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USSR: Computers

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SCIENCE & TECHNOLOGY

USSR: COMPUTERS

CONTENTS

SOFTWARE

/13046

COMPUTER SCIENCE INSTITUTE DIRECTOR DISCUSSES COMPUTERIZATION PROGRESS, POLICY

Moscow ZHURNALIST in Russian No 11, Nov 86 pp 72-75

[Interview with Boris Nikolayevich Naumov, Academician and Director of the Institute of Computer Science Problems, USSR Academy of Sciences by ZHURNALIST correspondent O. Chulkov, "'Tree of Goals' in the Computer Foliage"]

[ZHURNALIST] Boris Nikolayevich, in coming to an institute that deals with problems of computerization, I naturally expected to see a display on its director's desk, and, honestly speaking, was somewhat disappointed when I did not find one. . .

[Naumov] There is simply no need for this. Perhaps, this is a specific feature of an academic institute, but I feel that I must read through several papers in all every day - the most important ones. Or none at all. My primary task is the discussion of scientific and engineering concepts with close associates. A computer is not necessary for this. And when we discuss them and begin to implement the concepts, then we cannot do without computer hardware.

For example, we no longer think of working without a computer when preparing documentation. Imagine that we are going to our foreign colleagues with a draft of technical documents concerning mutual cooperation; this documentation is carried in the side pocket of a coat. It is a floppy disk. Upon arriving, we print out the requisite number of text copies on machines compatible with ours, distribute the text to all interested parties; they make their own corrections at a terminal and when the final variant of the document has been worked out, the machine prints out its text, again in as many copies as are needed, and in this case, without any errors and misprints, in contrast to a typist.

To keep a display on every person's desk only because it is possible is hardly reasonable.

[ZHURNALIST] Nonetheless, the computer can be found more and more often in the offices of intermediate level administrators and many are not averse to having one. At times this is a necessity and at times an epidemic. . .

[Naumov] Well, it would be good to look into the matter: what is a micro-computer for its owner - a useful tool or simply a fashionable accessory? Is

it for business or appearance? These questions must be asked, because it is quite important that computers be correctly used.

Unfortunately, one frequently overlooks the fact today that computerization of a particular enterprise or institution must encompass primarily its primary functions. If this is a clothing manufacturing plant, then the computer technology must be used primarily for the automation of the manufacturing processes, the reduction of manual labor, improving the quality as well as curtailing the product manufacturing timeframes and reducing its cost. At times, we begin computerization with the bookkeeping, transforming expensive and complex machines into ordinary calculators. By the way, this is one of the widespread errors when the proper class of machines is not used for the solution of particular problems. Another is the computerization of only one of the functions of an enterprise. This produces a minimal effect or does not produce anything at all. Machines must be used for the entire manufacturing process cycle, at its most "critical points"; then the desired gain will be obtained.

I would say that one of the most important tasks today is not just the design of the hardware, but also the simultaneous development of an overall national concept for its application. Where, how and in what sequence are computers to be employed? Before investing money, one must clearly understand what we are to gain as a result.

Judge for yourself, will there be much benefit if, let us say, we develop the OGAS, the Statewide Automated Data Retrieval and Processing System, about which a great deal was said in its time, while the automation of production remains at a low level? For this reason, one must again carefully weigh everything and clarify the procedure and sequence for the implementation of computers. Somewhere, perhaps, it is more advantageous to do without them. The guideline must be a good final result, and not the desire to do something, perhaps even unconventional and grandiose, something which captures the spirit, only because this is theoretically possible.

It is time to acknowledge the fact that computerization has grown from the at one time narrowly specialized task into a key aspect of the resolutions of the major problems of research and development. The program for scientific and engineering progress of CEMA member nations provides for five high priority directions. One of them is linked to the extensive use of electronics. Within the framework of this priority program, as well as in the development of our Unified State Program for the Development of Computers, it seems to me that one must also develop a concept for the computerization of our society. Perhaps, even adopt a Law on the Extensive Use of Electronics or Computerization, which would define who, where and what must be done in order to attain the maximum effect. In any case, it is essential to determine this. For this, it is necessary to discuss not only engineering and economic questions. Computerization touches all spheres of our life; for this reason, one must draw on humanitarian specialists for the development of the concept: psychologists, sociologists, philosophers . . . One could combine these efforts under the aegis of the recently created USSR State Committee on Informatics and Computer Techology.

[ZHURNALIST] Boris Nikolayevich, we have been talking with you for half an hour, and during this time, not once in our conversation have the words "computer science", "computer technology", "EVM" ["electronic computing machine"], "computer" and "microprocessor" been heard. Our ears have now become used to them and they decorate todays newspapers. But we would like to know whether we are creating any confusion in their use? How are these concepts related?

[Naumov] We shall begin with EVM [computer]. It consists of two parts. The first is the electronics. This includes the central processor - the "brain" of the machine. We obtain the microprocessor, and correspondingly, a microcomputer through a high level of integration of the components. The second part of a computer has "flexibility", the capability of adapting the computer to the solution of particular problems. This is the software.

Computer is simply another term for an EVM, taken from the American lexicon. Sometimes this term is more convenient, as you will agree: "computerization" sounds better than "EVMization". A personal computer is a tool for individual use.

Computer technology is a more general concept incorporating the hardware and software components, as well as all of the peripherals: display, printer, etc.

And finally, informatika [computer science]. This word came into our language recently and it is of French origin. There is no unanimous opinion concerning its interpretation. I understand it to mean the same as what the Americans call "computer science", that is, the science of computers. It can be said that computer science is the science related to the development of computers and their utilization in the processing, transmission and storage of information.

[ZHURNALIST] And how clearly, would you say, do we conceive of the computer future? And about which areas of our life can it now be said that the application of computers is justified and promises a good effect?

[Naumov] Computer technology is a most dynamic field. Microprocessors are becoming increasingly smaller, while an ever greater number of components is packaged on a single chip, and this makes it possible to create altogether new qualities in machines and extend their applications area.

We are seeing increasingly clearly how one must move ahead in education. I have in mind not only the secondary schools, but also preschool institutions, professional vocational schools, higher educational institutes and skill level improvement institutes. Almost half of all personal computers will be used in this sector, and starting with it, we must begin to come up with a unified concept of computerization, determining what and how to teach, in order that later when a person goes to work, he will not have to be retrained.

Here, I would like to say something about the use of computers in the leisure time sector. The computer should become the favorite plaything of the

adolescent, who must know its capabilities and be prepared to work with it in the field to which he intends to devote himself. But we must take care in a timely manner that it is not only a plaything. There must be balance here. A computer can be a game of chance and a teenager can amuse himself with it to such an extent that he does not consider anything else in the world. And this happens at times, which creates psychological resistance among parents.

One must consider that a useful thing, in being improperly utilized may cause harm. Let us consider a microcalculator. A first grade student can use it. But if we give a primary school student a calculator right at the beginning of his instruction, then we render him illiterate in arithmetic. They have come up against this, I know, in American schools. For this reason, to be sure, youngsters must be taught how to calculate without a calculator the first time, and after some point in time, they are to be given a machine and taught to use it. Youngsters must understand that the calculator is a help for them, and not a magic wand that they can use for all their work. I remember the case of one medical student. He had a wrist watch computer (there are already such things today) and prior to the examination on pharmacology, he entered all of the necessary prescriptions in his miracle machine. And he passed the exam successfully, getting a "C" for subject knowledge. Thus, as you see, the computer can cause both good and harm, depending on how you use it. And this concerns not only the educational sector.

I have already spoken about the use of computer technology in manufacturing. We also are considering the tasks of using computers to automate scientific research as well as planning and design work. Machines enhance their efficiency by an order of magnitude. If we consider, for example, design work in the construction industry, then it can be seen that hundreds of thousands of people are engaged here in work requiring no thought at all.

Computers can also find extensive applications in the nonindustrial sphere. Recently I had the opportunity to become familiar with the "house of the future", designed by one of the foreign companies. What doesn't the computer do here! It can be used, without leaving the apartment, to obtain information on a variety of goods in a store and a train schedule, as well as placing an order, and on the road home giving an instruction to heat up the tea for your arrival, and if when on the road from home, if you did not turn something off, correcting the oversight . . . In general, the computer can take over the majority of concerns of a homemaker, freeing time for reading, sports, in short, for all-round development.

The prospects of computer use in everyday life are of course quite attractive, but today, we shall take a sober look at things, since household applications are not our most urgent task. And here one will still also have to take a careful look: how to begin, what to start with and in what sequence to move ahead.

[ZHURNALIST] Boris Nikolayevich, you have just now referred to foreign experience, and I thought, that as soon as a conversation today turns to computers, complaints are unavoidable: they say that Soviet computers are significantly inferior to imported ones, they are not reliable, and so forth.

[Naumov] Yes, and unfortunately we are lagging behind today in the development of computer technology. This is explained by several factors. I see one of them in the fact that in its time, the institutes of the USSR Academy of Sciences that were involved in the development of computer technology were turned over to industry. As a result, the scientific component of the most important direction was destroyed, which held us back considerably both in the field of fundamental research and in applied engineering.

In 1983, after many years of debates, a decision was made to organize a department of computer science and technology in the Academy of Sciences; a number of appropriate institutes was set up, including ours. It became the head organization of the recently created intersectoral scientific and technical complex (MNTNK): "Personal Computers". The institute directs efforts in this area and within the framework of the CEMA, having the goal of creating a mass technology - a standardized technology up to the best designs in the world. And I think that one of the main tasks of our MNTK is, in conjunction with other socialist nations, to set up the mass production of computers that could be purchased from us. However, organizational obstacles must be eliminated in order to do this.

We have talented scientists, brilliant engineers and highly skilled workers. But the institutes conducting the fundamental research in the field of computer technology, doing the developmental and prototype design work as well as the enterprises employing the results of this labor all share notorious departmental barriers. There is an enormous imbalance between the number of those who design computers and those who manufacture it, in favor of the latter. But if the design is poor, the plant, no matter how beautifully equipped it may be, will not produce good products. Moreover, the resources necessary for the development of the intersectoral scientific and technical complex are allocated only to the Academy of Sciences, and its capabilities are nowhere near as great as those of the industrial ministries.

[ZHURNALIST] Many newspapers have written about the "Irisha" computer - the child of computer enthusiasts from the chemistry department of Moscow State University. Judging from everything, it has proved to be quite successful, although the development of personal computers does not fall within the duties of its designers. How do you feel about such creativity?

[Naumov] It can only be applauded. In general, I feel that any monopolization is harmful. For this reason, the more such enthusiasts there are, the faster we will grow. Remember how aviation came into being: the small clubs of the Society for Assistance to the Defense, Aviation and Chemical Construction of the USSR [1927-1948], as well as the general passionate interest in gliding and airplane modeling. And so then, we have outstanding designers in rocket and aviation engineering.

Such a general frame of mind is also needed as regards computers. As far as the "Irisha" is concerned, I am familiar with it and it is a good design based on a Soviet microprocessor. But the fact is, by the time it had appeared, a similar model had already been accepted for series production, incidentally, also made at Moscow State University. For this reason, when the question of

the "Irisha" came up, I took the following position: transfer its good points to another model and produce a unique kind of hybrid.

[ZHURNALIST] You do not generally find figures on prices in newspaper articles on computer topics. It would be interesting to know how much the least expensive Soviet computer costs?

[Naumov] Several hundreds of rubles for the one we are preparing for the schools. At this price, massive, universal dissemination of the technology becomes possible.

[ZHURNALIST] And how much do the most expensive machines cost?

[Naumov] Well you see, the components of this class of computers can be built up as a function of the complexity of the problems to be solved. The issue involves processors, memory, monitors, plotters, printers and other peripherals. The cost of the machines increases correspondingly. But there also exists a class of supercomputers, which, for example, are used as the central components in overall state planning systems. They are distinguished by high performance, an enormous memory and the capability of working with a large number of communications lines. Their cost runs up to several millions of rubles. And I also acknowledge those cases where machines are needed that cost tens and even hundreds of millions of rubles. With the optimal number and proper utilization of them, they can provide a great economic savings. There is also yet another thing that I would like to turn our attention to. Today, 80 percent of the costs in the field of computer technology already go for the creation of programs. Ways must be found of both reducing these costs and improving the labor efficiency of programmers.

[ZHURNALIST] Judging from newspaper publications, there is no unanimous opinion as to how many programmers we need. One article states that the demand for programmers will grow in an avalanche fashion. The author of another article feels that we can make do with the already available number of specialists.

[Naumov] I feel that the number of programmers will increase. In any case, there will be a great many more of them than there are workers engaged in the production of computer hardware. Here, they like to cite a ratio of nine to one, and I will not argue with these figures.

At the same time, one of the highest priority tasks is the creation of software that would allow any person to sit down at his personal computer and learn how to work with it in a few hours. The first machines, and even some of the present day ones, are accompanied by documentation for the users running to thousands and ten of thousands of pages. Several tens of pages should be sufficient, well, a hundred at most. Functional program packages designed for applications in a particular field promote free operation of a computer. Having put one program in a computer, a design engineer can work with it, and putting another program in, the computer is ready to help an architect and with a third program, can function in the business sector while a fourth program can do word processing . . . you do not need to write the program; your business is to enter the information and data in the machine.

Moreover, we are creating special teaching programs. That is, the machine itself will instruct you how to use it. In the present five-year plan, it is planned that 1.1 million personal computers will be produced. And it is not feasible to send each potential user to special courses.

[ZHURNALIST] The pages of newspapers are echoing with calls for programming to become a second area of required grammatical competence. But if I have understood you correctly, knowing how to write programs and knowing how to use a computer are not one and the same thing. Why do all of us have to know the fundamentals of programming and why pound it into the heads of the school-childred of today and tomorrow? For even cartoons are beginning to teach the children the binary system. . .

[Naumov] Honestly speaking, here we have made serious mistakes. I have in mind a current textbook on the subject "Fundamentals of Computer Science and Technology". If I had studied in it, being a school pupil, then I would probably have become the first "D" student. It is uninteresting, too scholarly and boring. We understood this when it came out, but unfortunately, the textbook was published while we stood around.

There are several points of view as to what it should be. I have carefully studied various approaches to this in the U.S., England, Japan and other countries and have come to the following opinion. A school course, especially the first part of it, must introduce the children to the world of computer technology and computer science. It should provide an idea of how a computer can be useful and in what fields, as well as instruct in the use of the functional program packages - the most popular ones. And after this, it is worthwhile to provide information on how the computer is designed and how it works. School students need to be captivated, and one should not create an antipathy in them towards a new subject. The second task of a school course in computer science and technology is showing how a computer can be used to more interestingly and effectively give lessons in various subjects. Things are even worse in this regard . . . The USSR Ministry of Education is now correcting the matter and has announced a competition for a new textbook. A large batch of good Japanese machines has been purchased. It is important now that they be used intelligently.

[ZHURNALIST] A computer in a school is both a subject to be studied and an aid in comprehending other disciplines. If we talk about its second underlying principle, is the hypothesis true that a computer promotes the development of conceptual thought?

[Naumov] Yes, of course. But there is also something else interesting here. Students are coming to see that the machines themselves are also capable of "conceptual thought". The machines are now used as databases and files, as information systems. A person uses them to select factual material and draw certain conclusions from it. The next step is expert systems, based on knowledge bases. That is, you will have before you not a database, but a rather a highly skilled expert in a particular field, capable of coming up with a problem solving concept. You can accept it, correct it or propose your

own to replace it - the person is not eliminated, but his intelligence and capabilities are amplified considerably. They are already starting to develop such systems. I was a witness to how doctors obtained consultative advice from one of them concerning the diagnosis of a severely ill patient near death and saved him. Such capabilities will be one of the specific features of the new generation of computers.

[ZHURNALIST] The fifth?

[Naumov] I prefer not to use the numbers. You see, there are no clear-cut boundaries here. There are breakthroughs in certain areas of the development of computer technology, while in others, it remains at the level of the previous generation. But such a thing as a leap forward in all areas simultaneously has not happened, and probably will not happen.

[ZHURNALIST] Computer technology today is still called information technology, having in mind the fact that computers are called upon to subdue the rapidly rising flood of information. In some cases, it is actually indispensible, as in science. And take our economic planner: how many instructions, orders, and regulations does he receive, without which he could do wonderfully, and moreover, work more efficiently. Well then, the computer will come to his aid. What then, he is to grind out products of the superfluous production of information, a bad information crop, in short, just red tape in the end?

[Naumov] We have such a disease to be sure, which is developing in accordance with Parkinson's law, well known to lovers of scientific humor. I don't recall how it is formulated word for word, but the meaning is as follows: in order to demonstrate his right to be in the easy chair, a particular manager produces a multiplicity of documents. But the computer is precisely an impediment to this profusion of meaningless paper. You cannot work at a computer with information, without formalizing and ordering it, without revealing the essence. And then it will turn out that the king has no clothes . . . And this does not at all mean that we must wait for the universal use of computers in order to root out paper creativity.

[ZHURNALIST] It would probably be of interest to journalists to find out the possible applications of computers in their work.

[Naumov] Well, then . . . computers can also aid in word processing and when setting up newspaper pages as well as in the management of an editorial archive. I saw the tomorrow of journalism when I visited the editorial and typesetting complex of the Japanese newspaper "Asahi". Computers are used here throughout the entire cycle - from the moment an article is turned over by a reporter to the editorial staff to the packaging and shipping of the newspapers. Computers are used in all production stages - this is something I would like to emphasize. Workers in the mass media must get used to the idea that the computer will replace their typewriters, reference books, files . . .

[ZHURNALIST] I am not sure that everyone today is readily convinced of the superiority of the terminal over a pen and notebook. In other words, one will

simply not be able to work in any other way when there are nothing but computers all around. But then the question arises: how soon will this happen? Won't you risk making a prediction: when will displays appear on the desks of regional newspaper journalists?

[Naumov] I think between 1990 and 1995. This class of machines is rather well developed today.

[ZHURNALIST] Well, this is not such a long way off. Boris Nikolayevich, could we not move on from "computers for journalism" to "journalism for computerization"? What tasks do you see confronting the press in this regard?

[Naumov] Primarily the popularization of the capabilities of computers and achievements in this area. Competence and precision are required here on the part of journalists. I recall that the following was reported on the front page of one of the central newspapers: some institute had made an industrial state-of-the-art controller having an overall size of a "Rubin" television set. This was put forward as a great victory of the scientists. But this hyped information by no means produced gladness for these achievements. The state-of-the-art is several circuits on a tiny chip. Consequently, someone wanted to peddle the old for the new, and the journalist, without investigating, helped his cause and led the readers astray. Incidentally, a recent decree of the CPSU Central Committee and the USSR Council of Ministers, "On measures for fundamentally improving product quality", deems it necessary to establish material and administrative responsibility of officials for distorting information on the world state-of-the-art when evaluating product quality.

Journalists from local newspapers would do a real service in turning their attention to questions of computer literacy: what is being done in a region in this regard, who and what is holding up the work and what assistance is necessary . . . Furthermore, considering the economic specifics of a region, a local paper can cite examples of the efficient utilization of computers, even if only as yet based on the experience of others. And if computers are already being used somewhere in the region, it would be unforgiveable to keep readers in ignorance of this.

[ZHURNALIST] And a last question. How, in your view, would our interview have gone, let us say, 15 years from now?

[Naumov] I suppose that the preparation of the material for the press would have been done differently - you would have worked at a display keyboard compiling the text, shortening or adding to what was written, changing the positions of words, sentences and paragraphs . . . As far as the very first step in the work is concerned, here, I am confident, the machine would not disrupt the person to person dialog or interfere with personal contact.

8225
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USSR, BULGARIA PRODUCE 32-BIT MINICOMPUTER

Moscow TASS in English 1342 GMT 17 Dec 86

[Text] Moscow December 17 TASS--Soviet and Bulgarian scientists have designed and put into production a 32-bit minicomputer. The personal computer built to world standards will succeed the so-called 16-bit machine. It has a greater volume of on-line storage and a greater capacity for automated design, control of scientific experiments and complex technological process.

The machine, in common with other developments by scientists of Moscow's scientific-production organization "Elektronmash" and specialists of the socialist countries, is envisaged by the comprehensive program for scientific-technical progress outlined by the Council for Mutual Economic Assistance until the year 2000. In keeping with that program, fifteen hundred leading research, design and production organizations of the CMEA member countries have joint efforts in solving various problems.

The Soviet association Elektronmash is engaged jointly with experts of Bulgaria, Hungary, the GDR, Cuba, Poland, Rumania and Czechoslovakia in designing new models and assimilating the production of mini- and micro-computers and terminals for them.

"Scientific organizations of every country have undertaken to develop certain components of the electronic computer complex," a TASS correspondent was told by Niyaz Saifi, head of the main designer department of Elektronmash, said.

"We have concluded bilateral agreements and contacts with organizations in the fraternal countries on cooperation, Niyaz Saifi continued. The forms of participation in joint development range from an exchange of papers to mutual supplies of assemblies and devices. Our ties are strengthening. The Elektronmash association, has, in particular, agreements with the Polish and Czechoslovak organizations on direct ties. In the future they are to lead to the formation of joint research teams to engage themselves in work on specific problems. The first such Soviet-Polish team is to be formed next year."

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ANALYSIS OF CONTROL STRUCTURE OF MULTIPROCESSOR COMPUTER SYSTEMS

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 4, Apr 86 (manuscript received 10 Jun 85) pp 163-170

[Article by S.I. Uvarov, Moscow]

[Abstract] An attempt is made to determine the characteristic elements of computer system control structures which can be used to perform a more detailed description of a multiprocessor computer system, considering control feedback. Isolation of such elements is based on analysis of possible structures of the interaction of a certain "main" device in the computer system with sets of subordinate devices. The principle used to isolate multiprocessor computer system structural control elements is general, and the elements can be used fruitfully in the description, and possibly, classification of the control structures of various computer systems. The approach can be used to describe structures of data flows in multiprocessor computer systems as well. Figures 2; references 10: 8 Russian, 2 Western

/13046
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UDC 681.326.7

PLANNING OF FULLY SELF-TESTING MONITORING SYSTEMS OF PROGRAMMABLE LOGIC ARRAYS

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 4, Apr 86 (manuscript received 18 Apr 85) pp 149-156

[Article by L.V. Derbunovich and V.V. Neshveyev, Kharkov]

[Abstract] The time and cost of LSI and VLSI chip diagnosis can be decreased by using methods of functional diagnosis during the planning stage to create self-testing discrete devices in which any defect of given class is located by built-in testing circuit during normal functioning. A new method is suggested for designing fully self-testing circuits for m of n codes in programmable logic arrays, based on utilization of the properties of generating words in strictly cyclical subcodes of the m of n codes. Figures 5; references 9: 3 Russian, 6 Western.

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APPROVE THE LASER FOR OPERATION

Riga SOVETSKAYA LATVIYA in Russian 27 Dec 86 p 2

[Article by M. Zarutskiy, docent, RKIIGA [Riga Red-banner Institute of Civil Aviation Engineers imeni Leninskiy Komsomol], candidate of technical sciences: "Approve the Laser for Operation"; first paragraph is SOVETSKAYA LATVIYA introduction]

[Text] The technical council of the Riga Production Association, VEF [Riga Order of Lenin State Electrical Engineering Plant imeni V.I. Lenin] included the topic "Development of Methods and Equipment for Holographic Nondestructive Testing of Domestic Radio Equipment in the Design Stage" in the integrated system plan of the Kachestvo-90 enterprise. But this is only the first step in using the capabilities of holography.

Photographs, first demonstrated by Louis Jacque Dagger in 1839, so fascinated mankind that until recently no one called into question the mastery of such a method for storing graphic information. But in 1948, the English physicist Dennis Gabor proposed the idea of storing solid images, producing--unlike photography--a three-dimensional object. As a consequence, this method received the name holography.

In its relatively short life, holography has taken a giant leap, having become the most effective--for the time being irreplaceable--instrument in scientific and practical investigations into many areas of human activity, from criminal to the cosmos. Mainly, what it does is this: it has a unique ability to record, store, and retrieve (at any time, after a day or a year) perfect color copies of any object.

What does Dennis Gabor's discovery yield for practical activities today?

A great deal. Above all, holography is a contactless method of nondestructive testing, studying the structure of any complex shape, made of any material, at any temperature. Here, the labor-consuming preliminary refinement of the parts is not required.

Let us suppose that it is necessary to glue together several layers of a composite material. How can the quality of the bonding be checked? There are many ways: ultrasound, X-rays, electric induction. But all of these are not very effective and are labor-intensive. Holography, though, proposes to

place the object under study in an air-tight chamber, illuminate it with a broadened laser beam, and record the image of the object on a photographic plate. Then, to change the pressure in the chamber or, as the specialists say to load the part, and to once again imprint its "appearance" on the same photographic plate. Such a hologram of the two interacting copies provides a picture of the internal condition of the object in the form of a band of a different shape. At any point where there is even the most insignificant breakdown--ungluing, ply separation, not filling--the bands will be thicker and with obvious breaks. If an air-tight chamber can not be arranged, the part can be heated, excited with ultrasound vibrations, etc., but the main thing is to take away its seady state, to view the difference between micro-deformations of the conditioned and defective segments. A difference even as small as a micron, not detectable by any existing method, will be revealed by the hologram.

Using this method, for example, it is possible to check the air-tightness of the joint between the base and the glass in an electric lightbulb. If the joint is faultless, when the pressure in the chamber is lowered the glass of the lamp will burst from the inside, and the hologram will show a dense network of bands. On the other hand, if the pressures outside and within it are the same, roughly speaking, we will see only an "undisturbed" photograph of the lamp.

Another urgent problem is checking "cold" soldering in radio electronics manufacturing. In this case, the fastened parts must be heated several degrees between the two recordings of the images. The picture of the bands framing the "cold solder" points will be very visible.

Holography opens up absolutely unique possibilities in studying vibrations. We literally see them at each step. And frequently they become the reason for the destruction of parts and structures. Modern methods of vibration analysis can yield information on the frequencies and amplitudes of the fluctuations only at each individual site taken. For the overall picture, it is necessary to check point after point, to subsequently construct the shape of the deformation of the entire segment. Yet another method, the "sandy figures" method, is used: sand spread on the surface piles up only at the nonvibrating sites. But what if the surface is convex or cylindrical? Well, all the roads here lead to...holography. It is sufficient to illuminate the vibrating object with laser light and obtain the hologram in order to "read", by its bands, the distribution of amplitudes across the entire field. Computations show that introducing this method in only one of the design bureaus in the Radiotekhnika production association will make it possible to reduce research time of acoustic systems under development at least fourfold, and will provide the capability to perform an entire class of essentially new tasks.

The list of areas for the possible use of holography as a method of plant supervision is extremely long. But, in our republic, alas, these capabilities are, for all practical purposes, not used. Here, holography can not grow up from the short arms of laboratory studies. In Latvia, only two to three very small-staffed holography groups are working -- separately. What

can their efforts do? Prepare 5-kopek dissertations, or even obtain a 10-kopek inventor's certificate. True, one of the "oldest" of the groups, the group of holographers from RKIIGA, formed nearly 15 years ago, has designed a unique, for the time being in our country, portable holographic device with a pulsed laser. This novelty earned the VDNKh [USSR Exhibition of Achievements of the National Economy] medal. Now what? There is a customer and there is a plant capable of beginning series production of the device, but this matter is standing still. Everything is held up because of the lack of staples to develop the technical documentation, on the search for funds to pay for this work, and on the formalistic obstacles of bureaucratic disassociation. Holography remains a "pure" science, not burdened by implementation.

Of course, if every bulb were imaged twice using the laser, they would be "golden". But today we must assign an especially important role to holography in the design and development stage of this, or any other, production.

Presently, the sore spot in a number of enterprises is the imperfection of reproduction components of acoustical systems: namely, telephone handset membranes and radio receiver dynamic speakers. The defect lies in the very design basis of these articles, which have, for example, an overtone, that is, multiple voices. The hologram makes the site where this originates visible and, consequently, in series production a model will be produced that is raised to a higher degree of quality.

However, it is evident that the greatest economic benefit of the holographic method of testing will be produced in series, in-line production. Even here there is an alternative. An electronic holographic interferometer is needed: a system capable of immediately providing the results of testing on a television screen, rather than registering it on a photoplate. Such systems have already appeared abroad, in particular, in laborabories of Japanese radio electronics companies. An interbranch scientific-production holographic center could develop such an instrument for the needs of our industry. It would become the reliable fulcrum for manufacturers in increasing the quality of their production.

One of the tasks of the currently nonexisting center would be to perfect manufacturing methods. For example, silicon substrates for microcircuits of modern communication equipment undergo multiple heat treatments during manufacture. The differences in temperature significantly change the internal condition of this uncertain material, which notably "echoes" the quality of the occasionally very expensive instruments. Holographic testing of the condition of the substrate material at the various heating and cooling rates will show the optimum thermal processing regime. The center could also train specialist-holographers for the republic's enterprises. In a word, precisely, it will help holography come down from the pedestal of "pure" science into life.

If we do not do this today, then with each passing day it will be more difficult to rise to an exemplary technical level, to endure the rigorous competition on the world market.

12304
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HOW TO TRANSLATE AN IDEA

Vilnius SOVETSKAYA LITVA in Russian 6 Jan 87 p 2

[Interview with Yurgis Karlovich Vishchakas, academician; scientific director, "Lazer" scientific production association; director, laser center, LiSSR Academy of Sciences; chief, laser opto-electronics department, Institute of Physics, LiSSR Academy of Sciences by L. Grinis; date, place, and time not given; first paragraph is SOVETSKAYA LITVA introduction]

[Text] The economic and social changes that are currently being observed everywhere can be conditionally characterized as a time of specific concerns. We have begun to avoid the subjunctive mood: instead of "it would be good to do", we are doing; the evasive "it is necessary to provide" is more often being heard as "we are providing", "we are producing". In this atmosphere of specific and large-scale achievements, an idea that "sets the tone" for all subsequent activity is especially important. It is difficult to overestimate its enormous national-economic significance, when the question at hand is a scientific idea, a creative concept of scientists, that gives a powerful impulse to the improvement and intensification of production. To perform this task, representatives of science and manufacturing took aim at the materials of the 27th CPSU congress. In our republic, laser technology is considered one of the most promising branches of science, having an actual yield in practical matters. Since it represents such a concrete application in enterprises, our correspondent met with Yurgis Karlovich Vishchakas, academician; scientific director, "Lazer" scientific production association; director, laser center, LiSSR AN [academy of sciences]; chief, laser opto-electronics department, Institute of Physics, LiSSR AN.

[Grinis] First of all, Yurgis Karlovich, let us examine this question: must the scientists, themselves, slant their work with a constant view toward production? Not very long ago the opinion existed that the researcher was to think in categories of a theoretical nature, and not the practical at all.

[Vishchakas] I understand: to be up in the clouds, not coming into contact with, God forbid, actual reality... I think that this point of view was sewn not so much by the scientists, themselves, as excessively by the zealous popularizers of their activities: as a rule, by people more than practical. Earlier, in my view, the distance between a discovery and its implementation was greater. The researcher did not always have the capability to check the theoretical research and conclusions in practice. Thus, the scientist was

"ahead" of his time. Laser physics is an example, whose electromagnetic radiation was theoretically studied even by A. Einstein in 1917. But experimental confirmation of this research was obtained only in 1954, when the quantum generator was created, and after six more years, the first optical quantum generator, that is, the laser.

[Grinis] But today it is all-pervasive. In optics, medicine, machine-tool construction, heat treatment, even in art, if we mention holography and the associated hopes of the film makers -- the laser is everywhere. It, as they say, keeps on "changing the profession". But, you see, the question is this: which, of all of them perfected, should be considered the basic one? Where is its effect relative to the economy of the republic especially felt?

[Vishchakas] In our republic, high-power laser radiation has been used in many enterprises. One of them, the Shyaulyay Television Plant imeni 40th Anniversary of Soviet Latvia, introduced the production process of thermal strengthening of small parts. The annual economic benefit of this introduction is over 61,000 rubles. It increased the wear resistance of the cutting instrument fourfold to fivefold, improved the processing quality of the items, and achieved a significant savings in material, finance, and labor expenditures.

There is one more that is characteristic -- the Vil'nyus Furniture Combine. Here, the laser "took over" the thermal hardening of cutting tools. Its introduction in this most difficult process made it possible to obtain an annual economic benefit of more than 23,000 rubles, and to double and triple the wear resistance of the drills, blades, and milling cutters. The process of laser perforation of the water-intake filters for artesian and underground wells, reducing the labor intensity for manufacturing the filters and making it possible to eliminate the extremely scarce materials -- brass mesh and shaped stainless steel. For two years already, 52 such instruments have been successfully used at the Kaunasskiy reservoir in the village of Bichyunay; in Kirtimay they are scheduling the manufacture of such filters for water purification systems for the entire republic.

I will state, that all of those things mentioned above concern only using the laser in manufacturing, which in our institute is handled by a specialized laboratory for laser technology, headed by doctor of technical sciences R. Kanapenas. We have still never mentioned the creation of a whole series of laser devices, successfully used purely on the scientific "front". Here, it must be mentioned, that we have created the "BIYUKA" picosecond adsorption parametric spectrometer, whose authors, V. Syrus, V. Kabelka, and others were awarded the First Degree Diploma, VNDKh, Lithuanian SSR.

[Grinis] That picture is quite impressive, Yurgis Karlovich. But, isn't it too glowing? Is everything really going along so smoothly with using lasers in manufacturing?

[Vishchakas] We need to look at these things objectively. Yes, we have our faults -- there is no shortage of orders from customers. Furthermore, demand is outstripping supply. The picture, indeed, on the whole is favorable, if

there weren't a certain "but". Laser technology is a completely new matter, requiring, in terms of production, a complete reorganization and revision of plans, and a regrouping of forces. That which was previously by a shop, let us say, now can be done by one wide-range specialist. But the fundamental breakpoint appears to be that nobody is serving the purpose. The risk accompanying any innovation appears, to everyone, to be too great.

The story goes like this: the mechanics of the laser are a long way off, but in return it has been approved and does not require reconstructing our entire business. The laser waits. Once again the plan is completely in order. This point of view is narrow. One can see in this a certain inertia of thinking, not understanding that the partial use of our existing capabilities is turning around existing losses for the state. Automation, of course, is well and good. But sometimes it is desirable to compare it (and only it) to rejoicers that leap into the air, who, having once reached a respectable limit, do not undertake any more attempts.

[Grinis] At the beginning of our conversation, you casually touched upon such an important aspect as the term for introducing new developments. Specifically, how great are they?

[Vishchakas] About two years, or three, not more.

[Grinis] After the expiration of this term, you will get an instrument. Then what? Where is the guarantee that in series use it will not seem less satisfactory for production?

[Vishchakas] Your remark is true, there was a time when the blame has rained down because of the "great difference" between the experimental device, made by specialists of our scientific center, and its factory variant. And many specific steps have been taken here. At our institute, a basic production enterprise has been created. Now, the developer and representative of the collective users are located two steps from one another, in one office. The creation of an experimental device and its introduction are common affairs. Once an innovation is distributed to the consumer-requester, the representatives appear in the role of curators, directly in the shop where the running in, finishing, and adjustment of the equipment is going on. And as a consequence, we are prepared--at the first call--to come and render effective assistance.

[Grinis] You said that the demand for development exceeds your capabilities. Should we understand that the laser industry is experiencing a shortage of well-trained specialists?

[Vishchakas] Indeed, the case is precisely that. The demand for the laser, on the whole, is growing, but only the physics department at VGU [Vil'nyus State University] is, in essence, training them. In our opinion, this is catastrophically few. We understand that to open a department of quantum electronics of VISI or the Kaunasskiy Polytechnical Institue imeni A. Snechkus is a more than complex matter. (Although, at present, it is already being thought about.) But why not create a combined department, where the

capacities of the VGI, VISI, and our insititue could come together in as unified whole interest. Such a department could accelerate the progress of training laser specialists, organizing and monitoring the respective students' early work. The laser is a promising direction. Today, it is already necessary to give some thought to, tomorrow, providing it with the broad field of activity that he once "bore on his shoulders".

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ON FORMS OF REPRESENTATION OF PRINCIPLE ALGORITHMS FOR PROCESSING ECONOMIC INFORMATION

Moscow KLASSIFIKATORY I DOKUMENTY in Russian No 12, Dec 86 pp 1-7

[Article by A. B. Lerner, Kiev Branch of Planning and Design Technology Office for Locomotives]

[Text] A number of problems must be solved to resolve the problem of improving the efficiency of designing economic information processing systems, specifically, one must select the forms and methods of representation of the principle data processing algorithms.

The forms and methods of representation of principle algorithms are the external specifications with respect to the realization algorithms--programs. The requirements outlined in [1] are placed on means of representation of principle algorithms.

It is unrealistic to assume when selecting the means of data description that users will begin to represent the specifications in terms of Prolog language or some other language of the same level, since they are involved in economic and accounting calculations, reserving seats on airlines and with similar matters, which have nothing in common with those concepts which are used in design of programs. For similar reasons, the traditionally used concepts "files," "segments," "blocks" and similar concepts, used to represent data in the storage structures of various programming languages and data banks, are also unsuitable for representation of external specifications. Economic indicators (henceforth, indicators) can be used as the variables when describing principle algorithms. The indicators are elementary semantic units, which are an abstract type of data of complex structure. Indicators are used when compiling methods for accounting, planning, normalization and analysis in economics. When performing calculations, economists operate with indicators rather than files. A sufficiently high level of formalization of indicators as data is provided when using formalized languages of economic indicators. Thus, economic indicators are the most feasible level of representation of data when working out principle algorithms for processing economic information and for representing them. The following factors must be taken into account when selecting the forms of representation of principle algorithms. On the one hand, the form of representation of an algorithm should be clear and should help the designer to express his ideas. On the other hand, the form of representation of algorithms is a method of documentation and check of the principle algorithms which are used as external specifications and from which a transition is made to

realization algorithms. The graphic form of reprsentation of algorithms, which permits clear display of the relationships between the elements of the project, satisfies these requirements to the greatest extent.

Different forms: graphs (Figure 1), flowcharts (Figure 2) and HIPO diagrams (Figure 3) can be used to represent principle algorithms.

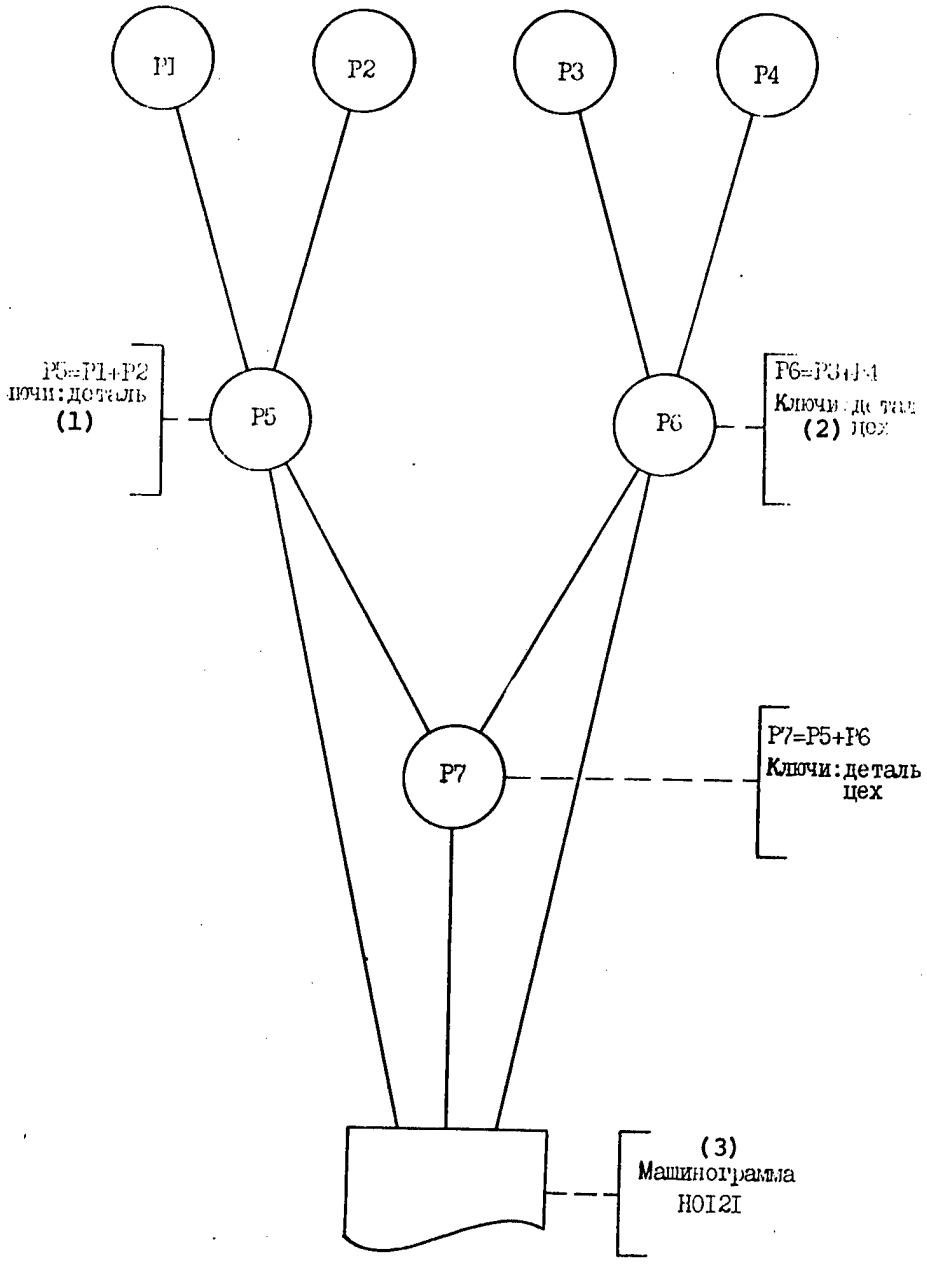

Figure 1

Key:

1. Keys: part
2. Keys: part, shop
3. Machine report

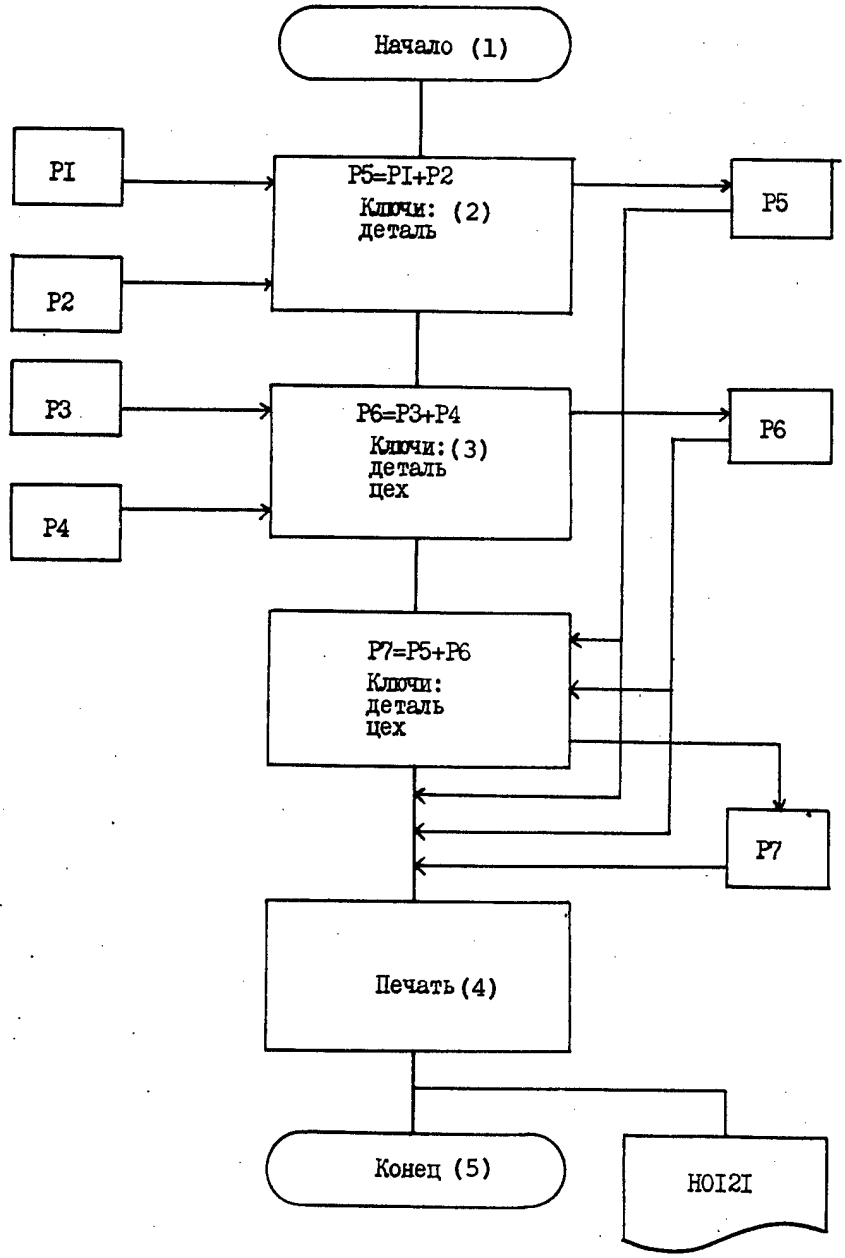

Figure 2

Key:

1. Begin
2. Keys: part
3. Keys: part, shop
4. Print
5. End

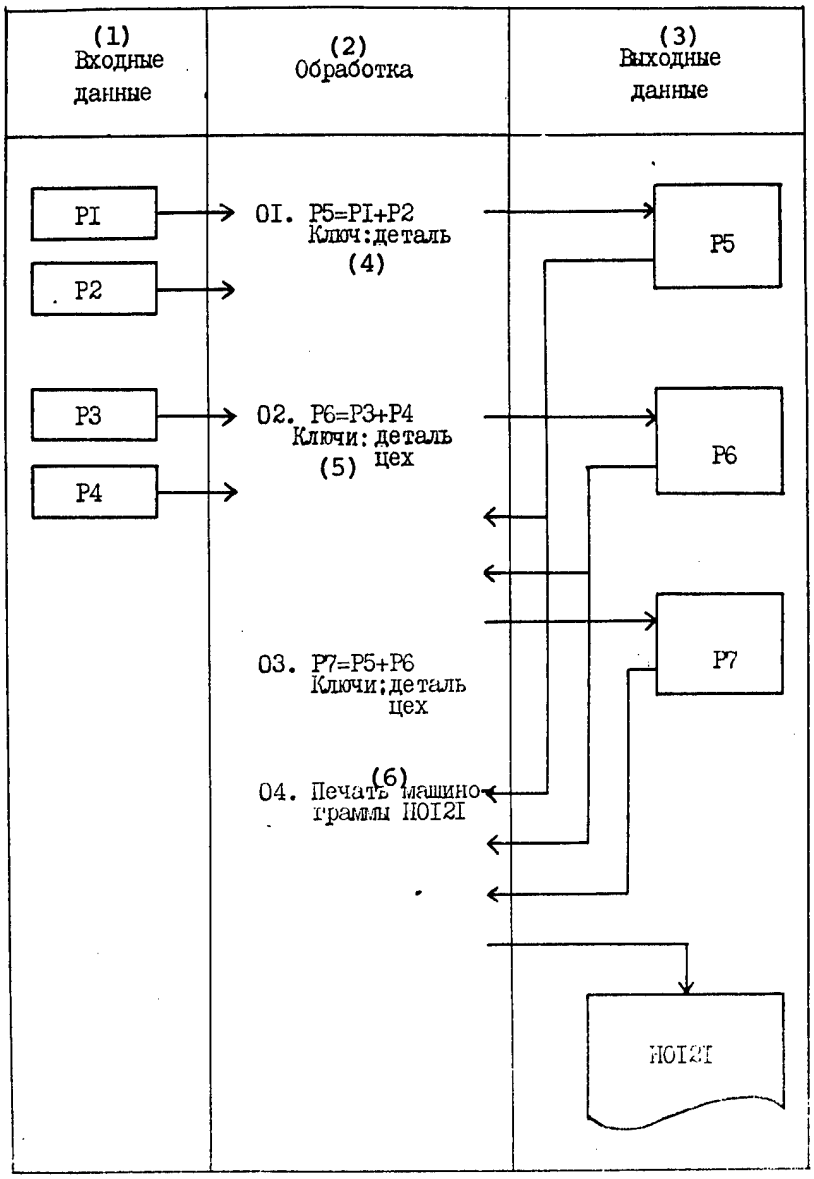

Figure 3

Key:

1. Input data
2. Processing
3. Output data
4. Key: part
5. Keys: part, shop
6. Print machine report

The T-language of economic indicator processing procedures can be used for formalized description of the procedures for calculating the indicators within each of the considered forms [2]. Let us compare the forms of representation of algorithms using graphs and flowsheets. As can be seen from Figures 1 and 2,

flowsheets are inferior to graphs with respect to descriptiveness, since it is complicated to follow the sequence of calculating the indicators on flowsheets. Moreover, the presence of a procedural line requires that this sequence be given, which is disinformation to a specific degree, since it is sufficient to adhere to a given sequence for indicators of a single rank on the graph at the level of representation of principle algorithms, while the order of computing these indicators can be arbitrary. For example, indicator P5 and then P6 or vice versa can first be calculated in Figure 1. The sequence of calculating the economic indicators is determined during design of the realization algorithms, on the basis of the technological features and constraints on computer resources [3].

HIPO diagrams are inferior to graphs, the same as flowsheets, in descriptiveness when representing principle algorithms, since it is more complicated to follow the sequence of calculation of indicators on them, which determines the completeness of the principle algorithm and the sequence of calculation of indicators as a necessary condition. Besides, HIPO diagrams, being a means of documentation with the "top-down" approach to development of algorithms, are unadaptable to design of principle algorithms using indicators, with regard to which it is more efficient to design economic algorithms from the "end"--specific output--machine reports and videograms--to the "beginning" rather than "top-down," by gradually determining the computation algorithms and intermediate and initial indicators. The composition of the output information--output indicators, required by users to perform their functions, after which the machine reports and videograms are designed, is determined during the first phase with this approach. Indicators, from which the output indicators and procedures for calculation of output indicators are in turn calculated, are determined during the next phase. This process is continued until the complete set of all input indicators (obtained from the input documents) is determined and until the complete set of procedures for calculating the output indicators from the input indicators is determined.

Thus, representation of principle algorithms using graphs of indicators is the most convenient form for describing the principle algorithms at the problem-oriented level.

The experience of describing the principle algorithms of ASUP [plant management automation systems] problems based on YeS and SM computers at the indicator level confirms the correctness of this approch. Flowsheets were used initially to represent the principle algorithms at the level of economic indicators. The principle algorithms later began to be represented in the form of graphs of indicators to supplement the flowsheets. It was decided in the subsequent phase, based on analysis of the design procedures, to represent the principle algorithms on in the form of weighted graphs of economic indicators.

The considered representation of principle algorithms in the form of graphs may be effective in design of a large class of ASUP, OASU [sector automated control systems], ASU TP [plant process control automation systems] and SAPR [computer-aided design systems], in which the economic indicator is selected as the semantic unit of information.

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6521
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OPTIMIZATION SOFTWARE FOR COMPUTERS BASED ON GAME MODELS

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 8, Aug 86 (manuscript received 25 Jun 85) pp 135-143

[Article by V.O. Groppen, Ordzhonikidzye]

[Abstract] A game approach is suggested to decomposition of programs, based on representation of the programmed algorithms by a tree assigning the sequence of computation and construction of duality graphs determining the alternatives of the players, with the conditions of the game determined by the goals of optimization. Possible optimization goals include minimization of the upper and lower boundaries of computation time or the volume of memory used. The selection of the criterion is determined not only by the specifics of the process being performed and the computer being used, but also by subjective aspects of the nature of the programmer, assuming that a pessimist will minimize the upper limit of computation time rather than the lower. Figures 5; references 11: 10 Russian, 1 Western.

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PROBLEMS OF DOCUMENTING ACTIVITY OF DATA BANK ADMINISTRATION SERVICE

Moscow KLASSIFIKATORY I DOKUMENTY in Russian No 12, Dec 86 pp 7-12

[Article by L. I. Yefremova, Candidate of Physicomathematical Sciences, All-Union Scientific Research Institute of Documentation and Archival Affairs]

[Text] A regulated community of users with automated system (AS) is possible through interconnected document forms, created with regard to the design technology of automated systems, and of instructive-methodical materials on operation of automated systems. This approach assumes standardization of documentation during design and management of the data bank (BnD), which ensures uniformity of documentation for main operations and for forms of data representation, reduction of explicit errors in documentation, reduction of labor expenditures when making changes in documents, improvement of documentation control, uniform representation of documentation for data bank administration services, problems developers and users and an increase of quality of design solutions by use of technology that guarantees a high level of design.

The requirements and organization of the software of a typical documentation system of the management activity of ministries and departments are presented in [1]. The experience of working on documentation of this systemwith respect to the activity of data bank administration is outlined below, but the proposed documentation structure has no constraints and it can be used to an equal degree in documentation of sector management automation systems and plant management automation systems.

The design of a data bank begins with construction of a conceptual model of the subject area and determination of the information needs for realization of the functions to be automated: the goals and tasks, functional and management procedures to be automated (accounting and control, information reference procedure, computations and so on) and methods of achieving goals and solving problems are determined. Documentation of the conceptual model is created to eliminate excess information about the subject area [2]. Complete solution of the problem of documentation of the conceptual model is possible upon automation of data bank design [3], but the requirements on standardization of the information environment must be established.

After the conceptual model has been constructed, a logic model of the subject area is created on its basis by using the database management system to be employed, user goals are formulated in the professional language of the data bank developer and the data of the conceptual model are matched with the capabilities of the database management system. The need to use a professional language in design of the logic model considerably restricts the number of people who understand this process, whereas nonprogrammer users more and more frequently apply to the services of the automated system. Different forms of communication, for example, the interactive mode, and access through an intermediary specialist are worked out to support access of the nonprogrammer user to the automated system [4]. Additional documentation, understandable by the nonprogrammer user, is required; this documentation should be constructed on the basis of sufficiently large concepts, visible to man.

Most problems of designing the logic level and of managing the data bank of automated systems are related to functions of data bank administration. The composition and content of documents, required to manage the data bank and the information reference servicing of users, must be regulated for more complete fulfillment of them and a set of methodical and instructive materials must be established. All documents for data bank management should meet the requirements of the guidance methodical materials on development of data banks and should be understandable to a wide range of users of automated systems.

The needs of the data bank administration and a wide range of users for reference, normative-technological and instructive-methodical information support the following sets of documents: reference information, instructive-methodical and operational. Each of them is constructed on the modular principle, i.e., it contains a library of modules of different documents.

The composition of the documents in each system should be as follows.

The technology of creating the documentation, which has access to the data bank, during the initial design stage--top-down technology, should be primarily reflected in the reference information system of documents. The layout of the information base should be described first and a systematic index of concepts should be presented so as to reflect the composition and structure of the data stored in the data bank. Representation of this information is possible by several methods. For example, data on information files, descriptions of the forms of input documents, dictionaries and classifiers are required for a special software system (SPO). The combination of dictionaries and classifiers can be formulated as a systematic index [5], in which the thematic headings of the lower level are the names of columns of the tabular forms of documents (or items of questionnaires), while group features that combine related names perform the role of upper levels. The terms in the systematic index are distributed by the thematic headings in a hierarchical system and are used to find the headings of the lower level according to content.

An automated reference dictionary (ASS) is developed simultaneously [6], in which all the summary information on design and modification of the database is contained. An internal database management system is required to manage the

dictionary. Thus, a hierarchy of two database management systems is created: a database management system for management of the reference dictionary is created on the first level and a data base management system for management of the data bank is created on the second level. Besides reference functions, the automated reference dictionary carries the load of the system that ensures automation of the documentation development process [2]. The automated reference dictionary is transformed in this case to a technological data bank design and documentation tool. Automated dictionaries have not become widespread at present; therefore, all necessary information should be entered in the corresponding documents.

The reference information system consists of three sections:

specification of the composition and structure of the data in the data bank. This section carries the information load. Tools that support interaction of the user and the system are created and intermediary functions are introduced to expand the capabilities of users of different ranks communicating with the automated system [4]. Therefore, the document is used in which the composition of the functions to be realized by the automated system is determined with regard to the selected data processing technology, in which a list of these tools is contained and in which references are given for instructions to realize the system;

technological characteristics of functioning of this system. The data bank management system is determined and the corresponding instructions are indicated in the section. The meaningful aspect of the information entered in the data bank is determined by the information classifiers;

technology of file management and file correction. The rules and technological instructions on formulation and management of reference information classifiers are a constituent part of the technological documentation of the system. Management of classifiers assumes timely correction and supplementation of them according to changes of reference information and is included in the duties of the data bank administration. This work can be facilitated considerably through the interactive mode, in which the codes and names of reference information are changed, deleted and supplemented from the display screen.

The documents of the instructive-methodical system provide users of all ranks with instructions and rules for communication with the automated system. The modular method of document construction is the most convenient. The documents of this system are hierarchically subordinate and matched to documents of the first system. The instructions and methods of the second system are explanatory with respect to the documents of the first system. The second system includes three sections:

technological instructions on filling in the forms of documents. The instructions contain general rules of filling in the forms of input documents (description and order of filling). The input form should contain clear definitions that ensure clear understanding even by an untrained user and also character symbols of input information;

description of regular requests to the database. Formalized descriptions of requests should be given in this section in terms of units of information, i.e., of objects, attributes and the relationships between them and also instructions on management of regular queries;

documentation on the technology of reorganizing the database. The composition and order of actions on reorganization of the data bank should be determined in this section of documents.

Documentation of the instructive-methodical system is used during the period until the automated reference dictionaries, integrated with the automated data bank system, have been introduced. They serve to accumulate information and also to organize and manage the development of the data bank [6].

The characteristic features of the system, type of computer, type of database management system, loading tools, characteristic features of data bank management and representation of the data bank model at external and internal levels are determined in the operating system of documents. The documents of the third system also include duty and technological instructions that determine the responsibility for guaranteeing the accuracy of data, restoration of them and consistency. Along with solution of organizational problems of functioning of the system, problems related to use of the database management system, to the technology of checking the data input, rules and procedures that guarantee the accuracy and consistency of data are solved.

The software of the database management system and of the applications programs permit the user to enter information into the data bank directly in the interactive mode. The user is responsible for checking and correcting errors. A logic check of the correctness of information input through software is widely employed, but software does not completely solve the complicated problem of checking information input. Since the automated reference dictionaries have not yet received the corresponding program and organizational support, the intermediary operator link for transfer of information to magnetic carriers before it is entered into the data bank is used when entering information. Thus, there is an additional check of information input, i.e., responsibility for the correctness of information input is realized.

The operating system should include the following documents:

the duty and technological instructions on development and servicing of the data bank;

instructions on transfer of information to magnetic carriers, which contain the order of entering the information and of checking its reliability;

rules for organization of applications program interfaces that include rules of connection applications programs to the database management system;

description of hardware for support of the data bank and additional software;

instructions on management of recovery and copy procedures;

documents on design of the data bank;

documents on supporting the connections to the applications programs and so on.

The duty instructions determine the functional range of duties on operation of the automated system (creation of copies of the data bank, maintenance of magnetic carriers in an efficient state, representation of reference information in the data bank libraries, changing the configuration of software and hardware and so on). These functions are called upon to ensure the reliability of the system.

The technological instructions for the operator to transfer data to magnetic carriers should include: the order of transfer of data to carriers, a list of documents to be entered in the data bank, which contains service information, methods of error check and correction, performed visually, and methods of checking the correctness of input through software. The general duties of the operator must also be reflected in the duty instructions.

The completeness and reliability of the information entered into the data bank are largely determined by documents on design of the data bank, for example, models for information input, correctly compiled during design. This is service information and it is compiled and entered by technical specialists. Instructions on filling out the input forms of the models should contain: general rules for filling out the model and rules and examples of filling out the separate components of the model.

Measures and maintenance of only the last version of the applications program are determined in the combination of documents to provide relationships to the applications programs. The practice of extensive distribution of automated systems requires support with documents that regulate the interaction of users of all ranks with the data bank. Further investigations of documentation of different technologies when using different database management systems and development of a system of an automated reference dictionary, integrated with the data bank, are required.

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ONE METHOD OF TEXT COMPRESSION OF CLASSIFIER ITEM. PROPOSED METHOD OF COMPRESSION

Moscow KLASSIFIKATORY I DOKUMENTY in Russian No 12, Dec 86 pp 32-38

[Article by A. V. Goroshetchenko, VNIPTIK VASKhNIL]

The feasibility of using the text compression method, including compression of classifier items using word dictionaries (combinations of words and letters) of fixed length, for more effective data processing with computers is substantiated in [1]. The implement it, one should break down the text in several phases, which are executed independently of each other and have independent significance:

obtaining dictionaries of combinations of n-symbols (n-grams);

selection of the basic alphabet;

substitution of the symbols in the text by n-grams from the basic dictionary.

Obtaining dictionaries of combinations of n-grams envisions:

substitution of the symbol by its number;

formulation of the number of the n-gram as a chain of the numbers of symbols;

sorting the number of the n-gram;

the numbers of identical n-grams are alongside in this case;

determination of n-grams, their frequencies and volumes, where the volume of the n-gram is the product of its length by the absolute frequency:

$$V_n = L_n \cdot P_n .$$

Selection of the basic alphabet assumes:

sorting of the n-gram according to the decrease volumes;

determination of the n-gram with maximum volume;

determination of the effectiveness of coding;

entry of the n-gram into the basic alphabet (if coding is effective) and correction of the frequencies and volumes of the generated n-grams;

the n-gram is assumed generated if it is included in composition n + 1-gram, n + 2-gram and so on.

The symbol in the text is substituted by analyzing the text for the presence of n-grams in it, beginning with the n-gram with maximum length and substitution of the n-gram by its number in the basic alphabet.

The presence of a complete set of n-grams and of their frequencies provides exaustive information about the object, which permits one to determine clearly the criterion of the effectiveness of coding at each step of selecting the symbols of the basic alphabet.

The effectiveness of coding is determined from the assumption that input of the n-gram into the basic alphabet reduces the total length of the text (incuding the length of the basic alphabet).

Let us use the following arguments to determine the criterion of the effectiveness of coding.

Let us have some message (T), consisting of a basic alphabet (T_A) and of the numbers of symbols in the basic alphabet (subsequently, text) T_C

$$T = T_A + T_C .$$

Let the basic alphabet consist of N symbols, where a length of the symbol is equal to L_i and its absolute frequency of occurrence is equal to P_i. The length of the alphabet (L_A) is then determined as

$$L_A = \sum_{i=1}^{N} (L_i) + L_T , \qquad (1)$$

where L_T is the length of the table that describes the addresses of the symbols in the basic alphabet.

The physical meaning of L_T is explained below. The length of the text (L_C) is determined as

$$L_C = Log(N) \cdot \sum_{i=1}^{N} (P_i), \qquad (2)$$

where Log is a base 2 logrithm.

The value of Log (N) determines the length of the code word with the number of the given n-gram in the basic alphabet and can only be a whole number for the case of uniform coding. Therefore, the value Log (N), Log (N + 1) will subsequently be understood in reality as]Log (N)[,]Log (N + 1)[, i.e., the nearest whole number, greater than the given logrithm. The total length of the text (L_{AC}) together with the alphabet is then

$$L_{AC} = L_A + L_C = \sum_{i=1}^{N} L_i + L_T + Log(N) \cdot \sum_{i=1}^{N} (P_i). \qquad (3)$$

Let the combination of K symbols (S_K) in this message be encountered P_m times.

$$S_K = \{N_i, N_{i+1}, \ldots, N_{i+K-1}\}.$$

Let us consider the length of the alphabet and text for the case when the combination S_K is entered in the alphabet. The length of the alphabet for this case (L'_A) is equal to

$$L'_A = \sum_{i=1}^{N} (L_i) + \sum_{j=i}^{i+K-1} (L_j) + L_T. \qquad (4)$$

To calculate the length of the text, let us calculate the new values of the frequencies of symbols N_i, N_{i+1}, ..., N_{i+k-1}

$$\left\{ \begin{array}{l} P_i = P_m \\ P_{i+1} = P_{i+1} - P_m \\ \cdot \\ \cdot \\ P_{i+K-1} = P_{i+K-1} - P_m \\ P_S = P_m \end{array} \right\} \qquad (5)$$

By substituting the value of frequencies from formula (5) and to formula (2), we find a new value of the length of the text:

$$\begin{aligned} L'_c &= \log(N+1) \cdot \left[\sum_{i=1}^{N} (P_i) + P_m - K \cdot P_m \right] = \\ &= \log(N+1) \cdot \left[\sum_{i=1}^{N} (P_i) - P_m \cdot (K-1) \right], \end{aligned} \qquad (6)$$

while the total length of the text is determined from equations (4) and (6) as

$$\begin{aligned} L'_{AC} &= L'_A + L'_c = \sum_{i=1}^{N} (L_i) + \sum_{j=i}^{i+K-1} (L_j) + L_T + \\ &+ \log(N+1) \cdot \left[\sum_{i=1}^{N} (P_i) - P_m \cdot (K-1) \right]. \end{aligned} \qquad (7)$$

Coding will be effective if

$$L'_{AC} < L_{AC} \qquad (8)$$

Substituting the values of L'_{AC} and L_{AC} from formulas (3) and (7) into expression (8), we find:

$$\sum_{i=1}^{N}(L_i)+L_T+Log(N)\sum_{i=1}^{N}(P_i)>\sum_{i=1}^{N}(L_i)+\sum_{j=i}^{i+K-1}(L_j)+L_T+$$
$$+\left[\sum_{i=1}^{N}(P_i)-P_m\cdot(K-1)\right]\cdot Log(N+1).$$

After the corresponding transformations, we find:

$$P_m\cdot(K-1)\cdot Log(N+1)>\sum_{i=1}^{N}(P_i)\cdot[Log(N+1)-Log(N)]+ \qquad (9)$$
$$+\sum_{j=i}^{i+K-1}(L_j).$$

The proposed reduction of the volumes of the initial text should be greater than the length of the new symbol in the alphabet. One must take into account in this case that if specific limits are reached

$$]Log(N+1)[-]Log(N.)[>0.$$

A new term appears as a result of an increase in the length of the number of the n-gram.

We establish from formulas (9) the criterion of the effectiveness of the coding: coding the text by substitution of the n-gram by its number in the basic alphabet is effective if:

$$P_m>\frac{\sum_{i=1}^{N}(P_i)\cdot[Log(N+1)-Log(N)]+\sum_{j=i}^{j+K-1}(L_j)}{(K-1)\cdot Log(N+1)}, \qquad (10)$$

where P_m is the absolute frequency of the n-gram.

The basic alphabet of the n-grams can be stored in the form of a group of dictionaries of n-grams having identical length. The number of the n-gram (N_{ni}) consists in of two components: the number of the dictionary (the length of the n-gram)--L_n--and the logic number of the n-gram in the dictionary--N_i.

When merging the dictionaries of n-grams, we find a table of the physical addresses of the dictionaries of the n-grams A_n of length L_T (see formula (1)). The physical address of the n-gram in the dictionary is determined as

$$A_{ni} = A(L_n) + (L_n - 1) \cdot N_i \,. \qquad (11)$$

This method of organizing the basic alphabet requires additional memory expenditures for storing the numbers of the n-grams. However, in practice a computer most frequently operates with data bytes. In this case the basic number of alphabet symbols is usually greater than 256 and considerably less than 32,767. Thus, 1 byte is insufficient to write the number of the n-gram, while 2 bytes is enough not only to write the n-gram, but to write its length as well.

Table 1. Main Parameters of Investigated Texts

Параметр (1)	(2)Значение параметра	
	(3)Текст I	Текст 2
Общее число слов в тексте (4)	I7I68	530698
Число оригинальных слов (5)	46I0	889
Коэффициент дублирования (слов) (6)	3,46	595
Число позиций (7)	429I	34500
Средняя длина слова (8)	8,76	6,87

Key:

1. Parameter
2. Value of parameter
3. Text
4. Total number of words in text
5. Number of original words
6. Doubling factor (of words
7. Number of items
8. Average length of word

This method of organizing the symbol alphabet has a number of advantages:

the possibility of correcting dictionaries of n-grams in the basic alphabet without changing the existing number of n-grams;

maximum use of memory for storage of the n-grams;

rapid retrieval and determination of the logic number of the n-gram for identification of it in the text.

Table 2. Characteristics of n-Letter Combinations of Text 1

Число (1) букв в сочетаниях	Общее число сочетаний (2)	Число порожденных сочетаний (3)	Число оригинальных сочетаний (4)	Коэффициент дублирования (5)
I	I49705	-	-	-
2	-	35494	597	59,453
3	-	28902	2562	II,28I
4	26532	22666	4I67	5,439
5	223I9	I6372	3980	4,II3
6	I8303	II669	3254	3,586
7	I4604	8I22	2469	3,289
8	II338	5798	I844	3,I44

Key:

1. Number of letters in combinations
2. Total number of combinations
3. Number of generated combinations
4. Number of origianl combinations
5. Doubling factor

The following software systems have been developed at VNIPTIK VASKhNIL [not further identified] to investigate and compress text information and for subsequent working with it:

for creation of dictionaries of n-grams and for finding the statistical characteristics of text;

for creating a basic dictionary of words and substitution of the words by their numbers in the basic dictionary;

the method of code compression of the classifier item is outlined in [2];

for working with text information (search by code or by groups of codes, word or by group of words), first compressed by the method described above.

The first software system was tested experimentally in the file of the Information Classifier for use in the ASU-Selkhoz and the ASPR "Selskoye khozyastvo" (it includes 4,291 items). The main parameters of the investigated text and the characteristics of the text combinations are presented in Tables 1-3.

Table 3. Characteristics of n-Word Combinations of Text 2

Число(1) слов в сочетаниях	Общее число сочетаний (2)	Число порожденных сочетаний (3)	Число оригинальных сочетаний (4)	Коэффициент дублирования (5)
I	I7I68	II882	5286	3,72
2	6II9	4027	2752	3,66
3	3206	2I70	I026	2,90
4	I605	I540	65	2,52
5	I000	9I5	85	2,25
6	540	205	335	I,80
7	I55	II9	36	I,55
8	45	2	43	I,25
9	I	-	I	I

Key:

1. Number of words in combinations
2. Total number of combinations
3. Number of generated combinations
4. Number of original combinations
5. Doubling factor

The second and third software systems underwent sampling industrial operation (34,500 items) from a file of class 97 OKP "Products of plant-growing sectors" (Table 1).

Operation of the systems showed their effectiveness. Use of them permits retrieval of the necessary data for an unordered text request, which considerably simplifies the user's work. The presence of an alphetical dictionary of words provides the user with complete information about the composition of the classifier and essentially eliminates the possibility of an inadequate request. In the future, the texts can be corrected directly by words or groups of words, which is much more convenient than correction by the codes of items.

The joint operation of the systems permits one to obtain characteristics of data compression, close to theoretical, with simultaneous simplicity and accessibility of the information base.

The second and third systems can work with any classifiers, written in a format developed by GNITsVOK [Main Scientific Research Center for Management of All-Union Classifiers], and having write parameters that are the same as in classes 97 and 98 of the Common CEMA classifier of industrial and agricultural products. Because of this, they are easily built into automated classifier management systems of similar structure.

The use of the described method of text data compression opens up new capabilities of online solution of the class of problems, related to analysis and processing of unordered text information.

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6521
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UDC 681.34

STUDY OF ACCURACY OF HYBRID SYSTEMS WITH RANDOM TIME QUANTIZATION

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 8, Aug 86 (manuscript received 21 Jan 85) pp 47-51

[Article by A.S. Shalamov, Moscow]

[Abstract] Differential equations are presented for the probablistic moments of phase coordinates of a hybrid system with pulse-width and pulse-time modulation, in which the moments of quantization form nonintersecting Borelian sets. The equations define the accuracy of the system within the framework of correlation theory. An example is presented. References 7: 6 Russian, 1 Western.

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MODULAR METHOD OF BRANCHES AND BOUNDS

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 8, Aug 86 (manuscript received 9 Sep 85) pp 98-108

[Article by Yu.S. Afonin, Moscow]

[Abstract] An approximate method is suggested for determining an optimal search strategy which can be applied for all existing modifications of the method of branches and bounds, intended for the solution of problems of linear and nonlinear integer programming. The approach allows the improvement of solution quality by maximum utilization of computer memory. The method developed is based on modular branching. An approximate method is suggested for optimizing the branching method, and results of a computer experiment and numerical example are presented. Figures 5; references 18: 8 Russian, 10 western.

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USE OF SIGNAL SEQUENCES IN CONSTRUCTION OF TESTS FOR NETWORKS OF AUTOMATA. I. COMPUTATION OF GENERALIZED ASYNCHRONOUS SEQUENCES

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 8, Aug 86 (manuscript received 17 Jun 85) pp 118-126

[Article by A.G. Birger and Ye.T. Gurvich, Moscow]

[Abstract] A previous work has suggested a macroblock method for construction of tests for combination circuits, in which the functional units or macroblocks of each type correspond to special input-output sequences. A key in applying the method is the question of which sets of sequences of macroblocks must be considered in constructing a test. This article suggests an approach allowing "structured" construction of a test for networks of automata similar to the D algorithm of Roth, based on data concerning the way circuit elements convert sequences between their inputs and their outputs. An advantage of the method is that it allows analysis to be limited to D- and C-sequences, with sequences on different lines having different lengths, and the required coordination provided by the fact that time relationships are established between moments when values are changed. The method of constructing the basic system of displacements will be described in a later portion of the work. Figures 3; references 5: 1 Russian, 4 Western.

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TWO DIAGNOSTIC MODELS OF DISTRIBUTED DIGITAL SYSTEMS

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 8, Aug 86 (manuscript received 21 Jun 85) pp 127-134

[Article by Yu.Yu. Bogdanov, Moscow]

[Abstract] Digital systems consisting of interconnected blocks capable of testing each other were first studied in an article by Preparata, et al. This article introduces limitations to classical mutual testing models not previously analyzed, studying the possibility of maximum diagnostic capabilities of the system with these limitations. Procedures are suggested for interpreting the syndrome of the system as represented by two modifications of mutual testing diagnostic models. By solving the problem of finding the maximum independent set of points on a graph and the minimum point coverage, the system can determine the minimum list of elements which must be tested to define the actual system state unambiguously. Figures 3; references 5: 2 Russian, 3 Western.

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SYNTACTICAL ANALYSIS USING CELLULAR-AUTOMATA GRAMMARS

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 8, Aug 86 (manuscript received 22 Jul 85) pp 144-155

[Article by A.I. Prangishvili, Tbilisi]

[Abstract] A new principle is suggested for constructing a parallel syntactical analyzer, utilizing matrices of cellular automata. High speed is achieved by parallel processing of input text, processing time being independent of text length. Examples of application of the principle are presented for context-free and context-dependent grammars. Figures 8; references 3: Russian.

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EXISTENCE AND DESIGN OF STABLE MODES IN RELAY SYSTEMS

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 4, Apr 86 (manuscript received 14 Jun 85) pp 16-23

[Article by A.V. Pokrovskiy, Moscow]

[Abstract] An algorithm is suggested for computation of forced oscillating modes in systems with nonlinearities. The question of the presence in such systems of stable periodic modes and their approximate design arises in a number of control theory problems. A class of systems is suggested which allows effective study and includes a description of many physical and technical objects. References 10: Russian.

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UDC [53.072:51]:519.272

MATHEMATICAL MODELING OF HETEROGENEOUS RANDOM FIELDS AND UNSTEADY PROCESSES

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 4, Apr 86 (manuscript received 25 Feb 85) pp 56-67

[Article by Yu.I. Palagin, S.V. Fedorov and A.S. Shalygin, Leningrad]

[Abstract] The method of parametric models is extended to heterogeneous random fields and unsteady processes. It is noted that parametric models, in contrast to autoregression models, allow modeling of steady random processes

and homogeneous random processes with arbitrary spectral density, and do not require the preliminary computations needed to determine autoregression parameters. The class of random functions analyzed includes locally homogeneous random processes and quasi-steady random processes. The parametric models generated provide a simple and adequate method of modeling heterogeneous random fields and unsteady processes described by an expansion which includes quasi-homogeneous random processes with variable parameters as one particular case. Figures 2; references 28: 27 Russian, 1 Western.

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METHODS OF CONTROL IN ADAPTIVE SYSTEMS WITH AN IDENTIFIER WITH CONSTANT AND VARIABLE CONDITIONAL DISPERSION

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 4, Apr 86 (manuscript received 15 Apr 85) pp 91-97

[Article by D.M. Lepskiy and F.A. Ovsepyan, Moscow]

[Abstract] Adaptive control systems with identifiers are effective for control of production processes with uniform products. The greatest value of residual dispersion defines the interval of variation of the output variable, known as the tolerance field. If all possible values of residual dispersion are within the tolerance field for the end product control seeks the mean value, otherwise control must assure the mean value of the output quantity and find the various values of residual dispersion within the field of tolerance of the end product. These methods are implemented by different control systems, which are analyzed in this article. An example is presented. Figures 3; references 6: Russian.

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ONE APPROACH TO DETERMINING DEFECTS IN LINEAR DYNAMIC SYSTEMS

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 4, Apr 86 (manuscript received 18 Apr 85) pp 157-163

[Article by G.G. Paramonova, Moscow]

[Abstract] A linear stable system is studied, defined by a structural plan with a certain number of functional component subsystems, which satisfies the conditions of observability and identifiability both in the properly operating and defective states. The problem is, having available a description of each

component of the system diagnosed in the form of a transfer function, knowing the structural plan of the system and observing the input and output signals of the system, determine the defective component. The distinguishing features of the approach suggested in this article are that: A new algorithm is suggested for the search for the defective component, based on analysis of the set of systems of linear algebraic equations for compatibility; the class of defects which can be detected is expanded; and an estimate is presented of the sensitivity of the approach when identification errors occur. The approach is presented in terms of analog systems, all computations are correct for linear discrete dynamic systems and the approach is distinguished by the fact that the matrix in the system is calculated once for each system component, can be stored in computer memory, and allows the beginning of deviation of coefficients of the transfer function of the defective component to be trapped. References 3: Russian.

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LEST WE REINVENT THE WHEEL

Baku BAKINSKIY RABOCHIY in Russian 23 Jan 87 p 3

[Article by D. Mekhtiyev, professor, director of AzNIINTI, under the rubric: "Patent Service": "Lest We Reinvent the Wheel"]

[Text] Nearly a million patent documents are published annually in the world, and we need to study this material for the most recent five to eight years, by country where the field is most developed, to determine the technical level a particular area of technology. To register a claim for a proposed invention, it is necessary to search the world's design novelties to determine that the proposed invention does not duplicate an already existing one, in other words, to not "reinvent the wheel".

To conduct a search of the enormous amount of patent documents by traditional methods is work of rare labor-intensiveness. Recently, in Azerbaijan, an Integrated System of Analysis, Improvement, and Data Base for Inventions and Patent Licensing Work was introduced. Opportunely, the visitors to the USSR VDNKh [USSR Exhibition of Achievements of the National Economy] can now become acquainted with it. At this main exhibition in the country, the experience is presented of those from Baku that developed this system, which has already had a great effect. But what does it represent?

Equipped with the most modern automated subsystems within the scope of the integrated republic systems, the "Vektor II" and "Paris" make it possible in a number of minutes to obtain information on the flow of inventions registered in the 49 most developed countries, and in the international and European patent departments. In addition, it provides completeness of the documents sent, which is important when determining the purity of engineering objects and novel solutions, when exporting products abroad.

The services of the system are already being used by a number of associations, enterprises, and organizations of the republic. For example, the Lakokraspokrytiye Production Association, Baku Chemical-pharmaceutical Plant, and the Institute of Petroleum and Chemical Processes of the republic's Academy of Sciences...

However, many scientific-technical institutes and design bureaus, when approving plans and beginning research, do not conduct a thorough patent search for novel subjects, as the GOST in effect requires. And there, where

this work is being done throughout the country, great expenditures are being made of resources, labor, and time, with no guarantee of completeness of the search. Obviously, this is one of the main reasons that, on the whole in the republic, nearly 50 percent of the designs are not recognized as inventions due to a lack of novelty.

Another automated subsystem provides for rapidly making copies of descriptions of domestic and foreign inventions.

When designs of plans for the economic and social development of the republic, ministries, departments, and enterprises are being drawn up, proposals are prepared with recommendations for implementation. In only the years of the last Five-Year Plan, nearly 3,000 inventions were proposed for use in the republic's economy, of which more than 500 were highly effective, with each of them yielding savings of over 100,000 rubles a year.

The system provides for a number of forms of publicity, but it is desirable to stay with the exhibitions and the open examinations of patent literature. In this way, there is the possibility to rapidly pick out descriptions of designs that are of the immediate interest for a specific segment of production. Last year, exhibitions and open examinations of patent documentation were conducted at the following plants: Electrotsentrolit, Azerelektroterm, Busbar plant imeni Vorovskiy, and others. Descriptions of inventions were presented in the fields of welding, heat treatment, rotary-container lines, robots, test devices...

The fact that anually, one-third of the inventions introduced in the republic were recommended by our institute testifies to the effectiveness of the system. The economic benefit from introducing the inventions amounted to more than 3.5 million rubles.

The documentation in the system, combined with the GOSTs, standards, and industrial catalogues, makes it possible for the developer to determine the technical level, novelty, and overall quality of the industrial articles being created and manufactured.

It is recommended to gather and store a stock-pile of documents on domestic and foreign production prototypes, editions of catalogues of prototypes, effective trademarks, as well as procedural assistance.

In the current Five-Year Plan, there has to be further improvement in the republic's system of patent information, within the scope of its interaction with the similar State system and data base organization, facilitating the creation and production of machines, instruments, production processes and materials, providing a high level of output production. This is one of the most important tasks facing our economy.

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CREATING DATABASES FOR SPARE PARTS FOR COAL MACHINE-BUILDING PRODUCTS

Moscow KLASSIFIKATORY I DOKUMENTY in Russian No 12, Dec 86 pp 13-15

[Article by K. V. Lotsmanov, Candidate of Economic Sciences, O. F. Mikulina, Candidate of Physicomathematical Sciences, and M. A. Kaporskaya, VNIIU ugol]

[Text] One of the most important problems at the OASU ugol [Sector Management Automation System for the Coal Industry] is management of the production, distribution, storage and accounting for spare parts for coal machine-building products.

An sector automation subsystem for support and use of spare parts for coal machine-building products Zapchastugol is being developed at the sector management automation system for solution of the given problem. A distributed data bank is being developed to support problems of the Zapchastugol subsystem with relatively permanent information. The data bank is a complicated hierarchical terriorially distributed sector classifier and normative management automation system (OASVKNz), designed for accumulation and multiaspect multiaccess data for finding the necessary information.

The organizational and functional structure of the system encompasses all planning levels in the sector:

first--mine and shop sections of enterprises;

second--mine, enterprise;

third--production association and VPO [All-Union Production Association];

fourth--the ministry.

Communications with central planning organizations--USSR Gosplan and USSR Gossnab--is provided in the structure of the distributed data bank.

The data bank consists of the database system with respect to spare parts for coal machine-building products:

a centralized information base of the sector classification and coding system--TsIB OSKK (it includes lists and nomenclatures of OKTESPugol [not further identified]), stored at the main computer center of USSR Minugleprom [USSR Ministry of the Coal Industry]; a classifier of spare parts for coal machine-building products, which includes the notation of spare parts according to a depersonalized classification system of product notation and design documents (YeSKD [Unified Design Documentation System]), is managed within the framework of TsIB OSKK;

database of the sector standards and norms classifier, which is managed on a central basis at the Main Computer Center of USSR Ministry of the Coal Industry;

numerical values of the standards and norms used in the system, which are stored either in the databases of the head service of the integrated automated standards and norms system (main computer center) or in the databases of functional subsystems of different management levels (IVTs [Information Computer Center] of production associations and the computer center of plants);

database of tracking the status of norm management (main computer center);

standard-forming factors used in calculations of standards and norms, stored either in the databases of functional subsystems or in databases of different management levels (information computer center, computer center of plants), specially developed for these purposes;

price databases for spare parts and wholesale price databases for spare parts (main computer center and information computer center of production associations).

Relatively permanent information is managed on a central basis in centralized databases and is used on a distributed basis--according to the needs of a specific level. Relatively permanent information, which is intended only for functional tasks of a given level, is managed in the databases of this management level. Thus, spare parts consumption standards are managed at the manufacturing plant's computer center. The head service of the integrated automated standards and norms system at the main computer center manages the sector-average norms of spare parts consumption.

The organizational and functional structure of the Zapchastugol system and the distributed data bank provide a single procedure for use of spare parts in the sector and for representation of information about them in individual management phases:

calculation of standard needs for materials to manufacture spare parts;

planning the needs for materials to manufacture spare parts;

planning the production of spare parts, manufactured by machine-building plants and the repair enterprises of the associations;

determination of the need for spare parts and working out supply plans;

distribution of funds for spare parts through all management levels;

production of spare parts and delivery of them to consumers and monitoring the deliveries;

supply of consumers with spare parts;

movement of spare parts in consumer enterprises.

Development of unified data management and organization (standardization of documents, development and use of unified rules of formalization of natural language and classification and coding systems) and also the use of single algorithms for calculation of standards and norms are provided to achieve compatability of tasks of the Zapchastugol subsystem. Standards and norms are calculated according to the requirements of sector procedural documents. Data on procedural documents and instructions, on the basis of which the standards are calculated, are managed in the database for tracking the status of norm management.

The databases in a distributed data bank are connected to a single information network by communications channels, which permits the use of relatively permanent information in the online mode, to maintain data in a timely status and to ensure their high reliability.

The following requirements should be taken into account when creating a data bank:

minimization of errors in preparation of input information;

optimization of the technology of actualizing the information in the system, which ensures the required reliability of the information;

minimization of the response time of the system when servicing users in the "question-answer" mode;

minimization of total information flows;

support of multimodel representation of data, which permits one to select the most suitable representation of the data to be processed for each application.

The spare parts data bank is also used when establishing intersector economic relationships of enterprises and organizations of different management levels for automation of data processing.

Intercommunications of OASUugol, the automated management systems of associations, plant management automation systems and the automated design work information system (AISKR), which is the most important prerequisite for

realization of information compatibility of the tasks in the indicated systems, will be achieved on the basis of a distributed data bank.

Thus, the problem of unity of representation, reliability and timeliness of relatively permanent information when supplying spare parts for coal machine-building products and use of them, which yields a significant national economic effect, is solved with regard to modern requirements on database management and organization systems upon creation of a distributed data bank.

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UNIONWIDE CLASSIFIER OF TECHNICAL AND ECONOMIC INDICATORS IN HEAVY AND TRANSPORT MACHINE BUILDING SECTOR

Moscow KLASSIFIKATORY I DOKUMENTY in Russian No 12, Dec 86 pp 16-18

[Article by A. D. Arsyukova and A. V. Shandor, Main Information Computer Center of USSR Ministry of Heavy Machine Building]

[Text] A sector division of the Unionwide Classifier of Technical-Economic and Social Indicators has been introduced and operated in the heavy and transport machine building sectors since 1982. This work is conducted in several directions:

modification of the sector division of OKTESP [Unionwide Classifier of Technical-Economic and Social Indicators];

compilation of a fund of descriptions of specific indicators used at ASUtyazhmash [possibly automated management system for heavy machine building];

use of standardized names of indicators in documents, worked out within the framework of ASUtyazhmash subsystems.

The sector division of OKTESP was modified on the basis of analysis of input and output forms of 20 subsystems of ASUtyazhmash of the first, second and third stages and of the forms of the certificate of the production association (enterprise). The indicators were systematized, the features according to which the indicators were aggregated were determined, the master items of the economic indicators were determined and the generalized classification structures (bases) are given.

The result of this work was 30 new master items, recommended for inclusion in the OKTESP and also new lists and items for supplementation of existing lists.

A logical continuation of the work on introduction of the OKTESP and on analysis of the names of the technical and economic indicators for ASUtyazhmash documents to manage and improve the OKTESP was work on creation of a descriptions fund of specific indicators used at ASUtyazhmash.

Means of formalized description of indicators (SFOP), the basis of which is the OKTESP, were worked out for organization of a fund of descriptions of the indicators. The means of formalized description of indicators provide:

single description of specific indicators, i.e., unit inidicators (unlike the OKTESP, which describes a multiple indicator), identical in meaning, but different in formulation;

compatibility of specific indicators in different aspects.

The descriptions fund of indicators is a list of tables of indicators that contain complete information about a specific indicator: the OKTESP code, standardized name, functional, time and other characteristics, location of the indicator in the input document of ASUtyazhmash, time of formulation, frequency of use and so on.

The fund of indicators is used:

to determine and exclude cases of duplication of indicators in ASUtyazhmash at the input and output of the system;

to determine interrelationships of documents, tasks and subsystems of ASUtyazhmash for further improvement of the sector automated management system;

to design databases for the database management system.

The terminological data on different readings in the names of identical indicators was analyzed during creation of the fund of indicators, which made it possible to construct a query language for an information reference system of technical and economic indicators in natural language.

The names of the indicators in documents, developed within ASUtyazhmash, are standardized according to the "Procedural instructions on standardization of the meaningful part of forms of ASUtyazhmash documents," prepared on the basis of OKTESP and SFOP.

Standardization of the names of indicators in documents provides:

clear interpretation of technical and economic indicators in documentation of the same type;

elimination of redundant text information;

support of compatibility of technical and economic indicators of different forms of documents;

provision of capability of effective organization of data processing, storage and retrieval using computer hardware.

A total of 175 sector forms of documents at the input of ASUtyazhmash was worked out by using standardized names of indicators and is issued at the output as a result of solving tasks of 1,176 forms of documents.

OKTESP is now the only classifier in the country that ties in the use of all unionwide classifiers in formalized description of technical and economic indicators. OKTESP provides the best conditions for machine processing of data according to meaningful features and provides effective organization of storage and retrieval. The OKTESP language is accessible to both the user and the computer. OKTESP will be the common language of information reference systems to be developed in different sectors.

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NOMENCLATURE CLASSIFICATION OF QUALITY INDICATORS OF NONFOOD MERCHANDISE

Moscow KLASSIFIKATORY I DOKUMENTY in Russian No 12, Dec 86 pp 18-23

[Article by T. M. Maksudov, Candidate of Technical Sciences, Samarkand Cooperative Institute]

[Text] Merchandise has a consumption and exchange cost. Consumption cost of merchandise is understood as the combination of morphological (constructive) indicators and consumption properties, due to which the merchandise satisfies specific needs of buyers. The useful properties of merchandise, manifested during its consumption or operation, are called consumption properties.

Morphological (constructive) indicators are made up of indicators of the raw material composition of the merchandise, the macrostructure and design of the merchandise. The term "constructive indicators" is usually employed with respect to various types of domestic equipment (electric equipment, electric appliances, photo and movie equipment, clocks and watches, transport vehicles, sports and hunting weapons and musical instruments) and the term "morphological indicators" is used with respect to the remaining merchandise.

Consumption properties characterize the quality of merchandise and morphological (constructive) indicators characterize its variety.

The term "consumer properties" is used in some cases instead of the term "consumption properties" in the literature. However, the use of the adjective "consumer" is valid only in word combinations of the type "consumer requirements," "consumer package" and "consumer unions," i.e., we are talking about consumers rather than consumption.

The use of the term "property" with respect to morphology (design) and indicators of the economy of merchandise is also insufficiently substantiated. The property of merchandise characterizes its internal state, the degree of manifestation of which is dependent on operating or consumption conditions, i.e., the dynamism of a state is inherent to the "property," while morphological (constructive) and economic indicators are always fixed and static.

The term "parameter" used in GOST [State Standard] 15467-79 "Product quality control. Basic concepts. Terms and definitions," can be used as a synonym term "morphological (constructive) indicator" only in the sense of manufacturing-technical goods.

The exchange value of merchandise expresses the amount of social necessary labor expended on its manufacture. The economic indicators (materials consumption, labor intensiveness and energy consumption of manufacture, maintenance and operating expenditures and so on) and technological properties (complexity of manufacture, degree of automation and mechanization of production, standardization factor, patent purity and so on).

The quality and technological effectiveness indicators of nonfood merchandise are the quantitative charasteristics of their consumer and technological properties.

Thus, full groups of indicators--quality, morphology (design), economic and technological--are typical for merchandise. The consumer is interested primarily in the first three groups.

The indicated groups were reflected in the State Standards of the Product Quality Indicator System. Problems of classification of indicators in the standards of this system are considered below. All groups of quality indicators of nonfood merchandise are combined under the name "quality indicators."

When properly grouping quality indicators of nonfood merchandise, one should proceed from classification of the needs which they must satisfy due to their consumption properties. Personal needs are divided into material, intellectual and social. The consumption properties of goods are divided into functional, aesthetic and ergonomic, respectively. Properties of reliability in consumption, which manifest other named properties over time, comprise a special group. Four groups of quality indicators correspond to four groups of properties of goods.

The results of analyzing the classification of quality indicators, morphology (design), economy and technology of nonfood merchandise are presented below in existing standards.

Classification of the indicators on the basis of the outline theoretical prerequisites is given in the table and the presence of allocated groups of indicators in 37 State Standards of the System of product quality indicators is shown. As can be seen from the table, the indicators in the standards, confirmed during the past few years, are more complete than those confirmed earlier.

However, there are a number of classification and terminological deficiencies in these standards:

1. Functional indicators of quality are distinguished into an independent group or subgroup in only 6 standards (GOST 4.12-81, GOST 4.143-85, GOST 4.344-85, GOST 4.362-85, GOST 4.381-85 and GOST 4.420-86). This means that insufficient attention is devoted to the functional indicators of quality, which express qualitatively the most important properties of the merchandise that determine its suitability for use according to designation.

Номера (1) стандартов	Показатели качества товаров (2)				(7) Морфологические (конструктивные) показатели	Экономические показатели (8)	Технологические показатели (9)
	функциональные (3)	эстетические (4)	эргономические (5)	надежность в потреблении (6)			
4.4-83	+	+	+	+	+	-	+
4.5-83	+	+	+	+	+	-	-
4.6-85	+	+	-	+	+	-	+
4.I2-8I	+	+	+	+	-	-	-
4.I3-83	-	+	-	+	+	-	-
4.25-83	+	-	+	+	-	-	-
4.34-84	+	+	+	+	+	-	-
4.47-83	+	+	-	+	+	+	+
4.49-78	+	-	+	+	+	+	-
4.60-80	+	+	+	+	+	-	-
4.65-80	+	+	+	+	-	-	+
4.66-84	+	+	+	+	+	+	+
4.69-8I	+	+	+	+	+	-	-
4.7I-8I	+	+	+	+	+	+	+
4.74-82	+	+	+	+	-	-	+
4.75-82	+	+	+	+	+	+	-
4.88-83	+	+	+	-	-	-	-
4.9I-83	+	+	+	+	-	-	+
4.94-83	+	+	+	+	+	+	-
4.I33-85	+	+	+	+	+	+	+
4.I43-85	+	-	+	+	+	+	+
4.I6I-85	+	+	+	+	+	+	+
4.206-83	+	+	+	+	+	+	+
4.2I5-8I	+	+	+	+	+	+	+
4.228-83	+	-	+	+	-	+	+
4.229-83	+	+	+	+	-	+	+
4.230-83	+	+	+	+	+	+	+
4.344-85	+	+	+	+	+	+	+
4.362-85	+	+	+	+	+	+	+
4.38I-85	+	+	+	+	+	-	+
4.39I-85	+	+	+	+	+	+	+
4.392-85	+	+	+	+	+	+	+
4.394-85	+	+	+	+	+	-	+
4.397-85	+	+	+	+	+	+	+
4.398-85	+	+	+	+	+	+	+
4.408-85	+	+	+	+	-	+	+
4.420-86	+	+	-	+	+	-	-

Key:

1. Numbers of standards
2. Indicators of merchandise quality
3. Functional
4. Aesthetic
5. Ergonomic
6. Reliability in use
7. Morphological (constructive) indicators
8. Economic indicators
9. Technological indicators

2. Economic indicators are allocated in almost all standards to a group of "technological effectiveness" indicators. Such indicators as "utilization

factor of material" (GOST 4.47-83), "consumption of wood particles" and "consumption of binder" (GOST 4.49-78), "labor intensiveness of manufacture" (GOST 4.65-80), "materials consumption" (GOST 4.66-84), "total production cost of product" (GOST 4.71-81), "specific consumption of materials" (GOST 4.94-83), "specific energy consumption" (GOST 4.206-83), "specific product cost" (GOST 4.391-85) and "specific technological product cost" (GOST 4.362-85) characterize more the economy of merchandise than the technological effectiveness of production. It is another matter with the indicator "degree of mechanization and automation of production," which, according to GOST 4.230-83, is related to technological indicators. One can also include here "indicators of production execution" (GOST 4.91-83, GOST 4.394-85), "indicators of the level of execution" (GOST 4.49-78, GOST 4.65-80) and "stability of quality indicators" (GOST 4.206-83, GOST 4.215-85, GOST 4.228-83, GOST 4.230-83), which cannot be distinguished into an independent group.

3. The parallel existence of related indicators is encountered in some standards. For example, there is no need to distinguish "comfort indicators" (GOST 4.91-83) in the presence of the group "ergonomic indicators." The "degree of luster" and "water-(light) resistance of paint coating" are distinguished into the independent group "indicators of surface properties having protective-decorative coating) in GOST 4.91-83 and GOST 4.394-85, although there are the groups "aesthetic indicators" and "reliability indicators" in the standards. The indicators "external appearance," "color" and "odor" have been established independently in an additional group "quality characteristics" in GOST 4.391-85 parallel with the group "aesthetic indicators." "Indicators of resistance to external effects" (GOST 4.408-85, GOST 4.420-86) or "indicators of resistance to temperature effects" (GOST 4.362-85) are found in some standards, along with "reliability indicators." The indicator "stability" in GOST 4.381-85 and the indicator "resistance to dilution by water" in GOST 4.391-85 in the presence of the same group are located in an additional group "quality characteristics." The "power consumed by the meter" in GOST 4.392-85 is included in the group "indicators of designation," although there is the group "economic indicators."

4. The indicators are given in some standards without the necessary heading. For example, the morphological (constructive) indicators and reliability indicators in consumption are located in one group under the name "indicators of designation" in GOST 4.49-78 and GOST 4.66-84. All indicators are presented under this name in GOST 4.60-80. The indicator "resistance of decorative coatings to effects of saliva, perspiration and moist handling" in GOST 4.88-83 is included in the group "ergonomic indicators." GOST 4.12-81 in the group "functional indicators" includes "guaranteed wearing life," "strength of thread attachment of parts of footwear blanks," "strength of attachment of sole parts," "strength of attachment of heel" and other indicators of footwear life. GOST 24886-81 "industrial consumer goods. Selection of nomenclature of consumer properties and quality indicators. Main regulations," RD 50-64-84 "Procedural instructions on development of State Standards, which establish the nomenclature of the quality indicators of groups of homogeneous products" and RD 50-435-83 "Procedural instructions. Order of developing State Standards with promising requirements in scientific research work to determine prospects of developing groups of homogeneous products" proposed that indicators of

designation be divided into two groups: functional and technical effectiveness and constructive (for machine-and instrument-building products) or of composition and structure (for natural raw material and food, materials and products).

Based on these procedural instructions, GOST 4.397-85 and GOST 4.398-85 include the "type of motor product" and "type of bicycle" respectively in the nomenclature of quality indicators, while GOST 4.47-83 and GOST 4.143-85 include "consumer type of product" and "classification indicators." At the same time, these indicators characterize the variety rather than the quality of merchandise, specifically, the conformity of the product to the needs of a specific group of users. Merchandise can be designated according to the degree of comfort or level of functional properties for different groups of consumers, for example, for professionals or amateurs, young people or teenagers; merchandise can also be divided into everyday, fashion and so on.

Indicators of designation play an important role in evaluating the quality and formulation of the variety of goods. Therefore, they must be included in the standards, but only together with the morphological (constructive) indicators to the groups "indicators of variety." Accordingly, it would be more accurate to call the System of product quality indicators the System of quality indicators and product variety.

It is recommended that the basic norm-technical and procedural documents (GOST 24886-81, RD 50-64-84 and RD 50-435-83), along with consumer, morphological (constructive), economic and technological indicators in the standards, be distinguished into independent groups "standardization and unification indicators," "patent-legal indicators," "transportability indicators," "ecological indicators" and "safety indicators." Such division of the list of indicators led to the fact that the number of groups of indicators exceeds 10 in some standards (GOST 4.362-85, GOST 4.392-85, GOST 4.397-85 and GOST 4.344-85).

To improve the visibility of the groupings, the first two groups can be combined with the groups "technological indicators," since they characterize the ease of assembly and competitiveness of the merchandise on the foreign market, while the last three groups are included in the group "ergonomic indicators," since they characterize the convenience of transport, harmlessness and safety of use.

This has exactly been done in some standards: the group of ergonomic indicators, for example, includes those such as "discharge of harmful chemicals into the environment" (GOST 4.49-78), "concentration of harmful chemicals discharged into environment" (GOST 4.228-83), "static electrization" (GOST 4.49-78), "indicators of discharge of noxious materials" (GOST 4.75-82) and "absence of nonfunctional sharp corners" (GOST 4.88-83).

The scientifically substantiated system of classification of quality indicators, morphology, technological effectiveness and economy of merchandise makes it possible to eliminate differences in interpretation of terms, to increase the quality of standards of the System of product quality indicators and will

provide the possibility of using them as basic indicators when working out standards for types of products.

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STANDARDIZATION OF MANAGEMENT DOCUMENTS - ONE OF METHODS OF QUALITATIVE INCREASE OF THEIR EFFECTIVENESS

Moscow KLASSIFIKATORY I DOKUMENTY in Russian No 12, Dec 86 pp 24-28

[Article by V. I. Kokorev, Candidate of Technical Sciences, Moscow State Historical-Archives Institute]

[Text] Current tasks of standardization changed as standardization of management documents developed with a fixed goal--an increase of management efficiency. Standardization of documents was directed toward elimination of unjustified variety of forms of documents in the USSR and abroad during the 1960s. This is the first task of standardizing them.

The expenditures for preparation and processing of documents were reduced as a result of the fact that one or several varieties of them were used instead of a large number of forms without loss of content of the forms that replaced the previous forms. Thus, the number of forms was reduced by a factor of 100 in working out 27 State Standards for business-administrative documents (ORD) in 1969-1970 and the number of forms of merchandise-cover documents for foreign trade was reduced by a factor of 10 in working out GOST 6.37-72. A saving was achieved as a result of reducing expenditures for preparation of forms, for preparation of documents, for training specialists to work with documentation and for processing documentation.

However, the most effective requirements for design of forms (requisites of business-administrative documents do not begin with the name of the document, which would be more convenient when entering data into the computer, the code fields of merchandise-covering documents are distributed throughout the document, although it would be more convenient to combine them in 1-2 zones and so on) were not standardized during this work; therefore, it was necessary to convert to the next phase of document standardization, which envisioned the acquisition of the characteristics of documents, statistical processing of them and comparison of versions. This made it possible to go onto solution of the second problem--to standardize the requirements, the comparitive effectiveness of which was greatest. In this case, standardization made it possible to use the experience of unification of documents of individual organizations and to use this experience on countrywide scales, since the requirements for the forms

of documents were established by State Standards. Thus, standards for business-administrative documents (GOST 6.38-72 and GOST 6.39-72) and for documents used in foreign trade (GOST 6.2-73, GOST 6.4-70, GOST 6.5-70 and so on) were prepared.

When developing State Standards for a group of documentation systems, when seven standards for formulas-models were confirmed simultaneously (GOST 6.11.2-75, GOST 6.12.2-75, GOST 6.13.2-75 and so on), the first of the named problems was solved, i.e., the unjustified variety of documents was reduced, in fact without selecting the most effective requirements for them, but with retention of the established traditions in design of documents. The approach used in solving the first problem was substantiated by the fact that requirements for the forms of documents, traditionally confirmed by different departments (TsU SSSR [USSR Central Statistical Administration], Minfin SSSR [USSR Ministry of Finance], Gossnab SSSR and so on), were first subjected to interrelated State Standardization.

Proposals were advanced in 1980 on solution of the third problem--selection of those parameters of forms of documents which would make it possible to achieve a maximum saving on expenditures when using them, i.e., to convert to optimization of the forms of documents [1]. The following formula

$$Ц = Э/З \rightarrow max, \qquad (1)$$

where Э is the effect in management due to improvement of the forms of documents and З is the expenditures for standardization of the forms of documents and preparation of them at all stages of processing storage, was used as a specific function.

To simplify solution of the problem at this phase, it was assumed that Э = const, i.e., it was assumed that improvement of the forms of documents has no effect in management. However, improvement of the forms of documents by reducing a time for preparation of them leads to an increase of the currency of management, while improvement due to reducing the number of errors leads to an increase of the accuracy of decision-making. To use the given assumption, it was assumed that all the errors occurring in readout of documents are corrected in that expenditures for correction of them are included in the total sum of expenditures for preparation and processing of documents.

The time expended on preparation and processing of documents is reflected in the value of З, since there is a direct dependence of expenditures on time in most technological processes of working with documents. Under these conditions, the specific function was transformed to a simpler form

$$З \longrightarrow min\ . \qquad (2)$$

This approach made it possible to refine the parametric series of paper formats for management documents, to select the most efficient values of spacing of the letter and spacing of the lines of printers and to work out proposals to increase the effectiveness of existing standards [1].

It is important to the national economy to reduce expenditures for documentation, but it is even more important to increase the effectiveness of management, i.e., due to achieving a saving in management, expenditures frequently justifibly go to increase expenditures for documentation. Thus, State accounting on introduction of standards was introduced. This required development of additional documentation, expenditures on preparation and processing of documents were increased, but the responsibility of industry for introduction of the standards was increased. However, the effect in management due to introduction of new documents is overestimated in many cases and development of documents is required, the benefit from which does not always justify expenditures. Quantitative analysis is necessary to estimate the feasibility and achieving it is the fourth problem in standardization of documents. One can find this estimate also by using the specific function (1) if one assumes that Э is the total annual saving due to improvement of the content and form of documents by standardizing them.

Improvement of content as a result of standardization can traditionally be expressed in establishing unified requirements on the indicators and requisites of documents, but these requirements should also establish rules by which one can solve the problem of the feasibility of including a specific set of requisites in a document and, in the final analysis, of the need to create the entire document. The method of calculation of Э and З for specific systems or groups of documents, of norms which are required for rapid calculations and the maximum values of the specific function (Ц in expression (1)), below which creation of useful documents is stopped and harmful creation of paper begins, should be standardized. Calculation of these maximum values should be accessible not only to specialists of people's inspection organizations of Gosstandart or of department inspections, but also should be accessible to any public committee.

This method can also be used to estimate the feasibility of creating standards, especially business-procedural standards. This would make it possible to establish their usefulness at the stage of development and then to confirm and introduce them on a substantiated basis.

Let us consider as an example of solving the fourth problem, the feasibility of standardizing business-administrative documentation (ORD). GOST 6.38-72 and GOST 6.39-72 will be regarded as documents, for which the effect due to use and expenditures on their creation and introduction must be determined.

The saving in wages upon introduction of these standards and of specific expenditures, related to development and introduction of State Standards for business-administrative documentation, is calculated. It follows from these calculations that Э = 120 million rubles/year and З = 171 million rubles on a countrywide scale, i.e., Ц = 0.7 from expression (1). Taking into account that standards are usually in force for more than 5 years and that the standards GOST 6.38-72 and GOST 6.39-72 under consideration are in force for more than 13 years, the derived value of Ц = 0.7 is quite acceptable, since it corresponds to a return of investment of $T_{ок}$ = 1.4 year and these standards are repaid no less than tenfold during their effective period (review of them is not yet planned).

Based on the fact that other standards for documentation should not be significantly lower in effectiveness then those under consideration, the minimum normative value $Ц_{н}$ could be established, for example, at $Ц_{нс}$ = 0.5 (the minimum return of investment is 2 years). The value of $Ц_{н}$ for other groups of documents should be considerably greater, for example, a significant part of the management documents is effective within a year and it is obvious for them that $Ц_{ну} \geq 2$. This norm could be determined more accurately after subtraction of its actual value for different groups of documents, including those whose benefit has not been proved (so that a significant part of them are beyond the limits of the norm).

It is simpler to determine expenditures for preparation and processing of documents. Expenditures for preparation of mass documents were determined in the Soviet Union and abroad [1], but far from all labor-intensive and distributed types of documents. Considerable expenditures for processing the created documents, storage of them and preparation of new documents for confirmation that they have been executed are still more significant. One must being selective accounting of the time expenditures of executors and of materials during the entire life cycle of the basic types of documents so as to find the normative expenditures for one document as a result of statistical processing and calculations as a function of its type, the level of creation and methods of preparation and processing.

It is more complicated to determine the effect on management due to the use of a document or of its separate indicators and requisites. Two methods are possible: determination of the extent of losses, which occur if there is no document or a part of it, and estimation of the expenditures upon replacement of documentation by another method of information storage and transmission.

The values of Э and З for different types of documents must be determined in practice and the method, use of which will make it possible to make a decision on the feasibility of using them upon unification and standardization of documents, must be prepared on this basis.

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EXPERIENCE OF AUTOMATED SPECIFIC LIST MANAGEMENT

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[Article by L. P. Akimov and A. B. Zaikin, All-Union Scientific Research and Design Institute of Ministry of Foreign Trade]

[Text] Introduction of a Common CEMA classifier for industrial and agricultural products (OKP SEV) largely provides information compatibility of the automated management system at the All-Union level, but the Unified merchandise list (YeTNVT), having a classification system different from the OKP SEV [1]. Therefore, the problem of managing this list, which is based on the Common classifier of industrial and agricultural products, but differs from it by the methods of coding and by the values of the codes of objects, occurs.

An automated specific list management system for machine and equipment export (TsNE), in which the list of export goods, based on OKP SEV, YeTNVT and local classification systems, is managed, was developed at the Ministry of Foreign Trade when creating the automated export planning system. Integration of all the lists provides information compatibility of the problems to be solved in the system.

Each record in the product (merchandise) database has the following properties:

a key (working) code based on the Unified foreign trade merchandise list;

the code of the Unified foreign trade merchandise list;

the code of the Common CEMA classifier of industrial and agricultural products;

the code of the unit of measurement;

the code of the next group of the key code;

the code of the next group of the Common CEMA classifier of industrial and agricultural products;

features of entering the merchandise in the lists according to various planning profiles (list features);

a list of the merchandise.

The YeTNVT code consists of 7 characters. The key code of the merchandise is usually an expanded (up to 10 characters) YeTNVT code and in some cases differs in structure from it.

With regard to the fact that the OKP SEV codes and key codes of merchandise may have other than a hierarchical structure (zero groupings), a coding method, based on the principle of reference numbers, is used when managing the specific machine and equipment export list. To do this, the properties include codes of groupings, which are calculated automatically for codes of the hierarchical structure, while the grouping code is assigned to a user when using zero groupings.

The key code performs all calculations in the system and is the main code when managing the specific machine and equipment export list. However, a rather simple conversion to using the OKP SEV code as the key code is possible [1]. Using different features in planning ensures that output information will be obtained from the system in the necessary list profiles.

The main principles of managing the specific machine and equipment export list are the following:

users, which increase the reliability of data, are responsible for the content of the specific machine and equipment export list;

the input data are checked and edited automatically;

all data are subject to input into the database, with the exception of those which cannot be identified automatically;

the merchandise first entered in the specific machine and equipment export list is coding automatically;

so-called ownerless groups for incorrectly prepared data, which cannot be refined automatically, are created in the specific machine and equipment export list;

changing the merchandise code automatically results in a change of the grouping code and replacement of it in all files of the database;

use of the method of reference numbers permits one to expand essentially without limit the ranks of merchandise groupings;

a rather wide range of means of working with the specific machine and equipment export list is offered to the user;

the specific machine and equipment export list is automatically merged with the lists of the external organization (with partial participation of users).

The specific machine and equipment export list is essentially managed automatically. Input information undergoes an automatic check and editing, which eliminate a number of input and data preparation errors. For example, an incorrectly transmitted unit of measurement can be corrected, the executor code is refined and so on. The merchandise code is also assigned automatically if it is unknown to the user. It is sufficient in this case to indicate the code of the next merchandise grouping. Individual cases of assigning different codes to a single piece of merchandise are eliminated by the user upon analysis of the planning documents.

One of three codes is automatically assigned to merchandise, newly entering the system:

a permanent code, if the user himself has assigned a unique code or automatic recoding if the code was not unique;

a temporary code, if the user indicated only the grouping in which the merchandise should be placed;

a working code, if it is unknown in which group the given merchandise should be placed;

merchandise with working codes is reduced to "ownerless groups" and requires refinement from the user.

The reliability of the data in the specific machine and equipment export list is provided by attaching individual parts to users and by the presence of access keys. The user of each rank has a different right of access to the data. All changes in the specific machine and equipment export list are recorded in the report which is sent to each user (selectively--according to the corresponding section of the specific machine and equipment export list).

Automated management of the specific machine and equipment export list and also attaching parts of the specific machine and equipment export list to users made it possible to omit a special subdivision at the computer center for merchandise coding and management of the specific machine and equipment export list.

During management of the specific machine and equipment export list, the possibility of access to data is provided by different methods:

on magnetic carriers;

on paper carriers;

from an automated workstation.

The data in the merchandise list arrive on magnetic carriers from organizations of the ministry having automated management systems, simultaneously with the economic indicators related to this merchandise. The main volume of changes in the specific machine and equipment export list is made with this type of access to the database.

A special typographic form or a machine reproduction of the process are used as the paper carriers of data for management of the specific machine and equipment export list. The use of machine reproductions of the process as a unified document for database management is described in [2]. The typographic form is usually employed to manage or refine the list features of the codes, not used during planning.

The main document for access to the specific machine and equipment export list is the machine reproduction of the process, obtained from the computer, in which the user is able to make any changes of the database within his competence, since the machine reproduction contains all the basic information required to evaluate the status of the economic process (accounting, planning and so on) at a given moment. The machine reproduction, prepared by the user, is transmitted to the computer center for data input.

The user also has access to the database of the automated workstation, equipped with a video terminal. He is able to select from two possibilities: access directly to the specific machine and equipment export list or making changes in all the files used in a specific economic process, if there is a model of the process on the screen.

The database is protected against unauthorized access with all methods.

Special attention is devoted upon administration of the specific machine and equipment export list to integration of it with lists of external organizations, with which data are exchanged on magnetic carriers.

A number of regulations, adopted at the ASPR [Automated Management System for Planning Calculations] of USSR Gosplan, is used for integration with the list of USSR Gosplan. The specific machine and equipment export list is transmitted on magnetic carriers simultaneously with economic information to the main computer center of USSR Gosplan, while the list of merchandise and the economic indicators of the plan arrive from the main computer center of USSR Gosplan, also on magnetic carriers, simultaneously with the confirmed plan.

The list of USSR Gosplan is combined with the specific machine and equipment export list according to new merchandise. Differences in the names of merchandise, having identical codes in the list of USSR Gosplan and the specific machine and equipment export list, are sent in the form of printouts for verification and refinement by users--selectively according to the corresponding sections of the specific machine and equipment export list. The refinements can be entered with the same printout into the database by the computer center operators or by the user himself from an automated workstation.

The lists are reduced similar to the case with the main computer center of USSR Gosplan and using the Common CEMA classifier of industrial and agricultural products for industrial enterprises and organizations, interacting with the specific machine and equipment export list management system on magnetic carriers.

The user daily receives parts from the computer center about changes in the specific machine and equipment export list by sections, to which he responds, which provides a permanent check of the status of the specific machine and equipment export list.

Besides this, users can review the specific machine and equipment export list at their automated workstation and can also order various types of printout by alphabet, groups of merchandise, by ministers and so on.

Thus, the specific export list management system, by supporting the needs of the users and external organizations for a list of merchandise, also makes available to them sufficiently broad capabilities and convenience of managing it.

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2. Akimov, L. P., "Using the Unified Document Principle in Organizational Management Automation Systems," KLASSIFIKATORY I DOKUMENTY, No 8, 1986.

6521
CSO: 1863/169

UDC 658.3.012.2

REDISTRIBUTION OF LABOR RESOURCES IN ACTIVE SYSTEMS

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 8, Aug 86 (manuscript received 15 Apr 85) pp 72-81

[Article by V.V. Andrusevich and V.N. Burkov, Moscow]

[Abstract] Inclusion of redistribution of labor resources in the model of an active system leads to a basically new class of problems in active system theory. The specifics of the solution of problems relating to the synthesis of functioning mechanisms considering the dynamics of labor resources are analyzed on the example of the problem of planning of production. The system studied consists of a planning center and a number of subordinate enterprises or active elements, the production capabilities of which are represented by cost functions dependent on the production plan. The task before the planning organization is to assign the plans so as to assure satisfaction of the plan for the system as a whole at the minimum total cost. An active approach is suggested to the control of labor distribution by stimulus, allowing the system to be maintained in the optimal state. References 6: Russian.

6508/13046
CSO: 1863/179

UDC 65.012.122

COMBINED SELECTION OF A PLAN AND ECONOMIC MECHANISM WITH UNCERTAINTY

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 4, Apr 86 (manuscript received 27 May 85) pp 104-117

[Article by V.V. Tokarev, Moscow]

[Abstract] This article continues a study of guaranteed quality estimates of various control methods used for economic systems. One method of control with feedback is studied which is widely used in economic practice and many areas of technology. The resultant control when this method is used is the sum of the program component and a correcting component formed in the process of functioning by collecting current information on disturbing actions and deviations of the object from the planned trajectory. The problem of joint

selection of a control program and regulation rule is formalized for cases when uncertainty is present. The process of economic control is approximately studied as one of automatic control. Two characteristic features are explicitly determined: variation in the set of permissible controls as a function of undefined disturbances and the multistage nature of the making of administrative decisions with various levels of information concerning disturbances. Figures 3; references 11: Russian.

6508/13046
CSO: 1863/175

UDC 517:518.948+543.422.23

SOLUTION OF CERTAIN MATHEMATICAL PROBLEMS OF COMPUTER TOMOGRAPHY

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA. SERIYA 15: VYCHISLITELNAYA MATEMATIKA I KIBERNETIKA in Russian No 3, 1986 (manuscript received 17 Mar 86) pp 52-59

[Article by V.Ya. Arsenin and I.B. Rubashov]

[Abstract] The problem of computer tomography is reduced to successive solution of convolution integral equations. The image quality of the tomogram generated is determined by the spatial resolution, contrast and their evenness over the field of the tomogram. One means of improving resolution is improvement of the hardware. A second method is to improve the algorithm for numerical solution of the integral equations. Algorithms for solving the equations are constructed on the basis of the method of regularization. The use of local regularization can improve the algorithm for construction of the approximations for the desired solutions of the equations. Local regularization for a homogeneous convolution-type equation is analyzed. A comparison of resolution using global and local regularization is presented for a typical model problem encountered in brain diagnosis. Figures 2; references 8: Russian.

6508/13046
CSO: 1863/39B

COMPUTERIZED PRINTING PLANT TO OPEN IN 1987

[Editorial Report] Baku KOMMUNIST in Azerri 11 October 1986 carries on page 4 an 800-word Azerinform report on the planned opening of Baku's largest printing plant in 1987. "The newest Soviet machinery, foreign machinery purchased from the GDR, CzSSR, England, India, USA, FRG and Japan, and computer technology will make it possible to significantly increase production speed and to attain world standards in product quality." The plant, which will concentrate on printing books and magazines, "will also be equipped with typesetting equipment to print books in English, French, German, Arabic and Persian. For example, various types of literature for Afghanistan will be printed here."

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CSO: 1863/161-E

ROLE OF COMPUTERS IN MEDICINE

[Editorial Report] Ashkhabad SOVET TURKMENISTANY in Turkmen 21 September 1986 carries on page 4 a 700-word Turkmeninform report on the third republic conference on "Information in biomedicine and health care." The report was delivered by V.A. Babayants, director of the republic Center of Scientific Medical Information, on "Scientific-technical progress and safeguarding the health of the TSSR population." Discussions centered on the use of computerized data banks to aid in medical diagnoses and management. R.S. Serebiryan, chief of the medical information and medical technology department of the Georgia SSR Ministry of Health, predicted that every hospital and clinic in our country will be equipped with microcomputers and terminals in the future and added that a Tbilisi clinic is soon to install a computer on an experimental basis. In Turkmenistan, a clinic has already been equipped with an Iskra-226 computer which is now being used for hospital management. It is foreseen that it will shortly be applied to public health and epidemiology work.

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CSO: 1863/161-E

BRIEFS

COMPUTER MEDICAL EXAMINATION--Recently, in Polyclinic No. 7 of the Second Clinical Hospital of Dushanbe, an integrated system of medical examinations of the public, using the Iskra-1256 computer, was introduced. Use of this innovation will make it possible for a smaller number of doctors to conduct the annual dispensary system of the population, to reduce their patient loads, to increase the quality of the medical examinations, and to reduce losses of work time of the patients. [Text] [Dushanbe KOMMUNIST TADZHIKISTANA in Russian 19 Dec 86 p 2] 12304

CSO: 1863/176

UDC 621.3.014.22

APPROACH TO REDUCED DESCRIPTION OF LARGE-SCALE SYSTEMS. PART 2. LARGE CHANNEL-SWITCHING NETWORKS

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 8, Aug 86 (manuscript received 6 Jun 85) pp 82-88

[Article by V.V. Marbukh, Leningrad]

[Abstract] This article continues a previous work, constructing a reduced description of large channel-switching networks with bypass route selection disciplines which consider the situation of the network. It is assumed that there are no locations for waiting and that the network functioning quality is evaluated based on probability of connection. The reduced description constructed is based on the assumption that the number of busy channels in various branches of the network can be approximately considered statistically independent, allowing the production of a closed, reduced system of equations to determine the one-dimensional distributions of the number of busy channels in each branch of the network, after which the probability of failure to make a connection is determined. Figures 6; references 7: Russian.

6508/13046
CSO: 1863/179

UDC 62-50

BOOK: CONTROL APPLICATIONS OF COMPUTERS

Krasnoyarsk PRIMENENIYE EVM V ZADACHAKH UPRAVLENIYA in Russian 1985 (signed to press 9 Dec 85) pp 1-2, 169-170, 171-178, 179

[Annotation, table of contents and synopses of papers in book: "Application of Computers in Control Tasks: Collected Scientific Papers", edited by corresponding member of the USSR Academy of Sciences, Yu.I. Shokin, USSR Academy of Sciences, Order of Lenin Siberian Department, Computer Center, Krasnoyarsk, 179 pages, 500 copies]

[Text] Annotation

This collection includes papers devoted to automation and control problems in industrial production, data processing and the simulation of large systems. The contents of the collection as a whole reflect the major directions of work done in the computer center of the Siberian Department of the USSR Academy of Sciences in the field of automated control system development and optimal control problems.

The collection is intended for specialists in the field of data processing, optimization problems and automated control systems.

Table of Contents

UDC 62-506.1

APPLICATION OF COMPUTERS TO THE MANAGEMENT OF A PRODUCTION COMPLEX WITH A CONTINUOUS PRODUCTION PROCESS

[Synopsis of article by A.R. Bubyakin, V.I. Volkov, Ye.V. Ilin, B.V. Kozakov, A.P. Krasnoshtanov, A.V. Medvedev, M.F. Mukhamedyarov, N.F. Novikov, O.Yu. Tryushkin, S.V. Shustitskiy, S.V. Shcherbakov, pp 3-14]

[Text] Questions of computer application to the management of a production complex with a continuous manufacturing process are analyzed using the example of the Norilsk Mining and Metallurgical Combine. A procedural approach to the construction of mathematical models of such production operations is discussed. One illustration, five references.

UDC 62-50;523.546

METHOD OF ANALYZING NONSTEADY-STATE MODES IN OPTIMAL CONTROL SYSTEMS FOR COMPLEX OBJECTS WITH DISTRIBUTED PARAMETERS

[Synopsis of article by N.D. Demidenko, pp 15-26]

[Text] Various problems of analyzing the statistical and dynamic modes in optimal control systems are posed and solved for complex objects having distributed parameters as a function of the selectred control parameters and as a function of the kind of optimality criterion. Four illustrations, seven references.

UDC 658.5.011.56.621

MANAGEMENT AUTOMATION

[Synopsis of article by I.G. Zubok, B.N. Nefedov, pp 27-35

[Text] A set of control variants for management activity is constructed by varying the requisites and fields of requisites. The analysis is carried out at the level of systems of data structures. Four references.

UDC 62-501.12

CONTROL OF LINEAR DYNAMIC SYSTEMS UNDER CONDITIONS OF NONPARAMETRIC INDETERMINACY

[Synopsis of article by A.A. Ivanilov, pp 36-49]

[Text] A control algorithm is proposed for a linear steady-state dynamic object. It is assumed that there is minimal apriori information about the object and the observation errors, and that the information belongs to the level of nonparametric indeterminacy. The asymptotic properties of the resulting algorithm are investigated and results are given for the numerical computer modeling of the control algorithms. Four illustrations, four references.

UDC 681.3.06

PRODUCTION OF DATA PROCESSING SOFTWARE IN CONTROL APPLICATIONS BY A GENERATION TECHNIQUE

[Synopsis of article by N.N. Karpov, pp 50-61]

[Text] A set of programs is proposed that execute the standard steps of data conversion in control applications. The language aids for the description of the programs and their generation are described, taking into account the specific features of a particular application. Seventeen references.

UDC 519.240;550.83

ADAPTIVE METHOD FOR SOLVING SYSTEMS OF LINEAR EQUATIONS IN GEOPHYSICS

[Synopsis of article by V.A. Kochnev, pp 62-71]

[Text] The problem of sequentially improving the precision of unknown new equations in step with their input is posed and solved. Initial approximations of the unknowns and their mean square errors are used for the regularization. One illustration, 15 references.

UDC 669.017.620.1:535.21

OPTIMAL CONTROL OF LASER BEAMS

[Synopsis of article by I.V. Krasnov, N.Ya. Shaparev, I.M. Shkedov, pp 74-85]

[Text] The results of simulating the optimal modes of a number of physical processes during the exposure of matter to a laser beam are reviewed. Ten illustrations, 11 references.

UDC 621.391.519.2

SIMULATION OF COMPLEX BIOMEDICAL SYSTEMS UNDER CONDITIONS OF STRUCTURAL INDETERMINACY

[Synopsis of article by A.V. Lapko, pp 86-97]

[Text] An approach is proposed to the simulation of developing biomedical systems in the case of incomplete information on the system structure and the form of the laws governing their functioning. Algorithms for synthesizing and analyzing the structure of such systems are developed on the basis of the methods of nonparametric statistics and collective estimation principles; the results of practical applications are also discussed. Eleven references.

UDC 62-506

HYBRID ALGORITHMS FOR THE IDENTIFICATION OF STATIC OBJECTS: CONSTRUCTION PRINCIPLES, PROPERTY ANALYSIS AND APPLICATION

[Synopsis of article by A.V. Lapko, L.T. Tolstov, pp 98-107]

[Text] Hybrid algorithms are proposed for the identification of static objects that make it possible to combine the advantages of different stochastic approximations in a single decision rule. Their asymptotic and approximation properties are investigated. Results are given for a numerical simulation and applications. Five illustrations, seven references.

UDC 62-506.1

ON DESIGN OF NONPARAMETRIC ADAPTATION ALGORITHMS

[Synopsis of article by A.V. Medvedev, pp 109-118]

[Text] Modificationa of nonparametric adaptation algorithms are given for the case of active data acquisition. The question of the generation of a working sample from the original teaching sample is analyzed. Questions of terminating the teaching process and estimating the quality of the functioning of adaptive systems are also discussed. Six references.

UDC 519.234:621.833

AUTOMATION OF INFORMATION PROCESSING AND DECISION MAKING IN EQUIPMENT TESTING APPLICATIONS

[Synopsis of article by V.K. Merkulov, A.A. Ivanilov, V.N. Sergeyevich, S.N. Chayka, pp 119-129]

[Text] The structure of the software for a vibration diagnostic testing system and a diagnostic algorithm are given that are oriented towards the use of small computers with small main memories. Two illustrations, five references.

UDC 619.25

DETERMINATION AND ESTIMATION OF CERTAIN FUNCTIONALS FROM PROBABILITY DENSITY FUNCTIONS IN STATISTICAL PROBLEM WITH TWO SAMPLES

[Synopsis of article by G.P. Morozov, pp 130-141]

[Text] The properties of certain functionals of multidimensional probability density functions are studied as applied to certain problems of pattern recognition, control and hypothesis testing.

UDC 621.782:525

CONTROL OF MOVING MECHANICAL SYSTEM WITH MULTIPLE CRITERIA IN INTERACTIVE MODE WITH COMPUTER

[Synopsis of article by V.A. Okhorzin, pp 142-155]

[Text] Algorithms and a package of programs for vector optimization of the process of controlling the movement of a mass point in an interactive mode with a computer are analyzed. A decision making procedure is given that is based on the analysis of a two-dimensional Pareto set. One illustration, six references.

UDC 519.688:550.345

EXPERIENCE WITH DEVELOPMENT OF MACHINE-INDEPENDENT SET OF PROGRAMS

[Synopsis of article by L.B. Chubarov, E.V. Chubarova, T.P. Uvarova, pp 156-160]

[Text] A set of programs is presented for the simulation of tsunami tidal waves, developed within the framework of the OLIMPUS software engineering system. Two references.

UDC 65.011.56.01

PROBLEMS OF TERRITORIAL MANAGEMENT AUTOMATION SYSTEM DEVELOPMENT IN KRASNOYARSKIY KRAY

[Synopsis of article by Yu.I. Shokin, D.M. Frumin, pp 161-168]

[Text] The status of the work on the development of territorial management automation systems in the Krasnoyarskiy Kray is discussed along with the problems arising in this case, which are of a rather general nature. Examples are given for the solution of individual problems in the working practice of the Computer Center of Siberian Department, USSR Academy of Sciences.

8225
CSO: 1863/226

KAZAKH SCHOOL BUYS JAPANESE COMPUTERS BUT NO SERVICE

[Editorial Report] Alma-Ata SOTSIALISTIK QAZAQSTAN in Kazakh on 29 October 1986 carries on page 3 a 1,200-word article by G. Yakimenko, deputy director for information technology of No 15 Middle Vocational and Professional School of Alma-Ata City, published under the rubric "Vocational Education, the Need of the Times," entitled "Computer Lessons and Problems." The article looks at experience gained in Yakimenko's own school in putting computers to use in the classroom and in training the specialists of the future.

Among problems discussed are the great expense of complete computer systems which require some 300,000 rubles for a complete Yamaha system, the lack of emphasis on programming, and shortage of programmers locally, the unavailability of complete schematics of computers and the lack of local servicing for the school's 16 Yamaha computers (the school also has a DVK-2M Soviet computer and another "minicomputer" of unknown manufacture). As a solution to the shortage of programmers in the republic, Yakimenko suggests the paying extra wages to programmer-instructors.

Much of Yakimenko's article deals with problems of how to best integrate computers into school programs. Yakimenko, however, is optimistic about progress being made and is very hopeful for the future.

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CSO: 1863/161-E

ESTABLISHMENT OF REPUBLIC COMPUTER TRAINING CENTER URGED

[Editorial Report] Baku KOMMUNIST in Azeri 27 September 1986 carries on page 3 a 1,500-word article by F. Magsudov, academic secretary of the Technical Physics and Mathematics Department of the AzSSR Academy of Sciences, on the growing importance of the computer in society. "Scientific-technical progress has reached such a stage that it is impossible to manage at a modern level without the use of computers. The basic reason stems not only from increasing workloads, but also from the need for fast decisions and from rapid changes taking place in technological processes. This situation demands computer literacy in the society as a whole." He concludes that "it would be good if an intersector computer teaching center were to be established in the republic." This center would be under the direction of the republic Council of Ministers.

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CSO: 1863/161-E

INTRODUCTION OF COMPUTERS IN SCHOOLS DISCUSSED

[Editorial Report] Yerevan AYASTANI ARDYUNABERUTYUN in Armenian No 5, 1986, carries on pages 20-22 ad 2,000-word article published under the heading "Science and Technology: Production" by Professor and Doctor of Technical Sciences S.S. Zakaryan, head of the Department of Automated Management Systems [ASU] at Yerevan Polytechnic Institute, entitled "Computerization: Searches and Solutions." As the 1985-1986 school year approaches its end, implementation of research on the new school subject "Principles of Informatics and Computer Technology" is continuing everywhere, pursuant to a decision by the USSR Ministry of Education.

In Armenia initial experiments with computerization began in 1977, with the Department of ASU at Yerevan Polytechnic Institute working with school children. Mainly this involved introduction to computers, computer capabilities, programming, study of programming languages, program debugging, etc. Today, however, the department is no longer satisfied with the available resources and time allocated, and other departments are becoming involved in the project. A number of measures are being planned and implemented: teacher retraining at advanced training faculties, decisions on locations for practical training, and field trips for school children to computer centers. Things are advancing slowly, however. The schools still contain few energetic young teachers who can assume the full burden of teaching classes on informatics. Another important element is to increase the number of computers available.

Schools are still not being provided with personal computers, a task which is difficult to accomplish in a short period of time. Contributing factors include lack of operating and maintenance personnel and, most important, difficulties in obtaining microcomputers. The author states that it is important to obtain more computers but that it is even more important to resolve the problem of increasing the productivity of each computer currently in the use inventory. The best solution to resolve the present situation is a specialized school computer network, which would link the computers of several schools for group use.

The author states that the lack of a unified coordinating body for distributing computers to schools is resulting in failure to meet targets pertaining to putting modern computer hardware in the schools. Distribution is based on personal connections, on initiative displayed by the schools and patron enterprises, rather than on the consideration of experience gained from

teaching informatics. As a result, available microcomputers are being acquired by schools which are not prepared to offer computer classes or to use the computers. The author suggests that since the supply of personal computers is inadequate at present, computer courses should take into consideration the students' future specialization area. He states that in order to achieve high productivity figures, five or six students at a time rather than an entire class should be the basic unit for computer sessions.

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