrying out the four arithmetical actions and frequently encountered operations: accumulation, operations with constants, computation of percents and of percentage ratios and of elementary functions, and others.

The second type includes machines with program control that are intended for automatic execution of computations in accordance with instructions and a prescribed program (figure 1.1).

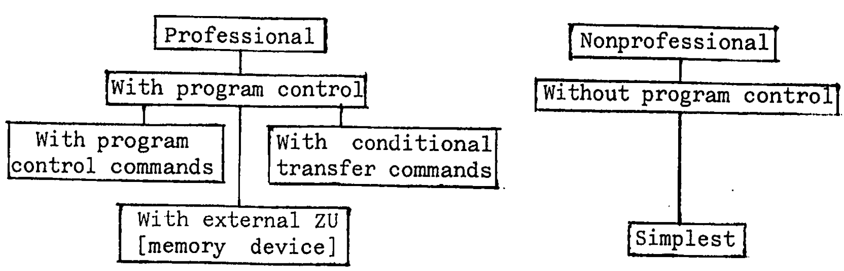


Figure 1.1. EKVM [electronic calculating machine].

This textbook examines EKVM's only of the first type.

Each type of machine is divided into three groups. The groups are distinguished from one another by the number of registers that are used in the machines, by different digit capacity and by operational indices. As the number of the group rises, the basic parameters of the machines rise.

EKVM's of the first group of the first type have no more than three working registers and one memory register. The digit capacity of such machines is 8-12. The machine executes at least four operations automatically: the arithmetic operations of addition, subtraction, multiplication and division. The average time for carrying out arithmetic operations does not exceed 0.5 second, and the rated input is 40 watts.

EKVM's of the second group have 1-4 memory registers and a digit capacity of 12-16, and the number of operations carried out automatically is 6.

EKVM's of the third group have at least 5 memory registers, the digit capacity is 12-20, and the number of operations carried out automatically reaches 8. These machines of the first type of the third group are called the simplest and are the subject of study of this textbook. They include the Iskra-11, Iskra-12, Elektronika-68 DD [coded decimal], Elka-22 and Zoyemtron-220.

The simplest EKVM's are designed basically for carrying out the four arithmetic operations, as well as the accumulation of algebraic sums of the results of arithmetic operations, the extraction of square roots, and work with constants. The digit capacity of the machines does not exceed 12. The simplest models are used for bookkeeping, economic and other noncomplex computations.

EKVM's without program control belong to the class of nonprofessional machines. These machines are intended for widespread use.

Electronic keyboard calculators with program control belong to the class of professional machines. They are intended for business and scientific calculations. Professional machines are intended primarily for carrying out complicated engineering and economic calculations.

Professional EKVM's have up to 128 commands for program control and no more than 16 memory registers, and, moreover, are additionally supplied with commands for conditional transfer and can be unitized with external memory devices. In this case the program control commands of such machines can number 512, the memory registers 64. Professional machines with program control can have up to 3 working registers and a digit capability not exceeding 16.

EKVM's for business calculations are included in the professional machine category. In addition to the operations carried out by the simplest models, business EKVM's can operate with percents of numbers, and they have accumulator and working memory registers. The information output of these machines is produced on a digital display or a numerical printout.

For scientific purposes, EKVM's that have a greatly expanded potential for carrying out operations are used. They are intended for solving scientific, technical, information, research and control tasks. The digit capacity of these models can exceed 20-22 places. EKVM's for scientific calculations operate with powers and trigonometric functions, convert operands and have program control and, sometimes, program language. They are used in scientific and technical sections, NII's [scientific-research institutes], KB's [design bureaus], institutes and VTs's [computations centers]. They are unitized with external devices. They can operate automatically or according to a prescribed program and introduce programs and baseline data with magnetic cards, and they have an output on a cathode-ray tube.

Despite all the diversity of the enumerated machines, all EKVM's have much in common in the nature of their construction.

Contents

11409
CSO: 1870

INTEGRATION OF PRODUCTION PLANNING

Moscow INTEGRATSIYA PROIZVODSTVENNOGO PLANIROVANIYA in Russian signed to press 10 May 78 pp 3-4, 229-230, 231

[Excerpts from the book "Integratsiya proizvodstvennogo planirovaniya" by R. S. Sedegov, N. M. Orlova and Yu. I. Sidorov, Moscow, Statistika, 1978, 12,000 copies, 231 pp]

[Excerpts] Introduction

The improvement of the system for the management of the national economy involves an extremely large complex of problems: the scientific substantiation of planning, improvement of the structure and organization of management systems, improvement of the system of material incentives, improvement of data collection and transfer systems, improvement of electronic data processing systems, etc. Nor are these problems of equal importance with regard to the realization of the main goal: the improvement of the entire system of management of the national economy.

The main problem is to increase the scientific substantiation of the planning of economic development (the reference is to planning in the broad sense of the term which embraces the entire system of production and distribution of material goods and which defines the activity of each national economic link and ranges all the way from the workplace to branches and interbranch relations). The resolution of these problems is a matter of no little importance to enterprises and enterprise subdivisions that are the actual producers of material goods.

The development of integrated data processing systems [integrirovannyye sistemy obrabotki dannykh - ISOD] as a part of automated management systems (ASU) is one of the principal ways to using the systems approach to the improvement of management and especially to planning.

In the process of integrating production planning, it is essential to consider and use the economic laws that operate under a developed socialist society. ISOD must be based on patterns inherent in the science of management in general.

The development of integrated production planning systems is not an end in itself. The expediency of their development is determined by the general tasks of improvement of the planning of the national economy at all levels of management and especially by the task of increasing the degree of scientific substantiation of plans and the tasks of enhancing the level of organization and efficiency of planning.

We can enumerate specific aspects of the overall problem of increasing the degree of scientific substantiation of planning in the present stage of economic development. Chief among them are: the enhancement of the program-goal character of planning, an integrated approach to planning, the optimization of planning, the establishment of long-range norms, and securing the proportionality of plan indicators.

The 25th CPSU Congress observed that the improvement of the system of economic management is one of the key issues in the party's economic policy. The implementation of our plans depends on the efficiency and effectiveness of management and the degree of promptness and completeness with which the available reserves are drawn into economic circulation.

The integrated system of production planning determines the results of economic activity that must be attained by the enterprise and also the permissible volume of resources and expenditures that may be used in the attainment of these results. In this way we determine the objective function and constraints that must apply to the production of basic products over a certain period of time. Operational management here ensures the fulfillment of given targets with regard to available resources and the task of rationalizing their use. In other words, the effectiveness of operational management is evaluated on the basis of the economic result attained for each period.

The concretization of targets in the national economic plan, the refinement of the composition and volume of production, and the substantiation of the requirement for labor and material resources are based on established indicators.

The mission of integrated production planning is to encompass the development of long-range, five-year and operational plans of enterprises and all its subdivisions, to optimize these plans, to determine indicators for the production and sale of products, to ensure the normative and planned levels of production costs.

The Program of the CPSU notes that the growing scale of the national economy and the rapid development of science and technology require a higher scientific level of planning, project-planning, accounting, and statistics. The increased scientific-technical and economic substantiation of plans gives them greater stability which at the same time presupposes the timely correction and updating plans in the process of their fulfillment. The Program emphasizes that planning must be continuous and must be closely combined with all types of plans -- long-range or current.

In the present work, the authors attempt to show the basic parts of the integrated system of production planning, the experience of creating and using these systems and their influence on the improvement of the enterprise management system.

[Annotation]

The book examines questions relating to the development of an integrated production planning system at industrial enterprises. The authors propose ways of creating the informational base of ISOD and principles underlying the construction of models of the enterprise economic information system. The book devotes considerable space to analyzing the experience of foreign countries in the utilization of integrated production planning systems.

The book is intended for developers of automated control systems, for information and computer center personnel, for personnel of economic planning and production services of industrial enterprises, and may also be useful to students attending economic VUZ's.

Table of Contents

5013
CSO: 1870

MODEL OF AUTOMATED INDUSTRIAL ENTERPRISE MANAGEMENT SYSTEM

Moscow MODEL' ASU PROMYSHLENNYM PREDPRIYATIYEM (Model of Automated Industrial Enterprise Management System) in Russian 1978 pp 3-5, 102-104

[Editorial comments by V. Yu. Bunakov, director of the Soviet-Bulgarian Scientific Research and Planning Institute Interprogramm, introduction and excerpts from the book by V. A. Kureyev, L. N. Kuranova, Ye. A. Perfil'yeva, G. D. Rakhmanin and V. F. Stafeyeva, Moscow "Statistika," 1978, 126 pages]

[Text] Modeling as one of the steps of investigation and design has found application in the most diverse fields of science and technology. Modeling-mathematical, simulation, laboratory, half-scale and so on--has become especially widely distributed in the field of systems design, specifically in design of technical systems.

The model described in the given book is related to the simplest type of modeling--laboratory, but it is the first complete model of digital type in the field of automated management systems (ASU) for industrial enterprises. The idea of the need to use modeling occurred to the authors of this paper with regard to the fact that modern high-capacity software--applied program packets (PPP) which include complex and efficient methods of solving various management problems of industrial enterprises--have been made available to developers of ASU. The ASU developer, utilizing this software, should have a good knowledge of the specific economics of the enterprise, know how to conduct economic analysis of the production system, to correctly apply mathematical methods contained in the PPP and also methods and means of constructing data processing systems and to have the skills to design ASU based on third-generation computers. It is natural that the aggregate of the qualities indicated above is far from inherent to everyone. Moreover, the ideology of management of an enterprise contained in the PPP system is not described in explicit form in the documentation to the packets themselves. The presence of alternative solutions in the packets makes the process of ASU design even more difficult. Therefore, the initial problem postulated by the authors was to create an ASU prototype on the basis of PPP. This determined the approach to development of the model itself--selection of some arbitrary enterprise and development for it of an automated management system using PPP. The limited quantitative indicators of the enterprise should provide good visibility of the produced model and the quite real nature of production, technology and organization of production should provide adequate representation of the result.

It became clear to the authors even at the beginning of the book that the application of the model is not limited by use of it for demonstration purposes. The model is a convenient tool for organization of training both developers of ASU and of enterprise personnel. Moreover, business games can be developed on its basis for activation of the teaching process. The process itself of developing the model is a part of ASU design (the unique feature by which the development of the model is distinguished from design of a real ASU is the fact that conversion from a real system of management at the enterprise to the system being designed is not taken into account in it).

Consequently, the technology of ASU development is worked out to a significant degree in development of the model. With regard to the fact that the model is the final programming system, it may serve to join additional programs or new packets with the program system of the ASU constructed on the basis of standard PPP.

However, the most important application of the model was determined after completion of development described in the given book. Since the arbitrary enterprise that was the basis for the model has features inherent to a rather wide range of real enterprises, direct introduction of the system realized in the model at real enterprises of this type was possible. The volume of revisions of model programs was extremely insignificant in the given case and reduces essentially to regeneration of the basic programs by using standard means of adjustment contained in PPP and also to reprogramming of some blocks which process input documents and which issue tabulograms. With the presence of a collective of "producers" at the enterprise who know their own enterprise well and of specialists having programming experience on YeS EVM [Unified computer system] (with total number of not more than 6-10 persons), the enterprise itself can successfully introduce the ASU based on the model by using its developers (purely consultative). If some significant characteristic not taken into account in the ASU model is found at the real enterprise, it is included into the information base of the arbitrary enterprise and the model is adjusted. This process is called "loss of complex situations" by the authors of the given book.

Thus, the ASU model is an effective multipurpose means which also determines the significance of the proposed book. The book should undoubtedly be of interest to enterprise managers who come into contact in one way or another with automation of enterprise management. It may also be useful to a wide range of professionals working in the field of data processing.

Introduction

The ASU model described in this book can most simply be defined as the ASU for a hypothetical enterprise having the most important characteristics of some class of enterprises. Let us turn our attention to the following to imagine how the ASU may operate at the hypothetical enterprise. The programming complex in any ASU is related to its information model, represented in the form of an information base on machine carriers, rather than to material production itself. The ASU contains service programs of the information base, the task of which consists in maintaining agreement between it and the plant. Consequently, it is sufficient to develop an information model which reflects the characteristics of a specific plant or class of plants for operation of the programming of the complex of the ASU. Operation of the ASU model is also based on this. Instead of real production information, user data are fed to the input of the information base service programs and the programming complex then operates with them and with data of the real plant: it generates solutions, formulates reports, controls data and so on. During the course of operation, the user may introduce new data which reflect the results of completion of solution and the course of production. In this case the model will continue to operate on the basis of the previous and new information.

The main components of the model are the information base, functional structure (process of system operation and methods of problem-solving) and the programming complex. These components will be considered in detail in the corresponding chapters of the book (from Chapter 3 through Chapter 6). The hardware complex of the system is illuminated here only in the part of requirements on computer configuration.

The main prerequisite for development of the ASU model was the new problem-oriented software of YeS EVM -- applied program packets "Information system for enterprise management" (ISUP). The applied program packets are generally adjusted program complexes capable of realizing a set of algorithms on the computer for solving a specific class of problems (mathematical, economic, information and so on), while the ISUP is a system of applied program packets capable of realizing the main production control algorithms and of providing the management of the enterprise with information for management. The PPP ISUP are considered in detail in [1-5], but since the principles and algorithms of the ISUP are the foundation of the ASU and since they are still not sufficiently known to a wide range of readers, they will be briefly outlined in Chapters 1 and 2 of the given book.

Hardware of the ASU model. Minimum configuration of the YeS EVM is required for startup and operation of the model:

internal storage device with capacity of 64 K;

three YeS-5056 (5052) direct-access devices;

YeS-6012 punchcard input device;

YeS-7030 (7032, 7033) printout device;

two YeS-5010 (YeS-5012 and IZOT) magnetic tape storage devices.

Of the three direct access devices, one is designed for the model resident which includes the DOS YeS [Disk operating system of unified system] and the generated program complex of the model; one is designed for seven files of the information base and tasks of the demonstration versions of the model and one is designed for the working files of the PPP and for the systems working files of the DOS YeS.

Two magnetic tape storage devices are required only for the demonstration mode of operation of the model -- these are the working magnetic tapes.

Operation of peripherals is not provided here in the standard ASU model. Preliminary information can be prepared on any punchcard data preparation devices.

Information is derived in the ASU model in real time in the form of tabulograms.

Conversion of the model to the DOS YeS 2.1 version and also use of the SIOD2 packet for the ISUP and the use of peripherals comprise the subject of further experimental investigations and methodical developments based on the ASU model. [337-6521]

6521
CSO: 1863

MORE AND BETTER PERIPHERALS OUTWEIGH NEED FOR MORE COMPUTERS

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 5, 1979

[Review by Yegor Belyayev of the book "Super-EVM" by A. P. Kochur, Moscow, 1978, 64 pages]

[Text] The classification of today's computers and their characteristics, main problems and trends in improving computers (based on foreign experience) can be profitably read about in the booklet under review, even by specialists. A. P. Kochur--the author of inventions in superconductive cryo-computers--knows what he is writing about: his information is not second-hand.

Superlarge computers with operating speeds of tens and hundreds of millions of operations a second "today stagger the imagination even of people who work with computers" (page 36). But without becoming amazed by the many still-future technical miracles described in the booklet, you begin to reflect on how the supercomputer will perform, how much and in comparison with what they will be effective.

Operating speed is not the main indicator of computer effectiveness and by itself is not an indicator of effectiveness. Without a doubt, increasing computer operating speed is extremely useful for numbers of tasks and sometimes simply just a necessity. But this indicator can never be viewed as suitable for all cases in life. Nor can we move on to far-ranging generalizations. For example, a generalization such as the following: "Total computer productivity, or the computer capability of the country, is a most important indicator of the technical-economic level of a country's growth, and indicator of its "intellectual might" (page 4).

Why does this appear invalid? The point is not even that for some number of operations within the computer obligatory input/output operations have to be completed, and that we must think about what to input and what to have outputted. Increasing the operating speed will stimulate intellectual activity, but more likely the ability to compare costs and results, to take account of public tax money, will be a real indicator of "intellectual might."

The vast majority of control computers in industry were until recently equipped with 1932 model German teletype units. The output speed is six characters a second. For one symbol to be typed with this teletype requires an average of four commands. The maximum operating speed that is required from the computer when outputting information with a single teletype is 24 operations a second. Let us assume that we actually have a computer with a capability of 240,000 operations a second. Then in the time it takes for the letter bar to travel to the paper and back (1/6 second), the computer is able to execute 40,000 operations. Now to the solution of the problem: how to use the remaining (40,000 less 4) operations--there are two ways of looking at this. The first is equipment-oriented--build an intermediate, buffer storage for the teletype. Entries can be made in this storage and outputting can be done slowly. The second way--program-oriented--is developing a special complex of programs, called the operating system, that would ensure not only a symbol-by-symbol output at the rate of 6 characters per second, but also the carrying out of other independent operations at the same time. The operating system has a lot of things to keep track of. It must, in particular, regularly check whether the letter bar sent to the paper many thousands of operations ago has returned to its normal position.

And converting "many thousands" to "many millions" requires that we think about parallel increase in the technical level of the peripherals: make them operate faster and make human and computer access to the peripherals easier. The unpromising situation with respect to peripherals indicates that a sharp rise in their number and quality is a challenge that, in any case, is no less urgent than increasing the operating speed.

Page 60 of the booklet we are reading makes reference to a book by A. Apokin and L. Maystrov, "Razvitiye vychislitel'nykh mashin" [Advances in Computers], in which we find a table that shows that in 1970 the cost of central processing units in U.S. computers amount to 70 percent, and peripherals--30 percent. In 10 years the figures switched places. In 1960 40 percent of computer costs were represented by programs and 60 percent--by the computers proper; in 1972 these figures also changed places.

So improving the operation of the processing unit, in particular, increasing the operating speed, permits raising the effectiveness of only 12 percent of all outlays (30 percent--the cost of central processing units--is multiplied by 40 percent--the cost of computers apart from programs). Can this 12 percent really by the most important part of the outlays? On becoming familiar with the literature on computers, it is hard to find any economic considerations for this position.

Perhaps, A. P. Kochur, is not familiar with the figures from the book we have cited? No. He knows of even more recent statistics. On page 36 he writes: "The use, for example, of 50 percent of computer capabilities, permits lowering the costs in programming by a factor of four." What then is viewed as primary, and what as secondary? The author would hardly admit that increasing operating speed is an auxiliary trend in lowering costs for programming. Then we would have to compare this trend with others that today can turn out to be more effective. For example, boosting programmer qualifications.

Advances in computers are now determined by fulfilling the planning indicator "computer production by units." Practically deprived of peripherals and software, orphaned central processing units move out of the gates of computer manufacturing plants. Originating under the beautiful name of first or base sets, in their hordes they bring joy to some and sadden others. We can take one more step and establish a new control figure--the total operating speed of all installed computers. All the more so, in that not only A. P. Kochur is certain that a total productivity of the entire stock of the country's computers is essential to handling "mass tasks" (page 18).

What is sweeter: thousands of units of computers or billions of their operations a second?--this is the question. As a start it would be good to analyze in the future the effect of boosting the operating speed. It is never simple to dash from one beautiful indicator to another. Computer users, on experimenting to see what "increasing the available computer stock" means in practice, are awaiting with a form of impatience quite their own the planning calculations about "increasing the total computer capability." This same emotion is what motivated this response.

[Portions of the book reviewed in this article have been translated and appear in TUST/PST, No 22, 10 May 78, JPRS L/7764, which is FOUO).

10123
CSO: 1863

DEVELOPMENTS IN COMPUTER TECHNOLOGY DISCUSSED IN NEW BOOK

Kiev AVTOMATIKA in Russian No 3, 1979 pp 90-92

[Review by B. B. Timofeyev of the book "Spravochnik Po EVM i Analogovym Ustroystvam" by V. I. Grubov and V. S. Kirdan, 2nd edition, revised and supplemented, edited by G. Ye. Pukhov, Kiev, Naukova dumka, 1977, 464 pages]

[Text] The reviewed reference manual is the second revised and supplemented edition of the book by the same authors "Computers and Modeling Devices," published by Naukova dumka in 1969.

Taking into account that the development of computer technology has undergone great changes since publication of the first edition (appearance of third-generation digital and analog computers, minicomputers, development of fourth-generation computers and so on), the authors attempted to make the appropriate corrections in the second edition, supplementing it with descriptions of new computer equipment and classes of machines. At the same time descriptions of many tube, electromechanical and other computers and analog machines, which are of historical interest, were excluded.

It should be noted that the greatest changes in the references manual were the chapters related to digital computer technology and to a lesser extent to analog computers, which corresponds totally to the developed real situation.

The problem of describing not only series produced computers (which it is very difficult to do in total volume, since their nomenclature is renewed almost every year), but also those computers and devices which were produced previously and have been operated until now at computer centers, at enterprises, at scientific research institutes and VUZ's, was postulated in the reference manual. The latter is of interest especially for instructors and students of VUZ's and technical schools, since it permits one to follow the development of the circuitry and design solutions of computers and transcend the development, permits one to compare different computers according to specifications and so on during study of the corresponding courses.

The approach to development of computers has undergone significant changes recently: instead of independent development of apparatus and some types of software, a system consisting of an aggregate of apparatus and programming devices has begun to be developed. The modern software system with which produced digital computers are usually equipped and on which the capabilities of their practical use depend to a significant degree, was established for today. Taking this into account, the authors were quite justified in adding to the characteristics of the described digital computers such an important characteristic for modern machines as software.

The inclusion of two new chapters--"Electronic Keyboard Computers" and "Centralized Control Machines"--should also be regarded as wholly justified.

Keyboard computers based on integrated microcircuits have recently attained very widespread distribution in different spheres of human activity due to the simplicity of use, small overall dimensions, high dependability and so on.

Different centralized control machines acquire no less important significance in development of ASUTP [Automated management system for technological processes] and ASUP [Automated production management system]. This group of machines has recently been supplemented by a large number of machines and devices used to record digital information in development of ASUTP.

The reference manual consists of two parts and the seven chapters contained in them. Each part and chapter is preceded by brief general propositions which characterize the main features of the computers and devices described in them. In this case the authors quite correctly do not go into the details of the construction of one or another classes of computers and devices, mentally referring the reader to the special literature of academic and theoretical nature.

The first part of the reference manual is devoted to digital computers and the second is devoted to analog and analog-digital computers and devices.

General-purpose digital computers are described in Chapter 1. Thus, Ryad-1 models are described in detail among YeS EVM [Unified computer system] and the brief characteristics of Ryad-2 models are also presented. Detailed description of Ryad-1 models is preceded by a block diagram of YeS EVM hardware, the minimum composition of YeS EVM models and the composition of YeS EVM hardware.

The specifications of individual models are well supplemented by layouts of the arrangement of the machines in the machine room and also in some cases by photographs of the overall views of the machines. The approximate costs of the machines are presented.

General-purpose universal digital machines such as the BESM-6, Vesna, MIR-3, NAIRI-4 and also some other machines of earlier manufacture are described in this same chapter.

Digital control computers are described in Chapter 2. The modular system of computer technology (ASVT) is separated into an independent section and M-40, M-60, M-400, M-1000, M-2000, M-3000, M-4000, M-4030, M-5000, M-5010, M-6000, M-6010 and M-7000 complexes are described. The description of the M-6000 model contains data on 24 standard complexes.

Data on digital control machines and general-purpose systems (for example, the Dnepr, KTS LIUS [Hardware complex for local information and management systems], Raduga, K-50, Elektronika--K-2000, Elektronika TZ-16 and a number of others) are also presented in the chapter.

Specialized digital computers used in different sectors of the national economy, in transport, in the academic process and so on (for example, AISI-3, Baykal, Kashtank, Kyyiv-70, Kolkhida-2, Sever-2 and so on) are described in Chapter 3.

Chapter 4 is devoted to a description of keyboard computers (EKVM): numerous EKVM models of types Iskra and Elektronika and also a number of well-recommended machines of types Kontakt, Ros', EDVM and so on.

Data on such well-recommended centralized control machines (MTsK) in industry as AMUR, Zenit, IV-500, KREM-3M, MARS and ELRU are presented in Chapter 5.

Data are presented on digital data recording machines, used extensively in development of ASUP at enterprises with digital production (Donets-1, Signal, URI and so on).

The descriptions of the machines are illustrated by the appropriate block-diagrams. Data are presented on multichannel pulsed regulators of type MIR.

Chapter 6 contains data both on well-known general-purpose analog computers of type Analog, MN, MPT, EI, ELI and EMU and on such analog and analog-digital computer complexes that have appeared comparatively recently as AVK, ATsEMS, GVS, MGVS and so on.

These complexes are used extensively for modeling complex problems with increased accuracy and are constructed by the combination principle in a unified system of analog and digital forms of display of machine variables to combine the best properties of analog and digital computers.

A number of unique general-purpose analog computers (network electric integrators KGU and USM, the Elektron analog computer and so on), which played an important role in their time in solving important national-economic problems.

Finally, data are presented in Chapter 7 on different specialized analog computers and devices (apparatus for automatic optimization of analog computer solution of boundary-value and variation problems, specialized control machines, analog computers for solving network planning and management problems, machines for calculating statistical characteristics, energy, thrust and technological calculations and a number of others.

The bibliography very completely encompasses the reference sources published in our country in the field of computers and analog devices.

Thus, practically all classes of computers and analog devices are described in the reference manual and a large number of computer types produced by domestic industry and operated at computer centers and in organizations of the country is presented. In this sense the reference manual may be regarded as unique in domestic publishing practice.

However, the reference manual is not devoid of a number of deficiencies: there is lack of coordination in the figure captions ("strukturnaya skhema" in some cases and "blok-skhema in other similar cases); technical descriptions of the computers are nonuniform in volume in some cases (for example, the descriptions of YeS-1060, NAIRI-4 and MGVS computers contain very sparse data); not all the latest computers and devices are supplied with illustrated material (for example, the YeS-1033, YeS-1060, NAIRI-4, Signal, GVS-100, MGVS, Saturn, KMM-12 and others); the prices are not indicated for all the computers and devices; some recent developments in the field of computer technology are absent (SM EVM [International System of Small Computers]) SM 1-4) and others); and there is no subject index, which makes the use of the reference manual somewhat difficult.

However, taking into account that the authors have for the first time in domestic practice taken on themselves the job of creating a reference manual in essentially all trends of computer technology and have placed a very significant number of types of computers and devices in it in a comparatively limited space, the indicated deficiencies cannot interfere with extensive use of the reference manual in the practical activity of scientific workers and engineers in the field of computer technology.

Republication of the indicated reference manual is a timely and useful matter and will be of significant assistance to all persons who utilize computer technology in their activity.

Taking into account the fact that computer technology is developing at tempos which exceed several times the other branches of technology and also the ever broader introduction of computers into various spheres of human activity, the reviewed reference manual must be systematically improved and republished every 4-5 years.
[240-6521]

6521 - END -
CSO: 1863