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Sources at the Ministry of Universities and Research state: "As far as possible, we are trying to coordinate our programs with the trends and choices of the manufacturing sector." Common areas are not lacking, such as the great industrial interest shown in telecommunications and the environment. Saporito pointed out: "We will therefore attempt to increase our launching capability by developing a satellite system for earth observation and environmental remote sensing. This system should start off as a national project for the study of the Mediterranean but could become a European program in the future."

Other strategic sectors are space-derived technologies, microgravity, and transport, as well as large-scale space projects such as the United States' ambitious Moon-Mars project involving the collaboration of European as well as national companies.

An Italian-Japanese committee for aerospace collaboration between governments, space agencies, and private companies was recently established and should become operational by the end of the year. However, the sector is also opening out to cooperation with East Europe. To date, this has been limited to the Soviet Union, the only country to have developed an adequate space research system.

Unfortunately, this large number of projects, initiatives, and collaboration agreements has not been supported by adequate investments to date. The ASI currently has a yearly budget of around 900 billion lire (half of which is for European commitments with the ESA), but its president, Luciano Guerriero, has already requested an increase for the next three years that amounts to 1.4 trillion lire for 1992 and 1993. The forthcoming Finance Bill, however, poses a threat to these funds. In recent days, Finance Minister Paolo Cirino Pomicino threatened: "If the National Space Program is not approved by September, cuts will be made to the sector's expenditure." Obviously, those involved in this field were the first to complain.

According to undersecretary Saporito: "We can counter the credit squeeze." In speaking to industries he stated: "Share in the risk yourselves by increasing your investments in the space sector and starting to operate with us instead of individually as has been the case to date. We also request that major industries, which are essential for competition at the international level, leave room for small and medium-sized industries."

Research minister Ruberti, stated: "I feel that hiding behind the steadfast principle of 'zero growth' is a path we cannot follow. We have reached the point where a new funding strategy must be devised, one that is better suited to the sector's current developments. Furthermore, funding, which currently comes exclusively from research funds, should come from varied sources. The innovation and market opportunities offered by major public clients, which have not been used in the space sector to date, should also be explored. For this purpose,

the Ministry of Research is thinking of organizing the first Space Users' Conference in September for major public and private companies, banks, ministries, and all those who are investing in the sector. Sources from the ministry state: "Italy would obtain greater benefits from the ASI's coordination of all these funds. For example, by increasing telecommunications and telephone capacity, as well as the number of environmental remote-sensing projects, is there any reason why interested bodies such as the Ministries of Postal Services, Defense, and the Environment should not contribute with their own funds or joint programs?"

"Space activities," Zuliani added, "can become a field of development to reconvert the military sector to civilian activities, thus preserving thousands of jobs which are now in jeopardy due to the crisis in the weapons industry. This is not a very difficult task since the companies operating in the aerospace sector are also investing in the military and strategic field."

BIOTECHNOLOGY

Hoechst Monoclonal Antibody Research Described

90WS0073A Duesseldorf *HANDELSBLATT* in German
19 Jul 90 p 20

[Article: "Medicine: Monoclonal Antibodies Search for Carcinomas. The New Detection Methods Originated With Nobel Prize Winner Georges Koehler"]

[Text] Using so-called monoclonal antibodies to search for carcinomas is one of the newest areas of pharmaceutical research. Four years ago, German scientist Georges Koehler and Argentinian professor Cesar Milstein received the Nobel Prize for production of the first monoclonal antibodies. It was possible then, for the first time, to duplicate (clone) a selected antibody formed by the body's immune system against invaders such as specific types of bacteria.

Today in research establishments of the pharmaceutical industry, researchers are certain that with monoclonal antibodies it will be possible in the future to localize even small carcinomas accurately in patients. "The use of monoclonal antibodies for diagnosis of cancer is still in its infancy," explains Dr. Karl-Heinz Bremer from the radiochemistry laboratory of the drug manufacturer Hoechst, where research on diagnosis of cancer with antibodies has been going on for years. "Nevertheless, we can expect rapid development in this area of research."

Diagnosis of cancer with monoclonal antibodies, so-called immunoscintigraphy, is based on the principle that scientists can utilize the capabilities of the human immune system. Dr. Bremer: "The immune system works in such a way that the body produces antibodies against foreign substances, for instance bacteria or viruses, which are directed against the invaders and

combat them. With its army of white blood cells of the lymphocyte type, the organism also forms anti-tumor antibodies which precisely match the binding sites of a specific tumor." Scientists have isolated antibodies produced by the immune system, e.g., against intestinal cancer, and cloned them using the methods developed by Georges Koehler.

Before Koehler's discovery, scientists could only produce a mixture of antibodies from blood. Now it is possible to produce a single (monos, Greek: one) antibody. If, for instance, a patient is suspected of having intestinal cancer, the tumor can be detected early with the aid of monoclonal antibodies, even if it is still too small for other diagnostic methods. The physician injects radioactively labeled monoclonal antibodies which match the tumor. Hours after the treatment, the antibodies are adsorbed by the desired tumor: Using special equipment, the physician can now locate the carcinoma precisely.

"Today we are working on optimizing radioactive labeling of monoclonal antibodies," says Dr. Bremer. In the beginning, iodine 131 was used for this labeling in the Hoechst laboratory, but today it is also possible to employ technetium 99m. The advantages: With a half life of only six hours, radioactive technetium decays more quickly than iodine. In this way the patient's body is exposed to the radioactive rays for only a short time. All together, the level of exposure is very low and harmless. Radioactivity has the advantage of being measurable even in the smallest amounts. For comparison: "A cube of sugar thrown into the Titisee could be detected if you examined only one teaspoonful of water from the lake. That's how precise the measuring technique is."

The method of examination is furthest advanced for intestinal cancer. Thus far, it has been possible to find a tumor or its metastases in 200 patients with suspected intestinal cancer. In immunoscintigraphy, Dr. Bremer sees a significant improvement of current diagnostic methods. The advantages of immunoscintigraphy are that even relatively small tumors can be detected and that cancer can be differentiated very precisely from other diseases using immunological detection methods. This diagnostic procedure increases the chances of being able to treat carcinomas earlier and more specifically and thereby improves the chances of recovery. However, radiodiagnosis is used only when suspicion of cancer exists: it is not a prophylactic.

Dr. Bremer expects further improvements of the method in the near future with the production of monoclonal antibodies. The antibodies available now are produced by mouse cells. With repeated use, the patient may develop an allergic reaction. Therefore, scientists are trying to produce human antibodies in order to avoid possible immune system defense reactions in patients receiving treatment.

Germany: Video Evaluation System for Gels Developed

90WS0073B Frankfurt/Main FRANKFURTER
ZEITUNG/BLICK DURCH DIE WIRTSCHAFT
in German 4 Jul 90 p 8

[Article: For Two-Dimensional Gels, Proteins and DNA Fragments As Well]

[Text] The evaluation of electrophoresis gels in genetic engineering or protein chemistry experiments is often problematic if the individual bands are indistinctly separated. While these difficulties have yet to be overcome for one-dimensional gels, that is, for those where the samples have only one direction of travel, special problems arise with two-dimensional gels. Here there is a pattern of spots distributed irregularly over the entire gel.

For the problem of evaluation, scientists from the Institute for Medical Molecular Biology (Institut fuer Medizinische Molekularbiologie) of the Medizinische Universitaet Luebeck have developed a video-based evaluation system. The device, called Opto-Quant, is to be used in the one- and two-dimensional evaluation of optically recorded data. Photonegatives, agarose and polyacrylamide gels, or microscopic images can serve as originals.

In principle, anything that can be recorded with a videocamera can be used as an original. With one-dimensional gels, for example from protein studies, even round or oblique bands can be detected and their intensity determined using the system. Moreover, even bands which have run into one another should be separable.

The identification of the bands themselves is fully automatic. In addition, the device simplifies the determination of band size. After measurement of a standard, this is provided automatically for each band. This procedure can be used for proteins as well as DNA fragments. For two-dimensional gels, the individual spots are given an area and intensity value with which even connected spots can be identified, a frequent problem in everyday use.

In order that two-dimensional gels can be compared—another procedure that can entail many errors—a computerized analysis is carried out. In so doing, the system can correct the distortions which are often present and simplify the evaluation. The system consists of a personal computer with image processing card, a video camera, and a monitor; it is marketed by a firm in Goettingen.

COMPUTERS

Progress in Speech Recognition Systems Surveyed

90WS0052A Frankfurt/Main FRANKFURTER
ZEITUNG/BLICK DURCH DIE WIRTSCHAFT
in German 25 May 90 p 8

[Article by Michael Wett: "Speech Recognition Will Improve Communication Between Man and Machine—In the long run, development of speaker-independent running speech recognition is the goal"]

[Text] Wherever people deal with machines, the wish arises to operate them not merely by pushing keys but by talking to them. Through commands in plain text and optical or acoustical responses, it should be possible in the future to operate in an interactive manner leaning more upon human communication. For machines to be able to use the speech of the user, computer guided speech recognition systems are required.

Whenever several users are involved, speaker-independent speech recognition through a speech recognizer is desirable which requires no training before use. Such a speech recognizer is described in this article. It is particularly aimed for use in news networks.

Current speech recognition systems, with uses in inventory maintenance, laboratory, quality control, medical diagnostics, travel plan information, car phone, airspace control and elsewhere, range from speaker-dependent recognition of single words to speaker-independent recognition of word chains. For long-range projects, the development of speaker-independent running speech recognition is currently in the foreground.

Methods of speech recognition are based mostly on frequency analysis and the dynamic programming of non-linear time adaptation. Its advantage is that little time is spent on training. For example, for the speaker-independent recognition system of AEG, the multi-template-technique is used, where speech samples from several speakers are employed.

In the framework of the EC research program ESPRIT [European Strategic Programs for Research and Development in Information Technology], a real time system was developed which recognizes words with 96 percent and sentences with 80 percent accuracy. Additionally, the Sip project is run for single-word recognition where enterprises from four EC-countries cooperate in the project. A speech recognition system developed by IBM already understands 20,000 concepts.

A novel procedure for the speech recognition of words, word fragments and running speech is the Hidden-Markov-Model (HMM). It is based on the description of the smallest word-units, the phonemes, to which symbolic information can be attributed which are independent of the actual acoustical rendering of cultivation.

The advantages of the Hidden-Markov-Model are, on the one hand, its large vocabulary and, on the other hand, the small amount of computation. This is associated with cost-effective operation. Its disadvantage, compared to the frequency analysis method, lies in the greater training expenditure.

With the recognition of phonetic units, altogether a considerable reduction of expenses and a recognition similar to human hearing are achieved. Nevertheless, phonetic elements are difficult to recognize because of their brevity and their variable transitions.

The difficulty lies in the establishment of robust phonetic reference samples. A recognition system based on the Hidden-Markov-Model is being developed by Tele-norma in collaboration with the Institute of Applied Physics of the University of Frankfurt. The current vocabulary of the recognizer contains a total of 23 individual words consisting of the numbers zero to nine, including the word "Zwo" [a variant form of "Zwei", meaning two] and 12 additional command words typical for telecommunication.

For the command word subgroup, a greater than 97 percent recognition accuracy has been achieved so far. The procedure employed uses LPC-speech analysis with vector quantization and added word recognition with discrete Hidden-Markov-Models. The Hidden-Markov-Model of the speech recognizer can be described simply as follows: This recognition system is, at the present time, suited for the speaker-independent recognition of isolated spoken words.

It uses stochastic models to describe individual speech signals to be recognized. Thereby the statistical properties of a large number of utterances can be taken into account according to probability theory, as they appear in the learning of a speaker-independent vocabulary.

In order to describe them, speech signals are divided into periods of 16 to 32 milliseconds. Within this segment length, the speech signal is largely stationary. The human speech signal cannot be altered with any arbitrary rapidity because it is formed through the mechanical adjustment of the mouth and throat cavity. The properties of every speech signal unit are defined by characteristic values which can be summarized for each time segment as a characteristic vector.

In the course of subsequent vector quantization, the task of speech analysis for each segment consists of finding the vector the spectrum of which best matches the actual speech spectrum at hand. The vectors themselves are optimized in a special training phase, using speech samples, and are stored in a code book. They can be immediately recalled through a ranking index and can also be further refined to suit a given case of application. The energy contents of given frequency bands can be used for spectral analysis.

At present, the system is set up for using the telephone band range from 300 to 3400 Hertz. For a local adjustment of the speech recognizer by the user, or for central application and transmission of an expanded frequency band, the future will permit the use of additional frequency segments in the analysis. To date, the systems recognition accuracy has been determined by the computer simulation. Further improvements are indicated through stepwise optimization of detail and augmentation such as, for instance, the consideration of speech pauses before and after a word.

In general, it can be stated that an additional possibility for improving speech recognition lies in using physiological phenomena associated with speech such as, for example, the externally measurable movements of the lips and the larynx. An expansion of this idea is the comprehension of body language associated with speech.

The development of computers with neuronal networks may also improve the recognition of spoken language. They are based on the principle of the human brain whose simple processing units, the neurons, store information and exchange it with many neighboring neurons. Through simulation of this neuronal network in the computer, a learning capability should be achievable such that, for instance, new words would be automatically added to the already learned ones.

The speech recognizer according to the Hidden Markov model, described in a simplified form, can be used, for example, for the menu-guided dialogue service of ISDN-telephones or for access control. A broad field of application will also emerge from booking systems. The vocabularies in the early American and Japanese studies of speech recognition had already been focussed on the names of cities and airports so that later, through the telephone, information might be obtained about flight connections and desired flights might be booked by spoken request. Such systems offer the advantage of around-the-clock service and can be supplemented with visually perceived information.

Currently, speech recognition is applied in practice mainly for purposes of information systems. Here, the speech input, together with speech output, serves to simulate the dialogue between user and the information personnel, for example, for time-table information, but also for other information systems with dialogue which can be schematized, for example for data banks. The input and output of speech in such usage have the advantage that the telephone network can be used and that the mostly untrained user is spared from having to learn a dialogue through keyboard and monitor screen.

Computer controlled dialogue systems are to be used, in addition, in industrial fields (inventory maintenance, quality control, ordering systems, product distribution, package sorting), in medical diagnostics and in airspace control. Further advances in the field of speech recognition will also allow the user to communicate more freely than with the currently available speech recognizers.

One of the most interesting long-range developmental goals of such systems with a large vocabulary is the field of application associated with offices. The goal here is a speaker-independent phonetic typewriter. Thereby, any text could be spoken into the "hearing" typewriters, for instance by telephone, and could be issued in a printed form. However, this would require a speech recognition system which understands running speech with a large vocabulary of about 20,000 words. Of course, current speech recognition systems and those of the foreseeable future are far from that.

Germany's Suprenum Facing Financial Problems

90WS0073D Munich SUEDEDEUTSCHE ZEITUNG
in German 12 Jul 90 p 29

[Text] *The future of the German high-performance computer Suprenum, on which more than a dozen research institutes, universities, and companies have been working since 1984 and have supposedly readied for market, is more uncertain than ever. Its marketing has proven to be exceptionally difficult due to serious performance defects in the prototypes and cheaper bids from the competition. Suprenum GmbH, Bonn, which was founded expressly for the development (hardware and software) and sale of the supercomputer, has long suffered from a shortage of funds.*

At the end of June, the GmbH was practically finished financially and had to be rescued with stopgap loans. More than DM 200 million, four fifths of which came from taxes, have already been sunk in the prestige item which, three years ago, the Federal Republic believed would put it in the forefront of international supercomputer development. Meanwhile, in view of the progress in Japan—especially at NEC—and at the US companies IBM, Cray Research, Intel, and others, experts place the Suprenum, at best, among the "also rans".

High performance computers consist of a large number of microcomputers, each with their own storage, connected in parallel and assembled into a unit for "superfast" execution of extensive numerical calculations. They are supposed to perform up to 5 billion individual computations per second. Initially, supercomputers were needed primarily for military purposes. Today these parallel computers have a multitude of technical, scientific, and commercial applications—from weather prediction to airplane wing design. At present, the volume of orders worldwide is estimated to be 150 "machines" of this type.

Recently, Federal Research Minister Heinz Riesenhuber more or less broke off his friendship with Suprenum. He considers it ready for market (in which he is largely alone) and has refused to make further funds available for support of the supercomputer on the grounds that the development phase is over. However, reports from universities and research institutions saying some work, still remains to be done before Suprenum is fully functional. Inside opinion is no less unfavorable. Original expectations of winning *Siemens Ag, Munich*, and *Nixdorf AG, Paderborn*, part of Siemens, as partners for Suprenum GmbH were also not realized.

Thus, the largest partner is still *Krupp Atlas Elektronik GmbH, Bremen*, which holds 54 percent of the Suprenum capital (27 percent of it in trust for potential partners) and—according to reliable reports—has also given several million in temporary credit. Additional Suprenum partners are the *Society for Mathematics and Data Processing (GMD, Gesellschaft fuer Mathematik*

und Datenverarbeitung mbH), St. Augustin near Bonn with 23 percent and the software firm *Stollmann GmbH*, Hamburg with 18 percent.

The price for Suprenum is about DM 20 to 22 million. Cray already provides comparable computers at a much lower price, while the Californian firm Intel is gearing up to market more powerful computers for less money in the near future.

DEFENSE INDUSTRIES

Fraunhofer Institute Views Changes in FRG Military Production

90WS0074A Munich SUEDEDEUTSCHE ZEITUNG in German 20/21 Jul 90 p 14

[Article by agr: "Conversion Begins in the Managers' Heads"]

[Text] Until now, the industry was held to be crisis-proof. But world-wide disarmament in the wake of the political developments in Eastern Europe is causing the defense technology industry increasing headaches. Conversion is now for many the magic word, which promises a smooth changeover from military to civilian production. But the head of the Fraunhofer-Institute for Chemical Technology in Pfinztal near Karlsruhe, Hiltmar Schubert, warns against illusions.

Schubert ought to know. His institute, founded in 1959 for defense-related research, has itself converted. In addition to solid rocket propellants and tube weapon fuels, fuels for civilian purposes are also researched today in Karlsruhe. In Schubert's opinion, conversion is a process that needs time and initially costs a great deal of money.

Dependence Has Already Been Reduced

Germany's leading defense technology establishments have also recognized their unilateral dependence on the supplier, the Bundeswehr, and have increasingly withdrawn from the armaments business. Among them is primarily Rheinmetall GmbH in Duesseldorf, which has reduced the weapons portion of its turnover from as much as 70 percent in 1979 to about 30 percent today. Other than Rheinmetall, the major purveyors to the Bundeswehr such as Krupp MaK Maschinenbau GmbH in Kiel, with a weapons share of 45 percent of total turnover, the Diehl Group in Nuremberg, also with a share of about 45 percent, Krauss-Maffei AG in Munich, with a share of nearly 50 percent, and, the biggest in the industry, Deutsche Aerospace AG in Munich, part of the Daimler group, also with an armaments share of about 50 percent, have already more or less successfully built up their own civilian fields.

On the other hand, more heavily dependent on orders from the Bundeswehr, according to Schubert, are the approximately 3,000 medium-sized enterprises in the industry with roughly 300,000 workers. Indirectly,

nearly 1.3 million employed people in the FRG depend on the industry. Worldwide, according to an estimate by the IAO in Geneva, there are about 55 million jobs which depend on the defense budgets. The importance of the "defense goods production" in the FRG is indicated in a table by the Federal Defense Ministry. In 1970 military goods, excluding the procurement of the stationed forces, were produced at a cost of DM 6.3 billion or 0.93 percent of the then gross domestic product (GDP) of DM 675.3 billion, but in 1989 this figure was already DM 24.4 billion or 1.09 percent of the DM 2237.03 billion GDP. According to figures by the Federal Office for Industry, the procurement order value for the stationed forces from German companies in the period 1987 to 1989 was about DM 8.246 billion.

Company closings and unemployment are only one side of the coin, however. ICT head Schubert also envisions technical difficulties from the armaments conversion. The closer the activity lies to the defense-technical end product, the smaller the chance of dual or alternative use for civilian purposes. Pure weapons research often has the advantage of being remote from the product and the knowledge acquired can easily be applied to other related fields.

According to Schubert, the greatest obstacle to successful conversion lies in the business-economic properties of the defense technology industry. In the military goods market, whether for tanks or olive-drab underpants, suppliers face the monopolistic demand of the Bundeswehr. Defense-technological marketing, on the other hand, requires "landscape maintenance," as Schubert says, the search for and maintaining of personal relations, if possible, with the purchasers. Acquisition in the defense field is a protracted business, however. Schubert fears that "continuous flexibility" and "rapid reaction to altered demand," such as characterizes the civilian market, will still have to be learned in the defense technology sector.

Government Transition Aid Necessary?

Furthermore: "The clumsy mentality, connected with the demand always to use nothing but the best, is frequently paired with a broadly dispersed, inflexible company culture." Conversion therefore begins in the managers' heads, says the head of ICT. But the Federal Government is also called on financially to support companies "during a transition period." The Federal Government regards it differently, however. In the reply by the Federal Government to an inquiry by the SPD in the Bundestag, it says that in a market-economic system the conversion of the weapons production to civilian needs is "primarily the task of the affected enterprises."

MBB Tests Vertical Airborne Weapon System

90WS0074B Stuttgart FLUG REVUE in German Jun 90 p 42

[Text] After several successful test series with the F-4 Phantom and the Alpha Jet, the Vertical Airborne

Weapon developed by MBB [Messerschmitt-Boelkow-Blohm] will soon be tested in the Tornado as well. The option for a 1993 introduction is still open. The basic thought with the vertical airborne weapon concept is largely to automatically locate and attack individual targets. The very complicated technology necessary to do this was developed by MBB in cooperation with various subcontractors such as Eltro and TST. This requires among other things passive sensors, highly sensitive position-indicating systems as well as ammunition effective against reactive armor. The drawback to the vertical airborne weapon is, however, the need for the aircraft to fly over the target, thus placing itself in great danger.

FACTORY AUTOMATION, ROBOTICS

Flexible Production Unit for French Tank Turrets

*90WS0058B Paris INDUSTRIES & TECHNIQUES
in French 18 May 90 pp 100-101*

[Article by Jean-Yves Catherin: "Flexible Tank Plant"; first paragraph is INDUSTRIES & TECHNIQUES introduction]

[Text] The Tarbes Giat is installing a fully automated plant with wire-guided cars for machining of tank turret parts.

Giat produces the tank turrets of the French Army in its Tarbes plant. Like most older facilities, until a short time ago the ATS (Tarbes factory) still had machines clustered together by function: batteries of lathes nudged batteries of milling cutters, etc. As part of its shop reorganization, the ATS has just set up a flexible production unit (UPF) for machining parts smaller than 500 mm. This proved to be the best formula, for runs of over 50 are rare. Average machining time has been halved and the cost of parts has dropped 20 percent. Esia did the engineering studies and sold the plant as a turnkey operation. In the machine shop, the four Graffenstaden CU 100 4-axis machining centers, equipped with Num 460, are automatically supplied with parts by two CRT (Transport Robot Co.) wire-guided cars controlled by Compaq. Any part can be dispatched to the available machine through the Centralized Control System (SCC), which consists of a Micro Vax 2 computer interfaced with the Nums and the TSX 80s by an Epson AX2. Once the part is set into the machine without any human assistance, a Renishaw sensor determines its exact position and can either reorient the part-holder or reset its computer program based on the values recorded.

A Sensor Determines the Exact Position of the Part

After the parts are machined, the cars transport them to the Hafroy "washing machine" to remove the lubricant and chips and to warm-air dry them for inspection on a Renault 3-dimensional measurement automaton controlled by a PDP 11/23.

The ATS worked for two years with Esia engineers to construct this architecture, whose interest is all the greater in that it combines computers from different manufacturers. In addition to the machines already mentioned, Bull Micral 30s, Mini 6s and DPS7s are integrated into the preparation, tooling-equipment and data-processing units, and the HP 9836 is used in the tool-measurement bench. Theo Peyrou, shop manager of the UPF, adds that the social climate has also changed: "The individual 23.5-percent bonuses that were distributed based on time gains have been converted to collective bonuses—making it in the interest of a whole team to produce high-quality work in the shortest possible time." The cost of the new plant is approximately 40 million French francs. Other shops are now being restructured, but the biggest future project is supervision of all the shops' NCMT (numerically-controlled machine tools) by an Ethernet-network integrated supervisor. And since changes never come one at a time, Giat, which up till January may have been able to afford expensive equipment in the name of national defense, will henceforth have to learn to be competitive: On 1 January 1990, it was converted from a public to a nationalized private company.

Germany: ILKON Flexible Design System Described

*90WS0071A East Berlin FEINGERAETETECHNIK
in German May 90 pp 213-215*

[Article by Prof Dr sc. techn. G. Hoehne, Ilmenau Technical University, Instrument Engineering Section: "ILKON—A Flexible System for Instrument Design"]

[Text] Known CAD systems, such as PCCAD, MULTICAD, CADdy, AUTOCAD, and PROCAD primarily support detailing, sketching, modification, and adaptation of standard solutions. The computer-internal object data generated by them are indispensable for the subsequent data processing in manufacturing preparation, production control, quality control (CAM, PPS, CAQ), and other areas. Thus, the designer becomes the most important supplier of data for the entire company.

However, these systems do not include the decision-making and drafting procedures essential for design for the functioning and production of a product. Increasingly intelligent systems are required to make even the predominantly heuristic methods of problem solving accessible to computer aided processes.

1. Requirements for Intelligent CAD Systems

In particular, the task analysis, principle definition, and configuration phases with their multiple solutions and decisionmaking under risk make new demands on information processing, e.g.:

- Object descriptions at various levels of abstraction and transfers between them (consistent and compatible computer-internal representation RID)

- Processing of nonquantifiable data, working with preferences among alternative solutions
- Tools for preprocessing of decisions
- Flexible (symbolically structured) preparation of data
- Execution of rules with uncertain or incomplete data.

These requirements point to the use of expert systems.^{1,2} In addition, there are numerous forms of support which complete the spectrum of intuitive, systematic, knowledge-based, computer aided, and even automatic performance of design activities. Integration of methodical and computer aided processes is also the objective of the ILKON system.

2. ILKON System

The Ilmenau design system includes methods to support problem solving in the early phases of the developmental design process. It targets the needs of instrument engineering and construction of precision machines.

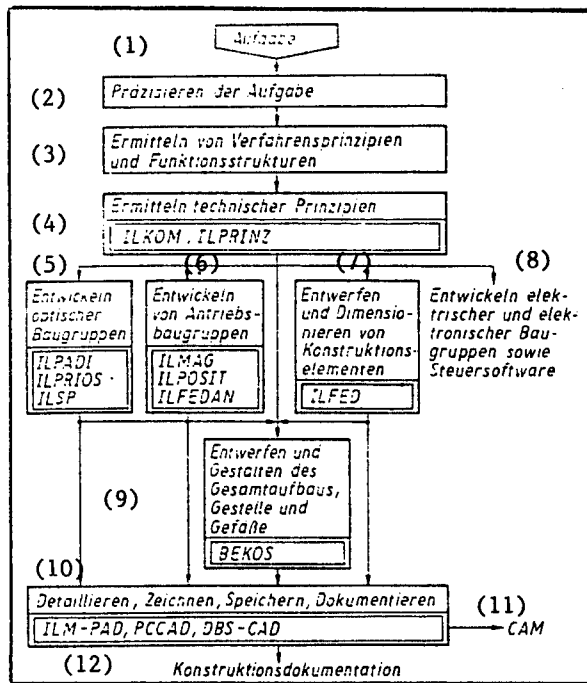


Figure 1. Development process with ILKON programs

Key: 1. Task—2. Task definition —3. Determination of process principles and functional structures —4. Determination of technical principles ILKOM, ILPRINZ —5. Development of optical assemblies ILPADI ILPRIOS ILSP —6. Development of drive assemblies ILMAG ILPOSIT ILFEDAN —7. Development and dimensioning of design elements ILFED —8. Development of electrical and electronic assemblies and control software —9. Designing and modeling of the entire structure, rack, and housings BEKOS —10. Detailing, sketching, addition to data base, documentation ILM-PAD, PCCAD, DBS-CAD —11. CAM —12. Design documentation

2.1 Methodical Design

The starting point for a modular system of CAD components for instrument design³ subdivides the necessary procedures according to the work steps of the design process (phase model) and the structure of the products (assemblies and control software). This forms the foundation for ILKON (Figure 1). In particular, the new and adaptive designs include synthesis activities (disassembly, integration, variation, combination, dimensioning) as well as analysis and selection activities whose content and consequences cannot always be predefined. Therefore, flexible work cycles should support problem solving with programs and methods both for the entire process and within the blocks according to Figure 1.⁴ To this end, ILKON's subsystems are modular and use alphanumeric and graphic dialogue for communication.

The fundamental subdivisions are shown in Figure 2. Using gradual enhancements, this design permits the transition from simple EDP programs to knowledge-based advisory systems since its components are developed according to the state of the art and need.

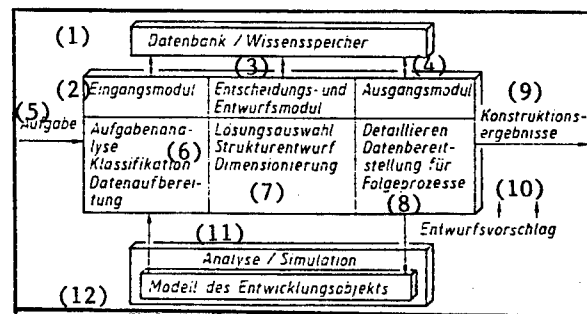


Figure 2. Major structures of the subsystems

Key: 1. Data base/knowledge base—2. Input module —3. Decision and design module —4. Output module —5. Task —6. Task analysis Classification Data preparation —7. Solution selection Drafting of structures Dimensioning —8. Detailing Preparation of data for subsequent processes —9. Design results —10. Design proposal —11. Analysis/Simulation —12. Model of developmental object

Input Module

The user interactively prepares input data, obtaining support both for model description and for use of the system. The input modules are increasingly assuming the functions of a task analysis processor⁵ and taking care of the program-based invocation of drafting and dimensioning programs. The subsystems ILPADI, ILMAG, and ILPOSIT contain the starting points for this.

Decision and Design Module

All forms of problem solving can be applied here (rules, algorithms, decision tables, even inference engines). They are always based on a specific level of abstraction of the product model (representation of principles, 2-D

or 3-D image, FEM, differential equations; etc.) and include only a limited range of objects (optical, mechanical, electrical assemblies), or, in the extreme case of a single variant design, only one object.

Output Module

Subsequent processing of the data generated is required both for further processing within the system itself (simulation, recording in the data base) and for the dissemination of the design results as a data file or documentation, which can be generated with PCCAD.

Analysis and Simulation

This component is specifically required for drafting systems to enable testing of the behavior of the object designed even during the design process as well as checking the consequences of design measures. Functional analysis or simulation is used for this in the ILPRINZ (simplified transfer matrices), ILMAG, ILPOSIT, ILFEDAN, ILFED, BEKOS (static or dynamic behavior) programs as is production simulation, e.g., simulation of adjustment procedures in optical assemblies with ILPRIOS.

Data Bank/Knowledge Base

Currently, each subsystem of ILKON has its own form of data storage. Depending on the specifications of the developmental object, the structure and scope of the data base, and the algorithms used, program-internal files, sequential and relational data bases (DBS-CAD¹⁰), and, in a preliminary stage, even intelligent knowledge bases (with ILPOSIT) come into play. The trend is toward more strict delineation of problem solving methods and product-specific knowledge.

2.2 System Components

The program systems shown in Figure 1, for which brief characterizations are presented in Table 1, must be used individually in the respective design phases on graphic workstation platforms (16-bit).

The programs for principle-based design transport the familiar methods of combination and variation to the computer and, above all, support effective management of large quantities of solutions.⁶

For development of optical assemblies, ILPADI and ILPRIOS are new tools which provide the instrument designer support in the preparation of the design of the optics, in the physical arrangement of the optical elements, and especially in the resolution of adjustment problems. They follow the development cycle shown in Figure 3.

The programs for the design of drive assemblies handle the types of tasks which recur frequently (ILPOSIT) or whose solution is expensive due to complex interrelations (ILMAG,⁸ ILFEDAN). BEKOS^{11,12} supports

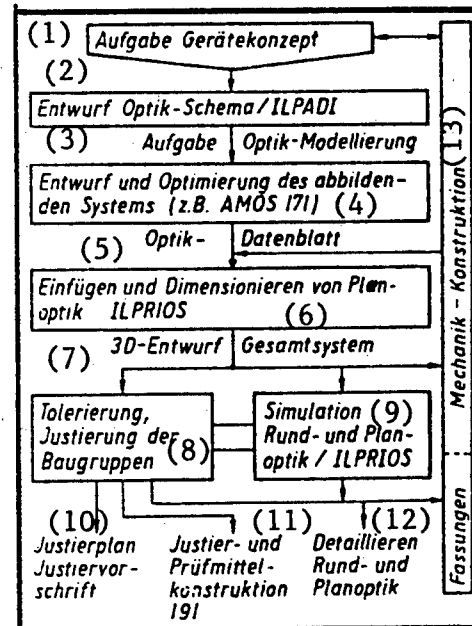


Figure 3. Cycle of computer aided development of optical assemblies

Key: 1. Task: Instrument design—2. Draft of optics schematic/ILPADI —3. Task: Optics modeling —4. Draft and optimize the system under development (e.g., AMOS) —5. Optics data sheet —6. Integration and dimensioning of the plane optics ILPRIOS —7. 3-D drafting of entire system —8. Defining tolerances, Adjustment of the assemblies —9. Simulation of 3-D optics and plane optics/ILPRIOS —10. Adjustment plan Adjustment instructions —11. Design of adjustment and testing means⁹ —12. Detailing of 3-D optics and plane optics —13. Mounting Mechanics—Design

dynamic simulation of racks. A combination of component optimization and selection of standard components is provided through the program system ILFED.
Final Remarks

With the solutions presented, the ILKON system extends the application of computers to rationalization of routine tasks and product data recording all the way to significant areas of problem solving in instrument design. Cooperation with the contracting combine VEB Carl Zeiss JENA focuses on design-based development of software, dialog, and data output. The programs are written in FORTRAN 77 and can be used on graphics-capable 16-bit PC's under DCP or MS-DOS. The ILMPAD graphics module which has been developed and the user friendly interactive routines support the use of FORTRAN 77 for this purpose.

Following this overview, the journal FEINGERAETECHNIK will present the content and applications of the most significant ILKON program systems in subsequent articles.

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Table 1. ILKON Program Systems

Area	Program System	Model	Activity
Principle-based design	ILKOM Computer aided combination	Combination matrix Generic Variants	Using a sample of a few variants from combination tables with any content evaluated manually and interactively, it generates suggestions for a selectable number of favorable solutions. Xij is a verbally described combination element.
	ILPRINZ Computer aided variation and combination of principles	Catalog of Elements Bearing Lever Motor Graphic symbols of principles with transfer vectors, chain structures	By variation of position (rotation) of elements, components, or groups of elements at any coupling points, it generates functional variants from a given technical principle or from a combination matrix and outputs them graphically.
Optical assemblies	ILPADI Paraxial dimensioning of optical systems	Paraxial structure (centered, thin lenses, collinear imaging)	Permits interactive dimensioning, manipulation, and analysis of centered, rotationally symmetric systems with an unlimited number of elements with any preset paraxial specifications. Graphic representation and output of the system configuration (object, images, principal planes, aperture diaphragms, foci) and the path of beams.
	ILPRIOS Analysis of location of aberrations in optical systems and dimensioning of plane optics	3D model with plane and 3-D optics	For errors in the positioning of lenses and prisms as well as internal aberrations of prisms, it determines the effects on the image (paraxial values, image rotation and tipping, monochromatic image errors, astigmatism, crosswise and lengthwise aberrations, vignetting, clarity of definition), prism catalog and prism dimensioning, specification of optimum axes, 3-D graphics of the system with the path of beams.

Table 1. ILKON Program Systems (Continued)

Area	Program System	Model	Activity
Drive assemblies	ILPOSIT Knowledge-based design of positioning systems	Motor Coupling Gears Control Measurement system Principle elements and assemblies for single-coordinate positioning systems (translation)	For a motion task with quantitative or qualitative specifications, it defines the order of the appropriate components for the subfunctions; intelligent data base for principle-based solutions, characteristic-based data base with configuration data; output of a true-to-scale design and dynamic simulation by means of stored transfer functions (MODS).
	ILMAG Dimensioning and design of DC magnets ⁸	Cup-shaped E-shaped U-shaped Simplified closed magnetic circuit, dimensioning equations for the steady state	Interactively determines volumetrically optimized bulk and coil data for magnets with or without the effect of characteristics by entering the power/curve of the magnet, material, ambient temperature, variant design for cup-shaped magnets in menu technology with output of drawings.
	ILFEDAN Analysis and synthesis of spring drives	Differential equation of motion for tension and compression springs with straight-line drives	Analysis: Determines the moving time or the stroke for a given spring, drive structure, and load. Synthesis: Specifies spring dimensions for given load, stroke, and moving time and permits selection of a standard spring according to TGL [GDR standards] (ILFED).
Design elements	ILFED Dimensioning and selection of tension and compression springs for static load		Interactively calculates and selects springs from TGL 19394 through 18397 for ten selectable combinations of spring characteristics in specific predefined search ranges, interactive optimization is possible.

MBB Evaluates High-Speed Cutting Installations

90WS0078A Frankfurt/Main, FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 1 Aug 90 p 8

[Unattributed article: "High-Speed Cutting Significantly Shortens Process Time"]

[Text] Frankfurt, 31 Jul—To remain competitive in the future in the materials processing industry, all available reserves must be mobilized for rationalization and automation. High quality, competitive costs, and short delivery times can only be achieved if production facilities can be used optimally and have a high level of availability.

One example of the high standard of production is high-speed cutting (HSC) which Messerschmitt-Boelkow-Blohm GmbH has advanced in the last few years in its Augsburg plant and has integrated into mass production. An example serves to illustrate the extent to which high-speed cutting sets new standards in production: For an Airbus integral component of dimensions 2,300 x 220 x 110 mm cut from an aluminum sheet at a metal removal level—that is the qualitative measure of a machining operation—of 94 percent, process time fell from 699 to 396 minutes using the new production technology.

It took years of development to reach the current level of metal removal in the aircraft industry before it became

clear in the 1980's that despite the emerging fiber composites, machined aluminum parts would always remain important. A recent American study puts aluminum's share of aircraft structural weight at approximately 60 percent for the year 2000. It also takes into account the use of the latest generation of metal materials, aluminum-lithium alloys.

"In the face of this scenario it has become clear," writes MBB in its journal NEWTECH-NEWS, "that significant rationalization potentials can be achieved by means of an increase in cutting speed and a corresponding boost in feeding speeds." The increased knowledge was obtained through the cooperation of a combined research project coordinated during the 1980's by the Technical University of Darmstadt's Institute for Machining Technology and Machine Tools (ITW).

For aluminum alloys, high-speed cutting begins at a speed of approximately 2,500 meters per minute, i.e., five times the conventional cutting range. Through close cooperation among the Augsburg production experts, the Central Laboratory for Machining also located in Augsburg, and the universities, research institutes, and the supply industry, all the HSC requirements for the machine tools and their peripherals have been met.

For this, along with process parameters, high priority is being placed on machine design, the highly stressed cutter spindle, and control and command technology. One of the features of HSC machines is the complete

encapsulation of the machining area for operator protection from flying metal chips and automatic chip disposal. The focal point of HSC development was the cutter spindle technology.

The mechanical and thermal loads occurring in the spindle on the one hand and guaranteeing running truth of a few thousandths of a millimeter, high rigidity, and robustness on the other hand, presuppose highly specific bearing technology. Another emphasis during development was the command and control technology.

This requires CNC controls with extremely short block cycle times (10 milliseconds); that is the interval after a digital memory cell is addressed for read/rewrite of data before the next address can be received by the same cell. This has a suitable, corresponding drive sampling rate (8 milliseconds).

Although development is not yet complete, entry into high-speed cutting has already proved to be worthwhile, according to MBB. For new, innovative machine and spindle designs, improved bearing designs, such as active magnetic bearings, improved sensor technology to increase service life, and increased rotational speed are being studied. The latest installation at the Augsburg MBB plant is supposed to ultimately reach 38,000 revolutions per minute with high power output.

LASERS, SENSORS, OPTICS

Germany, Israel Study Solar-Powered Lasers

90WS0049B Frankfurt/Main FRANKFURTER
ZEITUNG/BLICK DURCH DIE WIRTSCHAFT
in German 30 May 90 p 8

[High-Performance Laser Can Also Be Pumped by Solar Energy: Large Helio-stat Mirrors Required: Power Output 40 Watts]

[Text] Ot. Frankfurt, 29 May. High-performance lasers today are important instruments in the communications- and processing technologies. To operate, they must be powered from a strong light or other energy source. For this so-called "pumping," powerful flash light has been used to date, along with other technologies. But solar radiation too would be completely suitable to power a constantly operating laser.

This has now been demonstrated in a comprehensive study prepared by a team of specialists at the German Aviation and Space Research Laboratory (DLR) working in conjunction with Israeli scientists associated with the Weizmann Institute in Rehovot and the Soreq Research Center in Yavne. The cooperation with Israel suggested itself because of the numerous research facilities in that country directed to the utilization of solar energy. At first, solar-pumped lasers would be used in near space, in satellites, and in space stations to supply other satellites with power or to improve and lower the costs of operation of communications equipment on a sustained basis.

The study also indicates that applications here on Earth are also entirely possible. This is particularly so if the lasers powered by solar energy are themselves kept in deep cold. A new solid-state laser type, which achieved an output power of about 40 W at 77 degrees Kelvin, was most efficient. It consists of a neodymium-chromium-containing garnet that clearly demonstrates better laser properties than the neodymium-YAG laser crystals introduced for comparison.

The solid-state lasers used are tiny as compared with the systems employed to capture and concentrate the sun light. The crystal rods of both lasers were only 5 by 62 mm in size. On the other hand, planar 10-by-10-m heliostat mirrors together with 7-m large concave mirrors were used to capture the light. They permitted a power of about 1,600 W to be imparted to the pinky-finger long laser crystal rods. For additional light concentration, the laser rod is placed in a cup-like reflection vessel.

The neodymium-chromium laser emits monochromatic laser light in continuous wave operation in the wavelength sector of about 450 nanometers, which is to say in the blue spectral range. This very small solid-state laser would, after the comprehensive investigations, be able to provide powers of up to about 300 W on Earth as well, if it is cooled with liquid nitrogen. It would then be suitable to be utilized in material processing, in welding, or to initiate chemical processes, without the need for expensive power sources. A high-performance laser of this type can also emit its laser light via beam splitting and by means of fiber glass to various operational areas.

Eurolaser Project Receives Four-Year Funding

90WS0049C Frankfurt/Main FRANKFURTER
ZEITUNG/BLICK DURCH DIE WIRTSCHAFT
in German 15 May 90 p 8

[Surface Finishing With Laser Beam: Group of Companies Want To Develop a New Production Cell]

[Text] re. Frankfurt, 14 May. Surfaces can be protected against wear by hardening, alloying, or remelting. The use of laser beams for surface finishing appears to be very promising. Three German and four Italian companies now want to develop this technology within the framework of Eureka Research Project 204 (Eurolaser). The object of this cooperative research effort would be the design of a new production cell, i.e., an automated work station for the surface finishing of complex structural parts by means of high-performance laser beams.

Specifically, Friedrich Krupp GmbH, Essen, reports, the production cell would consist of a carbon dioxide laser with an output power of at least 5 kW, an optically variable transmission path, a portal system with at least five controllable axes, a sensor system for on-line process control and regulation, as well as a modular processing head. As a partial undertaking within the overall project, the Krupp Research Institute will be responsible for the

solution of process observation, production control, and application-oriented system integration.

In this context, process observation refers to the continuous temperature monitoring of the laser beam during the surface finishing of the structural parts in order to obtain controlled variables for laser performance from this sensor measurement. After the development and testing of the production cell, the companies want to improve the process by means of adaptive automatic control and to identify possibilities for integration in flexible material flow systems.

After the analysis and definition phase, the four-year developmental work period for the project has now begun with funding of about 18 million Ecu. Besides the Krupp Research Institute, on the German side, the Bremen Institute for Applied Beam Technology and Rofin Sinar Laser GmbH, Hamburg, will participate; the last named as national project coordinator.

Germany: Optical Radio Link System Developed

90WS0078B Frankfurt/Main, FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 31 Jul 90 p 8

[Unattributed article: "Transmitting Data With Optical Radio Link"]

[Text] Frankfurt, 31 Jul—Data transmission based on optics is assuming greater significance with fiber optic technology. However, the idea of carrierless transmission with optical radio link systems is not new because the postal authority conducted research into it as much as 30 years ago. But the idea could not be implemented until now. At the Institute for Communications Engineering and Electroacoustics of the Technical University of Darmstadt, an additional step has now been taken in this direction and an optical radio link system has been developed.

According to developer Dr Hermann Lentke, the system works with an infrared semiconductor laser. Instead of requiring a carrier for transmission of data, the connection between transmitter and receiver is achieved with infrared light pulses alone. For this, previous exact alignment of the transmitter is necessary. The semiconductor laser converts electrical pulses into infrared light pulses which are then reconverted into electrical pulses in the receiver.

One of the advantages of this optical radio link system is that the expensive wiring necessary with conventional data communications systems is no longer needed. According to the developer, with cable connections it is necessary to contend with outlays of DM300 to 500 per meter. The price for the optical transmission system is approximately DM30,000. It would therefore already be considered a cost-effective alternative at distances of more than 100 meters.

However, the cableless system does have some drawbacks. Communication capabilities are subject to weather related disruptions. This is true primarily for greater distances and restricts the possibilities for use of the system. It should therefore be used primarily for relatively short transmission distances. Lentke envisions its major area of application as industrial computer communication, i.e., in the installation of networks. The relatively fast installation should also be of benefit in this application. The system is soon to be tested in the computer network within the Technical University of Darmstadt. Also, a prototype will be installed at Hoechst AG's plant complex.

German Firm Develops Laser System for Clean Rooms

90WS0049A Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 28 May 90 p 10

[Article: Troublefree Measurement Through Particle Dynamics With Optical Process: LOT Company's CIS-System Combines Laser Measurement System With a Videomicroscope]

[Text] bh. Frankfurt, 27 May. The requirements for "dust-free" clean rooms can differ considerably. For example, the extremely clean spaces, which are required for fabrication work in the electronics industry, must be constantly monitored for dust particle contamination in the particular clean rooms. The procedures in particle dynamics—the simultaneous measurement of the size, velocity, and concentration distribution of particles in a room, have been substantially improved of late.

The CIS-system, developed by the LOT Company of Darmstadt, combines a laser measurement system with a videomicroscope. The system provides simultaneous information on the size and shape of the particles. According to the company, the system is immune to the such disturbing effects as light scattering, Brownian molecular motion, heat convection, fluctuations in the refraction index, temperature variations, and other factors. Unlike older measurement systems, the CIS-system does not measure a group of particles, but rather undertakes to measure individual particles. Particle analysis, therefore, is based on the statistics of individual particle measurements. A rotating helium-neon laser beam is focussed in the measuring range. Particle size is determined from the time the laser beam needs to run over the particle at a constant velocity contactfree.

Each signal is evaluated electronically. In addition, the company reports, the particle is simultaneously imaged on the monitor through the videomicroscope, thereby permitting the measurement results to be interpreted with more care and interfering phenomena like sedimentation and the physical state formation to be recognized immediately.

The CIS-system, with its single particle counter, can measure particles in many different physical states in the

one instrument: in gases, fluids, sludges, aerosols, pastes, or thin films. The particle counter is therefore suitable for investigations in engineering technology and other technological fields. The measurement of particles in fluids and pastes is particularly easy. In the first instance, plastic disposable test tubes, which can be changed rapidly, are used. Measurements in pastes are made in simple microscope slides, such as are used in light microscopy. The measurement procedure does not require calibration against standardized particles. Most importantly, it operates troublefree at the same high time and space resolution. Thanks to the system's ability to store results, comparative studies are also possible. This last capability should make the monitoring of particle dynamics in a clean room in different areas and at different times much easier.

MICROELECTRONICS

German Report on Philips Withdrawal

90WS0099A Duesseldorf WIRTSCHAFTSWOCHEN
in German 14 Sep 1990 pp 156-162

[Article by Herbert Fuchs and Wieland Schmitz: "JESSI: Philips Withdrawal Means Severe Setback - Difficult Task"]

[Text] Europe's chances in the technology race with Japan are dwindling. Alliances with the U.S. are supposed to help.

Right now, the committees of the European research initiative Jessi (Joint European Submicron Silicon Initiative) need to present a calm image. As Jessi Board spokesman Klaus H. Knapp puts it, the withdrawal of the beleaguered Philips group from the memory chip development project is an "accident," however. The area of static RAMs in which the Dutch firm worked is only a "niche" in the overall market.

EC commissioner Filippo Maria Pandolfi, in charge of research, is also trying to calm any fears: "The Jessi programs are far from collapse." By far the largest part of this project, he asserts, is not affected. Jessi's goal is to enable European industry during this decade to free itself from its dependency on Japan in microelectronics.

In fact, Philips only withdraws from the area of memory chips. The Dutch company will continue in 23 other study groups which work on logic components and on the production and application of LSI chips. Moreover, the market for static RAMs constitutes only a small fraction of the total market for memory elements. This market is clearly dominated by the so-called dynamic RAMs.

Still, the memory project is the most important one among the more than 50 individual projects in the overall program which carries a price tag of almost DM8 billion. It still accounts for approximately 20 percent of all Jessi programs, with Philip's part in it alone

accounting for approximately five percent. This means that nearly DM400 million are at stake.

In the Joint Memory Group, the experts of Europe's three chip manufacturers—the only ones in Europe—came together to do research on the memory elements of the future, silicone bodies the size of a thumbnail with up to 64 million memory locations: Siemens with a 55 percent participation covered dynamic RAMs, Philips with approximately 25 percent covered static RAMs, and the French-Italian semiconductor group SGS-Thomson (ST) was responsible for the so-called EPROMs (programmable memories).

Philips, already strained financially, was no longer willing to carry the high start-up cost for the static RAM business. In addition, market opportunities fell short of expectations. Just like the market for dynamic RAMs, it is dominated by the Japanese and experienced the same drastic price cuts. For that reason, three U.S. chip manufacturers also left the static RAM business in the past few weeks.

The Philips withdrawal could mean the definite end of static RAM activities within the research initiative. With the Siemens decision not to rely on Jessi for development of the 64 Megabit dynamic RAM and to cooperate with U.S. computer giant IBM, such a development would further reduce the importance of the ambitious European project. While Siemens' decision did ensure that company's continued chip activities, the static RAM line would be lost for Europe.

Siemens is not a candidate for this project. Therefore, the EC commission and the politicians, among them German research minister Heinz Riesenhuber, are placing their hopes on the SGS Thomson group which offers a broad range of semiconductor products and even claims to have sold more static RAMs than Philips last year. However, SGS Thomson is in trouble because of a recent decline in profits.

Therefore, experts doubt that the French-Italian joint venture can assume Philips' role, because it means a loss of not only the nearly DM400 million in financing, but of current Philips research results. "The governments in Rome and Paris would have to come up with a lot of money," says an industry expert.

Even if the static RAM chip is a niche product, it is something the computer industry cannot do without. Because of its low power consumption it is used in portable computers (laptops) which are becoming increasingly more powerful. Other versions are used as super-high-speed buffer chips in mainframes or in image processing. Most importantly, however, by 1994, static RAMs will experience the largest growth rate: 27 percent per year, compared to 20 percent for dynamic RAMs and 16 percent for EPROMs.

Professor Ingolf Ruge from the Technical University of Munich, a much sought after consultant and expert in the field of microelectronics, considers the static RAMs increasingly "essential."

Nevertheless, he does not expect any insurmountable problems with the static RAM supply from the Far East. Attempts at blackmail by the suppliers of those chips would not work, because competition among Japanese firms and with the new competitors in Korea is "extremely tough."

Ruge's concerns have other reasons. "The fact that one of the largest semiconductor manufacturers is giving up, means that the remaining European electronics industry will shiver and draw closely together." According to Ruge, the Dutch withdrawal is a symptom of the difficulties in this "almost hopeless battle" against the predominance of the electronic giants in the Far East. "It shows that it is extremely difficult to enter this brutal chip business as a newcomer." The Japanese follow a strategy of making enormous, government-sponsored investments so that they can introduce new technologies early when demand permits high prices. This way, they can amortize their investments before prices drop.

So far, the Europeans have not been able to do this; they came too late and had to bear the brunt of the price war. Siemens, for instance, continues to sustain heavy losses with the 1 and 4 MB dynamic RAM. As Ruge puts it: "Either you spend a lot of money to be in the market early enough, or you have to leave this miserable chip business."

Under these conditions, government support plays a key role. For Jessi, governments had planned to show off their generosity: Companies and institutions were to provide 50 percent of the total of almost DM 8 billion, and the participating European governments and the European commission were to provide one quarter each. Still, the participating companies are forced to haggle for support of each individual project. As electronics expert Ruge contends: "We won't get anywhere with half-hearted support measures like these."

In the meantime, the Jessi administrative bodies have started pondering how to close the gap left by Philips. However, indications are that probably no decision will be reached before the November meeting of the Jessi board.

However, there are rays of hope which indicate that the static RAM flop will not be followed by further defeats: By now, Jessi officials have established firm ties with the American research initiative Sematech. This program corresponds to one of Jessi's four major programs, research for equipment and material for the production of the next chip generation. On 7 and 8 Sep, high-ranking representatives of both organizations met in Austin, Texas. They already agreed on uniform standards and the mutual exchange of research results.

After the deal between Siemens and IBM, this is the second important bridge to the U.S. It could develop into a transatlantic research alliance with increased impact increasing the chances against the Japanese who

now dominate the chip market with approximately 90 percent worldwide. After all, the Asians do not find it that easy either to develop the leading-edge technology required for the 64 Megabit RAM.

Chip professor Ruge: "Even the Japanese are starting to perspire when they think of the 64 M production."

Siemens Announces New Circuit Simulator

90WS0073C Frankfurt/Main FRANKFURTER
ZEITUNG/BLICK DURCH DIE WIRTSCHAFT
in German 20 Jul 90 p 8

[Article: "Siemens: Titan Works Fifty Times Faster. Circuit Simulation Must Bring Increasingly Greater Performance"]

[Text] Siemens AG, Munich/Berlin, reports that its research laboratory has developed a circuit simulator, Titan, which works up to fifty times faster than Spice, the program generally used today. With Titan, even circuits with several thousand transistors could be simulated in acceptable computing times. Circuit simulation programs like Spice and industrial advancements are indispensable aids for circuit design.

The increasing complexity of circuits necessitates the use of ever faster simulators. The critical path of a 4 megabit dynamic read/write memory contains about 6000 transistors. The analysis of a cycle with read/write/read requires more than one day of computing time on a main-frame computer with Spice. According to Siemens, with the transition to the 16 megabit and 64 megabit generation, the simulation accuracy required increases along with circuit size.

A significant reduction in computing time is said to have been achieved through vectorization of the program and the use of a vector computer. The use of a newly developed table model for MOS (metal oxide semiconductor) transistors and the introduction of local time intervals have proven especially advantageous in this respect.

Germany: Static CMOS Memory With Address Access Developed

90WS0062A East Berlin RADIO FERNSEHEN
ELEKTRONIK in German May 90 pp 283-286

[Article by Dipl. Eng. Wilfried Hofrichter: "Static 64-Bit CMOS Memory U6264 DG"; first paragraph is RADIO FERNSEHEN ELEKTRONIK introduction]

[Text] The U6264 is a highly integrated write-read memory IC with random access in the organizational form 8 K x 8-bit and the first static CMOS memory developed in the GDR with address access. The memory circuits of this family type are intended for use in devices for data processing, automation systems, and business electronics. Because of their low power consumption they are particularly suited for battery-buffered and portable devices. They are introduced through this article.

Major Features The memory IC is characterized by the following major features:

- Organization 8,192 x 8 bit
- low power consumption
- low access times of 55, 70, or 100 ns
- six transistor cell
- all inputs and outputs are TTL compatible
- bidirectional data inputs and outputs
- tristate outputs for each two TTL loads
- integrated gate protection elements at all inputs
- gate circuits at all address and data inputs as well as the control inputs /CE1, /WE, /OE
- OE-input for connection to a bus system
- operating voltage of 5V +/-10 percent
- data retention to 2V operating voltage (standby mode)
- operating temperature range from -25 to 85 degrees C
- pin compatible to 64-Kbyte-EPROM U2764
- 28-pole DIL plastic housing; 15.24mm row pitch; 2.54mm pin distance
- high reliability.

Three types of U6264's, differing from each other only in access time, are planned.

With all three types the two CE access times and the address access time are identical to the minimum cycle time. The major parameters of the individual types are shown in Table 1.

Table 1: Major Parameters of the Types of the U6264

Type	U6264 DG 05	U6264 DG 07	U6264 DG 10
Access times			
t _{AVQV} , t _{C1LQV} , t _{C2HQV} in ns	55	70	100
minimum cycle time in ns	55	70	100

Connector allocation and circuit abbreviations are given in Figure 1.

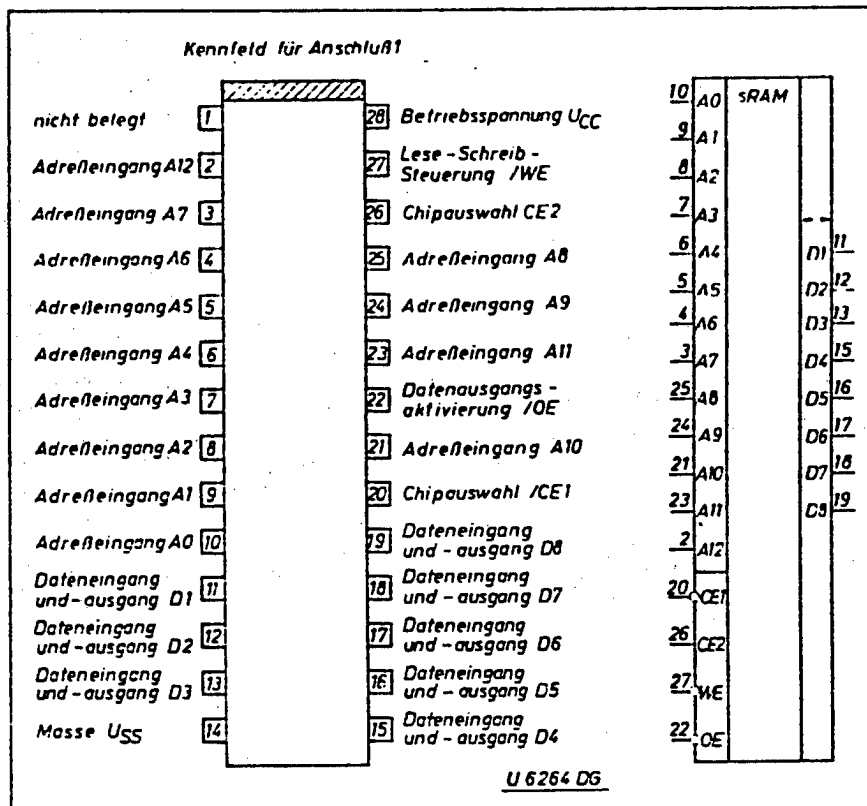


Figure 1. Connector allocation and circuit abbreviations of the U6264, Characteristics for connector 1 [numbers in key are pin numbers]

Key:—1. Not used—2. Address input A12—3. Address input A7—4. Address input A6—5. Address input A5—6. Address input A4—7. Address input A3—8. Address input A2—9. Address input A1—10. Address input A0—11. Data input and output D1—12. Data input and output D2—13. Data input and output D3—14. Ground V_{SS}—15. Data input and output D4—16. Data input and output D5—17. Data input and output D6—18. Data input and output D7—19. Data input and output D8—20. Chip select /CE1—21. Address input A10—22. Data output activation /OE—23. Address input A11—24. Address input A9—25. Address input A8—26. Chip select /CE2—27. Read/Write control /WE—28. Operating voltage V_{CC}

Fabrication Technology

The IC is a prototype for the static variant of state-of-the-art 1.5 micron CMOS technology, the so-called CSGT4's. It is produced at the same photolithographic level as the dynamic 256-Kbit memory U61256.

The static variant of the technology is characterized by the following features.

- p-silicon substrate
- n-Wanne
- 25nm gate oxide thickness
- 1 polysilicon layer (gates)
- 2 aluminum conductor layers
- 1.5 micron x 2.0 micron contact holes
- 1.5 micron minimum structure width and spacing.

A whole group of additional digital circuits is being produced in this technology variant, distinguished particularly by the use of two aluminum conductor layers.

The new level of technology permits a memory cell with the dimensions 14.5 microns by 20.25 microns. The memory includes a total of approximately 411,000 MOS transistors integrated on a chip surface of 4.50mm by 6.74mm.

Organization

Figure 2 is the block diagram of the U6264, which consists of

- 65,536 memory cells
- 1,024 redundant memory cells
- 8 bidirectional data inputs and outputs
- 256 row decoders
- 4 redundant row decoders with programming part
- 32 column decoders
- 256 Bitleitungsvorladungen preloaded
- 256 read amplifiers
- 13 address inputs
- 2 clock levels
- 1 address change detector and
- 21 protective circuits.

Through the use of the conventional six transistor cells, a low resting current is assured in the entire operational temperature range.

For increased performance, the U6264 has electrically programmable redundancy similar to that of the U6516. The redundancy amounts to 4 rows per 256 memory cells, or an additional storage capacity of 1.56 percent. The redundancy is integrated into the IC in such a way that it has no effect on the electrical characteristics of the circuitry.

Functional Description

The following modes of operation have been established for the U6264 IC:

- CE-controlled read
- address controlled read
- CE-controlled write

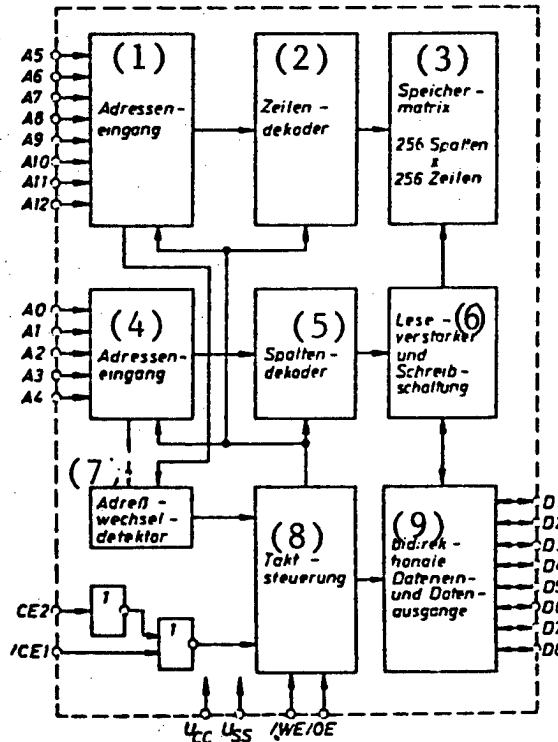


Figure 2. Block diagram of the U6264

Key: —1. Address input—2. Row decoder—3. Memory array, 256 columns by 256 rows—4. Address input—5. Column decoder—6. Read amplifier and read circuit—7. Address change detector—8. Clock control—9. Bidirectional data inputs and outputs

- WE-controlled write (with this a combined read/write cycle is also possible)
- standby mode.

In the disable mode ($/CE1 = H$ or $/CE2 = L$), all additional inputs are excluded. The data outputs are in the high mode.

At TTL input levels, a low resting current, which is minimal at $CE2 = V_{SS}$, flows through the input gates of $/CE1$ and $CE2$. This connection guarantees that the resting current at an operating voltage of 5.5V and an ambient temperature of 85 degrees C is not greater than $100\mu A$.

The circuit is activated by the H-L pulse from $/CE1$ or the L-H pulse from $CE2$. At the same time, the address and control inputs are opened. Depending on the data at $/WE$ and $/OE$, the data inputs or outputs are active.

During reading ($/CE1 = L$, $CE2 = H$, $/WE = H$), the data goes from the eight addressed cells to the data output stages (internal reading). In the read mode, each address change triggers a new read cycle. The H-L pulses from $/OE$ activate the data outputs, and the binary data is present in low level at data outputs $DQ0$ through $DQ7$.

This signal permits a shortening of the access time because after activation of the circuit the external data bus is again available to transmit other data.

During writing ($/CE1 = L$, $CE2 = H$, $/WE = L$), the data present at data outputs DQ0 through DQ7 are written into the eight addressed cells. The write cycle is terminated by the L-H pulse from $/CE1$ or the H-L pulse from $CE2$ or the L-H pulse from $/WE$. The data at $/OE$ are arbitrary during this operation.

During the combined read/write cycle, which is possible through $/WE$ -controlled writing, the data from the eight cells are read in parallel, and then the new data are written into these eight cells. To avoid bus conflicts, it is necessary to observe the hold time t_{WLQZ} before moving the new data.

For all types, data retention is guaranteed up to $V_{CC} = 2V$ (standby mode) with low standby current. In the standby mode (2V less than or equal to V_{CC} less than 4.5V), the circuit must be inactivated by $/CE1 = H$ or $CE2 = L$. For internal preloading, it is necessary to observe the hold time t_{AVAX} after terminating the standby mode (V_{CC} greater than or equal to 4.5V). Table 2 presents the individual modes of operation.

Operating Conditions and Characteristics

Figure 3 through 8 [not reproduced] show the pulse schematics of the individual cycles and the standby mode.

The limit values for the operating conditions are contained in Table 3. General operating conditions are summarized in Table 4; the different operating conditions for the three types, in Table 5.

A short circuit between active outputs and a short circuit between active outputs and the ground or power supply are forbidden!

When $/CE1$, $CE2$, $/WE$, and $/OE$ are in the read mode during write cycle 1 or write cycle 2, the data outputs are in the low level state. During this time it is not permitted to deliver the digitally opposed input data.

The general characteristics of the U6264 listed in Table 6 and the different characteristics listed for the three types in Table 7 are valid for the above-mentioned operating conditions unless otherwise specified.

Figure 9 through 20 [not reproduced] show typical interdependences of a few significant characteristics of the family of memories. Changes in the typical values are possible through additional type optimization.

Comments on Applications

Due to the great steepness of the pulses of the internal signals, upon activation of the circuit and upon address changes, short-term current peaks of approximately 100mA occur. Appropriate stabilizing capacitors must be provided to support the operating voltage. The values must be determined individually by experiment for each circuit on the printed circuit board (standard value approximately 100nF).

The ground and operating voltage lines must be low-impedance lines and as free of inductivity as possible because, otherwise, interfering pulses against the ground of the circuit could occur at the inputs of the circuit due to peaks caused by the fast, low-level data outputs.

Beyond the guaranteed standby voltage range, the data are retained up to approximately 1V at room temperature. Because of the gate circuits, it is possible to do without Ziehwiderstaende resistors.

Table 2: Modes of Operation of the U6264

Mode	$/CE1$	$CE2$	$/WE$	$/OE$	DQ0 - DQ7
disabled	X	L	X	X	
	H	X	X	X	high
internal read	L	H	H	H	high
read	L	H	H	L	low/data output
write	L	H	L	X	high/data input

X = arbitrary

Table 3: Limit Values of Operating Conditions
(all voltages must be based on $V_{SS} = 0V$)

Characteristic	
Operating voltage V_{CC} in V	-0.3...7.0
Input voltage V_I in V	-0.3... $V_{CC} + 0.5$
Power dissipation P_{Tot} in W	≤ 1
Ambient temperature θ_a in degrees C	-25...85

Table 4: General Operating Conditions of the U6264
(all voltages must be based on $V_{SS} = 0V$)

Characteristic	
Operating voltage V_{CC} in V	4.5...5.5
Operating voltage in standby mode V_{CCS} in V	≥ 2
L-Input voltage V_{IL} in V	-0.3 ¹ ...0.8
H-Input voltage V_{IH} in V	2.2... $V_{CC} + 0.3$

**Table 4: General Operating Conditions of the U6264
(all voltages must be based on $V_{SS} = 0V$) (Continued)**

Delay address change to output active t_{AXQX} in ns	≤ 10
Delay /CE1 to output active t_{C1LQX} in ns	≤ 10
Delay /CE2 to output active t_{C2HQX} in ns	≤ 10

**Table 4: General Operating Conditions of the U6264
(all voltages must be based on $V_{SS} = 0V$) (Continued)**

Delay /OE to output active t_{OLQX} in ns	≤ 5
Delay /WE to output active t_{WHQX} in ns	≤ 5
Ambient temperature θ_a in degrees C	-25...85

1. A one-time drop down to -2V for a period of 10ns within one cycle time is admissible.

Table 5: Different Operating Conditions of the Types of the U6264

Characteristic	U6264	U6264	U6264
	DG 05	DG 07	DG 10
Cycle time t_{AVAX} in ns	≥ 55	≥ 70	≥ 100
L-Pulse duration /CE1 t_{C1LC1H} in ns	≥ 50	≥ 65	≥ 90
H-Pulse duration CE2 t_{C2HC2L} in ns	≥ 50	≥ 65	≥ 90
Address hold time against write terminate t_{AVWH} , t_{AVC1H} , t_{AVC2L} in ns	≥ 50	≥ 65	≥ 90
Data hold time against write terminate t_{DVC2L} , t_{DVC1H} , t_{DVC2L} in ns	≥ 30	≥ 35	≥ 40
Data hold time after write terminate t_{WHDZ} , t_{C1HDZ} , t_{C2LDZ} in ns	≥ 0	≥ 0	≥ 0
L-Pulse duration /WE t_{WLWH} in ns	≥ 40	≥ 50	≥ 70
Address hold time against write begin t_{AVWL} , t_{AVC1L} , t_{AVC2H} in ns	≥ 0	≥ 0	≥ 0
Recovery time after write cycle t_{WHAX} , t_{C1HAX} , t_{C2LAX} in ns	≥ 0	≥ 0	≥ 0
Time from chip inactivation to standby mode t_{C1HUL} , t_{C2LUL} in ns	≥ 0	≥ 0	≥ 0
Recovery time after standby mode t_{UHC1L} , t_{UHC2H} in ns	$\geq t_{AVAX}$	$\geq t_{AVAX}$	$\geq t_{AVAX}$

Table 6: General Characteristics of the U6264 (all voltages must be based on $V_{SS} = 0V$; admissible deviations for the reference variables: operating voltage +/-1.0 percent; I/O voltages, I/O currents +/-2.5 percent)

L-Output voltage V_{OL} in V at $V_{CC} = 4.5V$, $I_O = 3.2mA$	≤ 0.4
H-Output voltage V_{OH} in V at $V_{CC} = 4.5V$, $I_O = -1.0mA$	≥ 2.4
Current drawn in resting mode I_{CCR} in μA at $V_{CC} = 5.5V$, $V_I = 0V$	≤ 100
Current drawn in standby mode I_{CCS} in μA at $V_{CC} = 3.0V$, $V_I = 0V$	≤ 10
Input leakage current of simple inputs I_{LI1} in μA at $V_{CC} = 5.5V$	-2...2
Input leakage current of bidirectional inputs I_{LI2} in μA at $V_{CC} = 5.5V$, $V_I = 0V$, $V_O = 0V$ or $5.5V$	-10...10
Dynamic current drawn I_{CCO} in mA at $V_{CC} = 5V$, $I_O = 0mA$, $V_{CEZ} = V_{IH}$, $V_{CE1} = V_{IL}$, $V_I = V_{IL}$ or V_{IH} , $t_{AVAX} = 100ns$, $\theta_a = 25$ degrees C	≤ 120
Input capacitance C_I in pF at $\theta_a = 25$ degrees C	≤ 10

Table 7: Different Characteristics of the Types of the U6264 (Because of the highest priority of the CE2 Input, the disable times t_{C1HQZ} , t_{WLQZ} , and t_{OHQZ} are set equal to the time t_{C2LQZ} .)

	U6264	U6264	U6264
	DG 05	DG 07	DG 10
Address access time t_{AVQV} in ns at $V_{CC} = 4.5V$	≤ 55	≤ 70	≤ 100
/CE1 access time t_{C1LQV} in ns at $V_{CC} = 4.5V$	≤ 55	≤ 70	≤ 100
CE2 access time t_{C2HQV} in ns at $V_{CC} = 4.5V$	≤ 55	≤ 70	≤ 100
/OE access time t_{OLQV} in ns at $V_{CC} = 5V$; $\theta_a = 25$ degrees C	≤ 35	≤ 40	≤ 50
Delay time CE2 after L to output high level t_{C2LQZ} in ns at $V_{CC} = 5V$; $\theta_a = 25$ degrees C	≤ 20	≤ 25	≤ 35

NUCLEAR ENGINEERING

Max Planck Institute Opens Experimental Fusion Plant

90MI0336 Bonn WISSENSCHAFT WIRTSCHAFT POLITIK in German 8 Aug 90 p 6

[Text] In view of the increasing energy consumption of a growing world population, the associated environmental problems, and the limited availability of conventional energy sources, the highly developed industrial nations have a special responsibility to provide a long-term energy supply with safe, environment-friendly, resource-saving energy sources. Inaugurating the new ASDEX Upgrade large-scale nuclear fusion experiment at the Max Planck Institute of Plasma Physics (IPP) in Garching, the parliamentary secretary of state at the FRG Ministry of Research and Technology (BMFT), Dr. Probst, said: We have only a few options open to us at present: solar energy, nuclear fission, and nuclear fusion. We must pursue all three options; especially with regard to climatic problems, we cannot afford to neglect a single one of them. We must not relax our research and development efforts. "This holds good regardless of the fact that commercial power generation from fusion and solar energy is still a long way off.

The aim of this fusion facility, the largest to date in the FRG, is to study central fusion research questions in conditions similar to those in a reactor. Now that sufficiently dense plasmas have been successfully confined in a stable form and heated to the requisite ignition temperature, the problems arising out of the interaction between the hot plasma and the surrounding walls have now become the main subject for study. The IPP's ASDEX experiment has already made a decisive contribution to solving these problems: The results were so significant that the European Community's JET (Joint European Torus) experiment in Culham, England, is currently being converted to this model. The ASDEX Upgrade follow-up experiment now ready to start can do without burning plasma and a full-scale reactor to achieve its scientific target. However, it has been designed in such a way that it will provide substantial results for the next large-scale international fusion reactor planned.

The main components for ASDEX Upgrade—the plasma container, the magnetizing coils, and their support—were developed and built back in 1983; it took about two years just to set the experiment up. ASDEX Upgrade's investment costs run to about 200 million Deutsche marks [DM]. The BMFT provided about half of this sum, about DM90 million came from the European Fusion Program, and about DM10 million was added by the Free State of Bavaria. The FRG Minister for Research and Technology is subsidizing fusion research with a total of DM200 million in 1990. The IPP is receiving about DM85 Million from the BMFT for 1990.

SUPERCONDUCTIVITY

Germany, Japan To Cooperate on Superconductor Research

90WS0074C Munich SUEDEDEUTSCHE ZEITUNG in German 16 Jul 90 p 17

[Text] An exchange of information about basic research and development for superconducting generators (but not cooperation on the development itself) has been agreed on by German and Japanese companies.

The corresponding contract was already concluded in May, as was just announced by Siemens AG, Berlin/Munich. The institution in charge on the German side is the Juelich Nuclear Research Institute. In addition, some private companies (among them Siemens) are participating in the cooperation supported by the Federal Ministry for Research and Technology.

In Japan the project is being undertaken by 16 companies in the fields of refrigeration engineering, generator construction and energy supply, and it is supported by the Ministry for Trade and Industry. The goal of the Japanese, according to information supplied there, is to develop a superconducting generator for a power plant with 70 megawatt output.

But Siemens's plans go even further than that. A pilot plant with superconducting field windings for 400 megavolt-Ampere (MVA) was presented as early as November 1988. This is regarded as the first step of an 850-MVA generator, which, according to Siemens, is the equivalent of a major power plant. This project is to become reality during the 1990's.

TECHNOLOGY TRANSFER

Swedish-Hungarian Telecommunications Joint Venture

91P60007 Budapest COMPUTERWORLD/SZAMITASTECHNIKA in Hungarian 2 Aug 90 p 1

[Article: "Muszertechnika-Ericsson Connection"]

[Text] Yet another joint venture plans on manufacturing telephone exchanges in Hungary. Other such earlier ventures were reported in COMPUTERWORLD/SZAMITASTECHNIKA 90/27 and COMPUTERWORLD/SZAMITASTECHNIKA 90/23.

The latest contender is the joint venture established between the Swedish Ericsson and the Hungarian Muszertechnika. The Swedish firm has been exporting telephone exchanges to Hungary since 1968, and in January 1988 it was the first to set up a digital exchange in Budapest. Although Muszertechnika is not yet experienced in the area of telecommunications, the telephone exchanges it will produce in cooperation with Ericsson

will look a lot more like computers than the earlier electro-mechanical switchboards.

In the first phase, the Swedish-Hungarian joint venture plans on building a 100,000-line-capacity assembly plant, thus supplying about half of Hungary's need. This capacity

represents the lower limit of profitability, so it becomes obvious that from among the joint ventures formed, no more than two could survive, namely the ones winning the recommendation of the Hungarian Telecommunications Enterprise. Just as we wait for a communication line, they wait for the green light, to start investing....

CHEMICAL ENGINEERING

Work of Hungarian Chemical Research Institute Reviewed

25020024A Budapest *MAGYAR KEMIKUSOK LAPJA* in Hungarian No 6, 1990 pp 255-259

[Article by Peter Vinkler: "The History, Achievements and Functioning of the Central Chemical Research Institute of the Hungarian Academy of Sciences"]

[Excerpts] The Central Chemical Research Institute of the Hungarian Academy of Sciences (MTA KKKI) was established in 1954. [Passage omitted]

The research themes at present can be summarized in three main programs—research on biologically active compounds, chemical research laying the foundations for the development of material conserving and energy conserving technologies and theoretical and structural chemical research.

The first, supporting original domestic pharmaceutical research, includes research connected with organic and bioorganic chemistry and the development of new crop protection materials and the molecular structure, separation technology and analytic studies necessary for this work.

The second area extends to adsorption, (homogeneous and heterogeneous) catalytic, reaction kinetic, corrosion, electrochemical and macromolecular chemistry (polymerization kinetic and polymer degradation) research.

The studies in the third area include the solution of various spectroscopic and diffraction structure research tasks, methodological development and quantum chemical, molecularographic and thermodynamic research.

The spectrum of research has expanded over the past 35 years and the personnel of the institute have increased simultaneously. At present the KKKI has 450 workers, including 209 scientific researchers. [Passage omitted]

The expense of operating the institute has increased, especially over the past few years, and the support received from the MTA is less and less able to cover the expenditures. The research staff has been forced to increase receipts from industrial contracts. This activity kept increasing as industry and agriculture made increased use of the work of the KKKI.

Five or ten years ago the chemical industry (primarily the pharmaceutical industry) could still finance a significant degree of basic research, but at present the outside contracts are almost exclusively for applied research, developmental work, services and production of products. About 60 percent of the income of the institute comes from industrial contracts. [Passage omitted]

As a result of the efforts of the institute's directors and researchers increasing sums are obtained from sale of patents. Income from production and services is

increasing also. These sources now make up about 20 percent of all income. [Passage omitted]

The OTKA (National Scientific Research Fund) and MTA sources (which aid basic research) represent a total of about 30 percent in the budget of the institute. [Passage omitted]

We can mention only a few of the theoretical and practical, or scientific and economic, achievements of the institute's researchers in recent years.

A theory of "compression and orientation steric substituent effect" was developed for a quantitative description of the steric effects which play a determining role in the interactions of biopolymers and small molecules. The essence of this is that in proportion to their filling of space the various atoms and groups of a molecule influence in a crucial way the binding or transformation of a compound (enzyme substrate, enzyme inhibitor, medicine, etc.) on a given enzyme or receptor. This effect appears only if the substituent is "appropriate" as a result of the binding, is in a spatial position oriented toward the biopolymer. Taking the orientation effect into consideration also explains the fundamentally significant stereospecificity in these biochemical processes. This concept is being applied in the design of medicines.

On the basis of a recognition of the laws of structure-bioreactivity-biological effect interdependencies on nucleic acid synthesis they synthesized an effective, original material against the herpes virus (5-isopropyl-2'-desoxyuridine). The first original Hungarian anti-virus medicine appeared in pharmacies in 1988 under the trade name HEVIZOS.

A number of new heteroaromatic compounds containing bridgehead nitrogen have been produced. With the aid of these they discovered a new phenomenon, the "anellation effect." In condensed heteroaromatic systems the anellation effect determines the stability and the unique features of reactivity—depending on the anellation (angular or linear) of the rings. On an experimental basis and as a result of quantum chemical calculations they established a simple qualitative rule with the aid of which it becomes possible to interpret or predict the balance ratios and the region selectivity of the nucleophile and electrophile reactions. A number of the compounds produced have favorable biological effects. One of these—an optimal antidepressant—is now undergoing first phase clinical tests.

They have solved the total synthesis of a number of natural organic materials (iohimbine, beta-iohimbine, plus-tebain and plus-or-minus-nortebain). These compounds or the materials which can be obtained from them play an important role among medicines.

Nearly every domestic pharmaceutical preparation has been referred to the institute in some phase of research and development. The complete path of the metabolism of a number of compounds has been studied at the KKKI. Researchers of the institute with international

reputations in the field have performed instrumented structure studies of a large number of domestic pharmaceuticals (using MS, NMR and IR spectroscopy and X-ray crystallography). A worthy professional level is also represented by the separation technology analysis base which is made great use of by the researchers at the institute and by the pharmaceutical industry.

Selectivity is a key question in the use of herbicides. The antidote concept created a selectivity which provides relative risk-free use of chemical herbicides. Chemical antidotes are compounds which protect useful plants against the harmful effect of the herbicide. The KKKI discovered a new antidote type which eliminates the yield reducing effect of a herbicide (EPTC) used most generally in corn production without reducing the herbicide effect. An American firm (Monsanto) purchased the patent for the material (MG-191).

In the area of aliphatic carbonyl compounds they succeeded in proving the production of enzymes which made necessary a reevaluation of a number of earlier accepted views concerning the photochemistry and photophysics of this compound type. It is well known what problems are caused in our country by the lack of chemical industry intermediaries. For this reason it is significant that, in addition to traditional methods, they have begun to use photochemical processes in the production of pharmaceutical and crop protection intermediaries. As an example we might mention domestic production of dichloro-acetyl-chloride. They have experimented with various types of photochemical reactors to produce intermediaries and a few of these have been built on a large laboratory or factory scale.

Researchers from the institute have studied the development of air quality in Budapest, for the first time measuring simultaneously the concentration of a large number of air polluting materials. Comparing the composition of Budapest air with the composition of exhaust gases it could be determined that the greater part of Budapest air pollution comes from transportation. They prepared a computer model with the aid of which they could calculate, knowing the meteorological conditions, the concentration of both primary and secondary (produced in the air by chemical reactions) pollutants at any location in Budapest.

Oxidation is a chemical process of central significance in nature. With the aid of mathematical algorithms they succeeded in giving general rules for modeling oxidation processes.

They discovered a new catalytic carbonylization reaction by virtue of which one can produce isocyanates using carbon monoxide. The reaction can be used for the economical and environment-friendly (free of phosgene) synthesis of crop protection materials (sulfanyl carbomides) which are effective even in small doses.

A clarification of the mechanism of oxidations performed with permanganate is an interesting and important task from both the theoretical and practical viewpoint. A key question is identification of the intermediate products containing manganese (V). They found indirect proof by studying the permanganate oxidation of olefinic and acetylene derivatives; in the course of studying the permanganate-sulfite reaction they were able to show for the first time a manganese (V) containing intermediary, with a combination of stopped-flow and rapid-scan spectrophotometry.

One of the most dynamically developing branches of heterogeneous catalysis is zeolite catalysis. They succeeded in proving experimentally that the temporary metal ions located in the zeolite matrix have a better catalytic effect than in a solution or in an oxide form. They succeeded in fundamentally modifying the ZSM-5 zeolite catalyzer thus achieving an especially high degree of form selectivity. They realized 99 percent para-selective ethylation of toluol with an 87 percent yield. This offers a possibility for producing a synthetic material, poly-p-methylstyrene, with properties more favorable than polystyrene, using toluol, which is cheaper than benzol.

They succeeded in significantly perfecting the so-called rotating sector method for determining the "absolute" speed constants of radical polymerization; this will make possible research on effects which could not be studied experimentally before. By determining changes in the value of the chain growth or chain closing constant, as a function of the conditions of the reaction, it became possible to give a direct, experimental proof of the hot radical theory developed earlier.

Significant basic research results were also obtained in a study of the degradation of polyolefines. A new result, important from both the theoretical and practical viewpoint, is that they produced alpha, omega disubstitution polymers, significant in the rubber industry, with radical polymerization. They produced polyurethane rubbers, with especially favorable properties for practical use (for example in automobile tire manufacture), by making it possible to approximate at will the theoretical value of polydispersity. [Passage omitted]

The library of the KKKI has more than 35,000 books and journals on its shelves. There is also immediate access to the large international computerized databases (such as Chemical Abstracts, CAS Online, BIOSIS, COMPENDEX, METADEX, DERWENT, etc.). [Passage omitted]

We also created our own databases to serve structural study problems. These include the C-13 NMR databank (now with almost 20,000), the mass spectrometry database (with about 80,000) and the infrared spectrum collection (with about 16,000 spectrums). The Cambridge Crystallographic Data Centre stores crystal diffraction data on more than 70,000 compounds as part of a project in Hungary. [Passage omitted]

COMPUTERS

Hungarians Develop Expert System for Nuclear Plant Fault Detection

25020018A Budapest *COMPUTERWORLD*/
SZAMITASTECHNIKA in Hungarian 24 May 90 p 17

[Article by Gabor Moray: "Heart Murmurs in a Nuclear Power Plant"]

[Excerpts] The Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences is one of the most productive workshops for domestic artificial intelligence research. The most recent result of the work being done there is a computerized system for fault detection and diagnosis at nuclear power plants. It will soon go into operation in the new three-four block at the Paks power plant.

Every layman knows that you cannot fool around with a nuclear power plant. So it is desirable for the operators to have continual precise data about the status of the subunits, to be informed in time when and where the danger of a failure exists. [Passage omitted]

Perhaps the most effective and widespread method for early fault recognition is based on an analysis of reactor noises. The noises indicate well small changes in the system which cannot yet be sensed in its global operation but which could become sources of serious failures later. [Passage omitted]

The system planned for the new block at Paks has about 100-140 sensors collecting various signals and the data registered by them go to a signal processing system. Fault detection is performed here, seeing whether the signals measured deviate from the normal. This signal processing is basically procedural, based on non-symbolic information.

The really artificial intelligence component is the fault diagnosis part which is next in the whole system. It has the task of providing the operator with advice pertaining to the cause and character of the possible fault and preparing for him a possible plan of action or making recommendations on what should be done. But before looking into the mind of this component we should devote a few words to the mind of the operator.

The big problem with the work of those running nuclear power plants is that—with some exaggeration—they have nothing to do. If everything is in order they need not intervene, but if there is trouble they are deluged with various messages and indicators, they are overwhelmed by the data flooding from the screens, and so they become incapable of effective action.

This effect was seen at Chernobyl and Three Mile Island, and it contributed greatly to the catastrophes. So it is very important that the messages reaching the operator

should go through an intelligent filter so that only the essential messages reach the decision points. [Passage omitted]

Diagnostic knowledge is based on experience, on rules, taking the form: "If we see this and this here and here, then this unit is failing with a certain probability." Most of these rules do not indicate an immediate cause of failure, we can reach this point only by considering many rules together, at the end of an inference chain.

The knowledge base of the system contains these rules. According to those who developed the system (Jozsef Bokor and his team) even when fully developed such a knowledge base should not contain more than a thousand rules; above this number the system becomes difficult to test and maintain.

The diagnostic expert system is in direct contact with the signal processing part, not only in that it gets data from it but also in that it can give various measurement instructions. [Passage omitted]

Development of the system is presently at the prototype stage; experimental operation will begin this year at the Paks power plant. But the product has already aroused interest abroad as it could be adapted to other nuclear power plants or even other systems. The most obvious applications area would be the Soviet pressure water power plants similar to Paks but in principle the French power plants of this type might be considered as well. Mixed enterprise discussions about marketing it are under way.

The system runs on two 386 computers linked by Ethernet. Obviously a computer developed for this purpose (such as a LISP machine) could evaluate the knowledge base of the expert system much more quickly and efficiently; but for the time being the COCOM rules prohibit the import of one of these. In any case the developers designed their system so that when the ban is lifted one of the 386 computers can be replaced by such a special purpose computer. This will improve the chances for selling the system in the West. [Passage omitted]

Hungarian Speech Recognition System

25020019A Budapest *COMPUTERWORLD*/
SZAMITASTECHNIKA in Hungarian 14 Jun 90 p 5

[Article by Gitta Takacs: "The PC is Listening to Us"]

[Text] At the Acoustics Laboratory of the Instrumentation and Measurement Technology Service of the Hungarian Academy of Sciences they have developed a speech recognition system which was shown at the Spring Budapest International Fair by Microsystem, which is the vendor for the equipment. The preprocessing unit has a microphone input and it can be plugged into XT/AT compatible computers in place of a floppy drive or Winchester. This unit, consisting of two cards with hybrid circuits, and with the speech recognition software, makes it possible to control computers,

robots or other electronic equipment with preselected optional words or simple sentences. It is recommended primarily for areas where both hands are busy during work, for example when preparing a map with a CAD/CAM system, when the spoken words can take the place of a third hand. It is also recommended for the handicapped or sick so that they can control equipment in their environment, such as the radio and telephone.

The words recognized by the computer can be changed at will, independent of language. The PC learns the words spoken by a given person in a few minutes of training. Words or expressions which can be spoken in two seconds are considered words for the system; recognition time is less than 500 milliseconds. Recognition precision is 95 to 99 percent if the environmental noise level is not greater than 20 decibels; this is for an 80 word vocabulary in the smaller version and a 300 word vocabulary in the larger version. The price for the smaller version, hardware and software together, is 250,000 forints; that for the version which can be expanded to 500 words is 420,000 forints.

Activities of Hungarian Software Developers Reported

25020019B Budapest *COMPUTERWORLD*/
SZAMITASTECHNIKA in Hungarian 14 Jun 90
pp 9-10

[Article by Zsuzsa Szekeres: "Companies In The Midst of Changes"]

[Excerpts] Szamalk [the Computer Applications Enterprise], employing 1,200 people, was established to serve ESZR [Uniform Computer Technology System] engineering; within a few months it has broken up into 21 corporations. It is not yet known how many of them will survive over the long run. Their first steps are to seek new profiles, because the ESZR is dead. [Passage omitted]

Szamalk Softec Software Development and Consulting Ltd. was formed with considerable base capital compared to the others, 10 million forints, and it is not only an independent limited liability company as it also represents the ownership rights of Szamalk vis-a-vis other companies. A company can be a first level one—then Szamalk can participate in the membership meeting of the company—or a second level one, which does not belong directly to the center but rather to a first level company.

The share of the base capital belonging to the 50 workers of Softec is more than a million forints. [Passage omitted]

Some of their people are working on projects in Western Europe, working on an hourly basis on software development or selling products. For example, they are selling the SOFTDOC program, developed jointly with the SES West German firm. More than 30 copies have been sold in England, America, Austria, the FRG and Switzerland. Depending on the complexity of the applications area the price is between 20,000 and 100,000 marks. [Passage omitted]

Most of the activity is developments based on IBM or IBM compatible computers, 370, 43xx and AS/400, and organization of PC nets or integrated systems of the computers mentioned. About 30 finished products are offered, 5 or 10 of them are sold each year. [Passage omitted]

The AS/400 line was selected because of the IBM connection but work is also done for UNIX and RISC computers. Workers are trained abroad and the company is a General Marketing Agent for IBM. [Passage omitted]

Szamalk-Dataman Ltd. was formed the first of January 1990. The Szamalk center is owner of more than 75 percent of the 2.3 million forints in base capital. The some 40 workers could purchase only the remainder. [Passage omitted]

Activities of the company include preparation of inventory, payroll, labor affairs, bookkeeping and other modules for the Economic and Technical Main Directorate of the Budapest Technical University. [Passage omitted]

Two companies were formed out of the former Applications Development Office. The largest of these, with 70-75 people, is Szamalk AFI Applications Development Ltd. Its base capital is nearly 15 million forints. [Passage omitted]

Previously they installed ESZR computers. We asked managing director Marton Krajcsovits whether they were still in contact with their old customers.

"The age of mainframe computers is over in Hungary because our enterprises do not have the money to buy hardware for a hundred million forints and spend additional hundreds of millions to develop their applications systems. I hope that this is only temporary, because there are applications areas where PC networks cannot take the place of mainframe computers. The ESZR age is probably finally over in Hungary so we have been forced to completely change products. We have switched to mini and microcomputer applications and are dealing with software trade. We supplement the training profile of Szamalk with mainframe software courses, not only here at home but also in England and the Near East (Kuwait). We have asked for foreign trade rights for intellectual export. We still deal with computer applications development, almost exclusively for industrial customers." [Passage omitted]

New Computer Viruses Noted in Hungary

25020020A Budapest *COMPUTERWORLD*/
SZAMITASTECHNIKA in Hungarian 5 Jul 90 p 10

[Unattributed article: "Forecast"]

[Text] The Stone/Marihuana virus spread like a plague at the Spring Budapest International Fair. A number of exhibitors called experts from the Solinfo Virus Hunter group to their stands. At the same time other virus infections are spreading as well.

Someone got the idea of spreading one new virus connected to a virus detector. They succeeded in isolating

the first examples of this monster at a few departments of the Budapest Technical University and at the computer laboratory. The program transformed into a virus carrier is SCAN57.EXE, a rewritten version of a McAfee type virus detector. This program does not even exist as such, we are talking about a rewrite, prepared with great ingenuity, of the 47 version, which does not have integrity protection. The "jokers" inserted into it the VIRUS2000 software virus of Bulgarian origin. At present, of the McAfee type programs, the one designated 3.01V59 can be used without danger, as can the current versions of SCANRES and NETSCAN.

The Help screens and identification data of the McAfee programs mentioned can be seen in the accompanying figure. What is new compared to earlier is the VALIDATE program, which checks the identity of a file on the basis of several algorithms. If the check number generated in two ways is the same then the program is the same also. Authentic versions of the McAfee programs can be obtained at the Mayakovskiy (Kiraly) Street showroom of Muszertechnika [Instrument Technology], or in the Vaci Street Floppyland shop of the Cedrus Company, free of charge, or for the price of the disk. These can be passed on freely also.

As we mentioned, VIRUS2000 is a program virus coming from Bulgaria. Barely 3 months after its appearance in the United States (the McAfee Associates firm in California obtained the first copy in February 1990) it has appeared in our country also. It infects the .COM and .EXE files. Its length—fitting its name—is precisely 2,000 bytes. It attaches itself after the individual files. Its text identifier is at the beginning of the virus: "Only the Good die young..." [Text is in English.] At the end of the virus is: "(c) 1989 by Vesselin Bontchev."

The virus can get into the computer from a floppy disk. It causes infection if some other program opens a runnable file for reading. This was the reason for building it onto the SCAN program. It infects the hard disk first. It infects a floppy disk only if it does not find more infectable files on the Winchester. It causes the system to freeze up, as the textual message in it suggests. If it is inserted several times it overwrites the individual files to such an extent that the program can no longer be restored. If it is active in memory then it takes 2,000 bytes from the length of every file into which it is inserted. In this way the directory shows them with their original length.

The Yankee Doodle virus continues to show variations. Its original length was 2,885 bytes. The Hungarian rewrite is longer, 2,932 bytes. The SCAN programs recognize it, but the specific virus removal programs do not eliminate the latter version.

There is some good news—the members of the Virus Hunters group have succeeded in finding an algorithm with which programs can be restored even after infection with an unknown virus. There is one condition—the restoring program must take a "finger-print" from the

state of the applications program prior to infection. Testing is now under way and the new program will soon be sold under the name SYSDOKI. To establish the identity of the files, this is a new possibility, it will use the procedure of the McAfee VALIDATE program, which has already become an international standard. The new software of the Virus Hunters could have been seen by those who visited their rather hidden display behind pavilion K20 at the Spring Budapest International Fair. (They can still be reached at their old address and telephone number: Szolinfo, 1118 Budapest, Bozokvar Street Number 11, Telephone 1812-646.)

Hungary's SZKI Computer Institute Finds New Activities, Partners

25020025A Budapest *COMPUTERWORLD/*
SZAMITASTECHNIKA in Hungarian 21 Jun 90
pp 9-10

[Article by Marton Vargha: "SZKI Fission"]

[Excerpts] Since it was founded the abbreviation of the name of the SZKI has remained unchanged but its expansion has changed several times. The name today is the Computer Technology Research Institute and Innovation Center, but even the content of this is changing. What is coming into the foreground today is not computer technology but rather "market research"; they are searching for foreign firms which are inclined to found mixed enterprises and the several laboratories and their accumulated expertise will be the "capital share" they contribute to these firms.

Even the Theoretical Laboratory has been transformed into a limited liability company, bringing in 36 percent of the capital of which 25 percent comes from abroad, from the Austrian Zentralsparkasse. There are signs that the development of the Ada compiler, on which they have been working for years, will be a victim of this change—just when they were to perform the official test, the so-called validation. The SZKI Intelligent Software Company (IQ-Soft Company)—the official name of the joint undertaking—has signed a vendor's contract for the domestic sale of the Oracle database management system, and has already begun to do so. There is great interest and the development of PC Oracle databases is taking place in several places. So far they have sold 50 MS-DOS versions and they already have orders for the VAX version.

In addition they are continuing to support MProlog, well known primarily abroad, primarily by developing expert systems. They are being aided in this by MProlog Dialog with which communication with the final user becomes more natural, closer to the spoken language.

A noteworthy experiment by IQ-Soft is to adapt an Austrian program package for the Hungarian market, for agricultural and forestry management operations. The original product was developed by Siemens Austria. When fully developed the Magic II application will have

fourteen branches or modules, from simple bookkeeping to planning cattle breeding. [Passage omitted]

The Recognita Company, which also exhibited at the SZKI stand at the Budapest International Fair, has a new item, the Finesse desktop publishing program manufactured by the Swiss Logitech. It is perfectly suited for in-house enterprise publishing and is a good bit cheaper (at 40,000 forints) than Ventura. The program was Hungarianized by Axis Ltd. in Szekesfehervar. [Passage omitted]

Using the Read2 program, developed at the Hardware Laboratory of the SZKI, and appropriate peripherals it is possible for a computer to read aloud any text recognized by the Recognita character recognition program. Recognizing the potential the Recognita Company has established, with 13.3 million forints starting capital, the Recognita Plus International Computer Technology Foundation for the Blind. [Passage omitted]

In addition to the speaking unit just described the Hardware Laboratory also exhibited an interactive German-Hungarian dictionary and a graphological analysis program called Youcan which analyzes handwriting read in by an optical reader. In cooperation with the Combiring Engineering and Consulting GmbH and Competex Ltd. in Szekesfehervar they developed the Transarchiv automatic image digitizing system.

According to Peter Keisz, representing Pixel Ltd., they have sold 50 copies of the Prima image archiving system in the past two years, most of them sold abroad. Now they are working on new software to be ready in September called Frabase which can work with a number of database managers including, naturally, dBase. They have begun to sell in Hungary an image handling expansion card called Frame grabber, manufactured by the Leutron AG, with which one can quickly digitize a video picture.

The Hardware Systems Technology Laboratory exhibited the Pro C program generator, a product of the Canadian company Vestronix. [Passage omitted] With the Hungarian language context dependent auxiliary system running under DOS 3.xx it takes 640 kilobytes of central memory and occupies 4 megabytes on the hard disk.

The Hardware Systems Technology Laboratory is also offering transputer expansion cards, with which one can build a system suitable for flexible, high performance, parallel processing.

The Design Automation Laboratory exhibited tools for the design and manufacture of printed circuit cards. The Smdbase databank contains data on surface mounted parts. Last year five firms purchased the system, which contains 10,000 to 12,000 entries. Updates are provided quarterly to those desiring them. A newer development is the Smdesign, which contains drawings of the parts. The Dias software provides for the testing of the finished cards on the basis of an analysis of the circuit; it gives all

the input signal series with which the automatic testing devices can find any possible error. This device uses the Testart test description language and compiler. Opart is a functional descriptive language for the computer modelling of digital circuits; it can be obtained in versions running on XT/AT compatible computers and in VAX/VMS systems.

Hungarian Cooperative Installs Software Development System

*25020025C Budapest COMPUTERWORLD/
SZAMITASTECHNIKA in Hungarian 28 Jun 90 p 5*

[Article by Janos Andor Vertes: "Software Which Is Not For Sale"]

[Excerpts] Actually if one wanted to see the sensational new item which Dataplan wanted people to know about, one would not have to go to the Budapest International Fair but rather to Paks where the small computer engineering cooperative is installing the information collection system for the nuclear power plant. [Passage omitted]

Dataplan conducts about half a dozen different activities and is best known for its business software. [Passage omitted]

The secret of the user software sold by Dataplan is in a program which is not for sale, which was not exhibited at the fair, but which is present in all their products. They have developed a software development system which works under Clipper; from the HELP tables to the code catalogs this is a uniform system for programmers with which they can develop the user connection as easily as the internal structure of the program.

Electrical engineer Andras Forgacs was willing to say this much about the system:

"When the programmer outlines the task the software development system automatically develops menus and screens. Windows open up in this menu system so I can always see where I have come from and where I have to go. The other service of the system is the linking of the HELP tables and program development. There are always two types of help behind the screen. In our case one of the HELPs is the same as a user manual. Here also a menu system helps paging and in its depths we can get to the concrete code data stores. This data store is already part of the program and for this reason this user manual never loses its timeliness, the HELP even changes as the program is modified.

"The other system always gives that description which belongs to the part of the program which is running. Searching through code tables is a nightmare for operators, so when this HELP is called one gets not the description but rather the code data store behind it and if I select some code from this by moving the cursor it is automatically written into the record to be entered." [Passage omitted]

We asked if it would not be good to develop this system into an independent product.

"We would like to make use of its services first. Years of experience are embedded in it; the users have a thousand demands so we feel that it is better business if we use it for development." [Passage omitted]

Expert Systems for Hungarian Power Industry Described

*25020027A Budapest ELEKTROTECHNIKA
in Hungarian No 6, 1990 pp 205-210*

[Article by Peter Kadar, electrical engineer at the Power Plant and Network Planning Enterprise: "Use of Expert Systems in Controlling the Domestic Electric Power System"]

[Excerpts] Expert systems are gaining ever broader application. News of their military uses is leaking out, they have appeared in peak technologies and are now appearing in traditional branches of industry and in our everyday life. [Passage omitted]

Because the theme is such a new one our backwardness in the use of expert systems is not so great compared to the leading countries of the world as it is in other areas. I might mention the expert system which monitors nuclear power plant safety, developed by the KFKI [Central Physics Research Institute], or the turbine diagnostic system developed jointly by the VEIKI [Electric Power Industry Research Institute] and SZAMALK [Computer Technology Applications Enterprise]. [passage omitted]

Restoring consumer service, substation fault analysis and substation simulators and preparing switching plans are areas in which the swiftest progress can be expected. Domestic implementations are under way in all three areas. [Passage omitted]

An advisory system to handle idle resources, based on an idle voltage sensitivity matrix of the network, was prepared in 1988 at the OVT [National Electric Load Control Center]. [Passage omitted]

At the level of the KDSZ [District Dispatcher Center] the task is limited to a recognition of the situation, and there is much information here which does not get to the OVT. But there is no possibility for effective intervention (which there is at the substations) and the dispatchers have no independent decision rights for system level problems. In the event of system problems the role of the KDSZ is to support the OVT. [Passage omitted]

The dispatchers have no easy task in the event of a serious disruption. Some of the problems here can be formalized and then can be processed logically. We can prepare an expert system. [Passage omitted]

Major disruptions are frequently accompanied by the control room syndrome, with the dispatcher unable to

filter out in a few moments from the flood of information arriving that which is important for dealing with the disruption. [Passage omitted]

In order to solve these problems the status calculations, which require so much computation, should be performed in advance so that we can have access to their results more quickly on the basis of a few logical characteristics. This principle, a knowledge based system, has been realized already at the OVT for one function. This is the Paks danger signal monitor; it provides advice in order to avoid a combination of powerline switch-offs which would be dangerous to the operation of the Paks nuclear power plant. Seeking out the dangerous situations, and loading the knowledge base, required several days of computation. [Passage omitted]

The Hungarian VER [electric power system] has a very limited supply of ready power plant blocks for a black start, and this could create a rather dangerous power situation in the country. It is true of this system, as it is for better equipped systems, that a few carefully thought out restoration schedules must be prepared to support a complicated restoration. [Passage omitted]

Checking all the factors requires a gigantic amount of computation, which cannot be done during the restoration. Two sorts of solution can be imagined—either we work from previously stored data or we compile simplified logical rules which err on the side of safety, for example in regard to what other overload might be caused by switching off a power line.

To sum up, expert systems can be used to stem the flood of information and recognize the elements which make up the events. We can expect success in the near future from the method of "logical recognition in a mass of data" as opposed to "fast numerical analysis."

Expert systems are indispensable tools for control of modern electric power systems. Their introduction in Hungary can be expected in the near future. The expert system to be developed to handle system disruptions at the OVT level must include the experiences obtained with the substation protection and switching simulators and fault analyzers already under development.

Hungarian R & D Information Network Expansion

*25020027B Budapest MERES ES AUTOMATIKA
in Hungarian May-Jun 90 pp 181-185*

[Article by Dr Peter Bakonyi and Dr Laszlo Csaba of the Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences and Miklos Nagy of the IIF Program Office: "The IIF Program"]

[Excerpts] In the course of the Sixth Five Year Plan it became increasingly clear that without a computer science background for research and development we could have no chance of keeping up internationally. [Passage omitted]

In the light of all this and on the basis of a professional proposal put together by institutions and authorities interested in this area the Science Policy Committee decided at its January 1986 session to create the R & D Information Infrastructure Development (IIF) Program.

The program was aimed at creating an information infrastructure for the domestic research community which would be compatible in its services and structure with similar systems in the world, but primarily in West Europe. [Passage omitted]

The first phase had a time limit of 31 December 1988 and included the following tasks: realizing a packet switched data network; developing a uniform database management system environment which would take into consideration the requirements of the Hungarian language; developing and introducing a system for electronic mail; creating and putting into operation more than 35 databases; and developing a software system to support international communication. [Passage omitted]

The goals and tasks of the second phase can be summarized as follows: integrating into the system, by the end of 1990, about 150-200 packet switched terminals, nearly 200 line switched (NEDIX) network data stations and about 2,000 work stations which can also be used in the independent mode and creating a possibility for access to domestic and international databases. [Passage omitted]

About 50 databases were created in the first phase of the program, these are expanding the spectrum of their services and in the second phase, by the end of 1990, another 50 databases will be ready. [Passage omitted]

At the beginning of 1990 it became possible for Hungary to join the international UUCP net (the EUnet) and thus domestic users also can make use of its services, including electronic mail. [Passage omitted]

As part of the second phase of the IIF program a study was prepared for the OMF [National Technical Development Committee] in the fall of 1989, bringing in numerous outside experts, which contained the chief goals for the period 1991-95. These goals include the following:

- Extending the services introduced in the first phase to an ever broader sphere of those working in R & D areas
- Handling and passing on primary information and full texts
- Creating and passing on interpreted and evaluated information
- Developing expert systems which can be queried
- Introducing information services which will be of interest to foreign users
- Integrating local networks (NOVELL, PRONET, DECNET)
- Expanding the data protection and security system.

[Passage omitted]

The national IIF system must be developed further taking into consideration international standardization and the possibility of cooperation with similar systems in European countries.

Hungarian Work on CASE Software

25020027C Budapest *COMPUTERWORLD/ SZAMITASTECHNIKA* in Hungarian 26 Jul 90 pp 13-21

[Article by Geza Varga: "Software to Prepare Software"]

[Excerpts] More than 100 programs which help to prepare software are now on the world market. The development of CASE (Computer Aided Software Engineering) software, called upon to revolutionize the work of organizers and programmers, promises to be a most profitable business. After a general review of the possibilities of CASE our author describes the results of three developments by Hungarians or involving Hungarian cooperation. [Passage omitted]

Jozsef Pirko, a software author and the author of a few good technical books, has been developing the JUDY system for eight years. For several years he used it to support his own programming work and only in 1988, at the urging of friends, did it appear on the software market. There have been a dozen successful Hungarian applications of it so far. The users (a few industrial enterprises, planning institutes, colleges and political institutions) are satisfied, their experience being well characterized by the opinion of one of them according to which one can do in one day with JUDY what would have been a month's work for a programmer earlier.

The system has been expanded with additional services in accordance with the experiences and desires of users (in its present version it consists of several times ten thousand program lines, about 500 kilobytes in extent) and at the same time its use has become simpler. The software "talks" in Hungarian or English, at the turn of a switch. [Passage omitted]

SYSTEMATE, written in the FORTH language, was developed within the framework of Swedish-Hungarian cooperation to run on IBM PC compatible computers to support system development. The original Swedish version also generates source code in the Pascal language.

SYSTEMATE is based on the principle of decision tables; the system to be designed and its parts are described in one or more tables in a so-called SYSTEM-ATRIX. [Passage omitted]

In its present form SYSTEMATE cannot be regarded as a tool for everyday applications. This is supported by the vendor's admission that no one has bought the software from him in the past two years. Despite its unfortunate characteristics the method could become part of a larger software product, of an integrated CASE system. But this system is still to be written.

At the same time the present version of SYSTEMATE can be used outstandingly for instruction, as it is at the Kalman Kando Electric Industry Technical College. [Passage omitted]

Within the framework of West German-Hungarian cooperation and on the basis of plans by the American Harry M. Sneed (SES—Software Engineering Service GmbH) Szamalk [Computer Technology Applications Enterprise] and the SZKI [Computer Technology Research Institute and Innovation Center] have developed over the past 10 years the SOFTORG product family in a modern experiment to create an integrated CASE system. SOFTORG (earlier known as SOFTING and recently registered in the United States under that name) consists of a total of seven subsystems and extends to almost every phase of the software life cycle. [Passage omitted]

The developers have recently modified their earlier position, yielding to the demands of the market, and now intend to automate software maintenance as well.

A number of prestigious firms in the FRG have been using the complete system or, especially, the several SOFTORG components for years. [Passage omitted]

The SOFTORG subsystems were originally in the German language. There are now English versions for two subsystems and there is a Hungarian language version of the handbooks. [Passage omitted]

Neither the West German nor the Hungarian developers have made a profit on it in any year. Of course the minor losses are counterbalanced by other advantages (such as arousing market interest, making contacts and winning contracts independent of SOFTORG) but an increase in receipts can be expected parallel with the spread of the product on new markets. [Passage omitted]

NUCLEAR ENGINEERING

Cyclotron Uses Reviewed

25020026B Budapest MAGYAR TUDOMANY
in Hungarian No 2, 1990 pp 181-186

[Article by Imre Mahunka and Ferenc Tárkányi: "The Utilization of Basic Research; the Hungarian Cyclotron Is Three Years Old"]

[Excerpts] Hungary's first cyclotron was put into operation at the Nuclear Research Institute of the Hungarian Academy of Sciences in November 1985 with the goal of being able to catch up to the international level under domestic conditions in the area of basic research based on accelerators and in the practical applications of nuclear technology. The laboratory based on the isochronic cyclotron of Soviet manufacture is the largest scientific investment of the institute; in addition to the Hungarian Academy of Sciences material support was provided by the National Technical Development Committee, the National Nuclear Energy Committee and the

International Atomic Energy Agency. It is characteristic of the good pace of the investment that operation of the accelerator was stabilized within a short time after it was handed over. By the spring of 1986 the cyclotron was operating at the maximum guaranteed energy and intensity values and this made it possible to carry out the planned research and applications programs.

At the end of 1988, on the third anniversary of the handing over of the Cyclotron Laboratory, the themes based on the cyclotron were reviewed at a scientific session organized by the Debrecen Academy Committee and the Lorand Eotvos Physics Society and held at the Nuclear Research Institute.

The results achieved in the area of basic research, results which are also of international interest, were achieved primarily with the aid of the measuring equipment and methods developed by the institute and used in the beams of the cyclotron. The special spectrometers used in the measurements made it possible for the information obtained with a relatively small cyclotron to be extraordinarily rich. An ample report on these achievements appeared in FIZIKAI SZEMLE, No 37, 1988. In our review we will concentrate on the multidisciplinary research and practical applications which may be of wider interest and which have immediate economic significance. [Passage omitted]

Our review is organized in the following three categories: isotope production, activation techniques and irradiation applications.

The essence of isotope production with a cyclotron is that when accelerated ions strike the atomic nuclei of the material to be transformed (the target material) we produce radioactive isotopes from them. With the aid of the cyclotron beams we can produce a radioactive isotope of practically any element; with the aid of the tracer tracking technique these can be used to solve research or applications tasks. [Passage omitted]

The greatest use of the isotopes is for nuclear medicine diagnostics. If the half-life is long enough the isotopes produced in Debrecen are shipped to the Isotope Research Institute in Budapest. Here the marked compounds are produced and they are shipped to the ordering hospitals by the IZINTA Isotope Trade Subsidiary. [Passage omitted]

The isotopes produced include Ga-67, Ga-66, I-123, In-111, Ti-201, Rb-Kr-81, C-11, N-13, F-18 and Na-24. The cooperating institutes include the Isotope Research Institute in Budapest, the National Koranyi TB and Pulmonologic Institute in Budapest, the Debrecen Medical Sciences University, the Lajos Kossuth Science University in Debrecen and the Vegetable Production Research Institute in Kecskemet. [Passage omitted]

The isotopes produced would make it possible to use a Positron Emission Tomograph (PET) for example for mapping the centers of the human brain activated by various stimuli with millimeter precision or for locating

cancerous tumors with the same precision. Unfortunately a PET is very expensive and there is no such equipment in Hungary. [Passage omitted]

Adapting or developing the peak technologies of our age in Hungary often requires the use of the tools and methods of nuclear technology. The cyclotron expands the range of domestic tools available (reactors, neutron generators, electrostatic accelerators, etc.) and this is especially significant in the area of activation techniques. [Passage omitted]

Activation techniques have been used in the following areas: to study trace contaminants in high purity aluminum and to study aluminum powder metallurgy products, in cooperation with the Design and Research Institute of the Aluminum Industry; to determine the oxygen content of gallium, in cooperation with the Ajka Alumina Factory and Aluminum Foundry; to study the element distribution in glass, in cooperation with the Silicate Industry Central Research and Planning Institute; to study changes in the element distribution of lubricating oils, in cooperation with the Budapest Technical University; to study the components of microcontaminants and surface layers and to study the wear of parts, in cooperation with the National Technical Development Committee; to study wear in engine and motor parts, in cooperation with the Isotope Research Laboratory, the Industrial Technology Institute and the Auto Industry Research and Development Enterprise; to study wear in bearings, in cooperation with the Hungarian Roller Bearings Works; and to study wear in metal working tools, in cooperation with the Industrial Fittings and Machine Factory in Budaors. [Passage omitted]

The irradiation applications include: production of nuclear filters, in cooperation with the Ministry of Industry; a study of the radiation damage to semiconductor electronic units, in cooperation with the Budapest Technical University; a study of the response signals of scintillators, in cooperation with the Gamma Works; tracer detector research on charged particle irradiations, in cooperation with the Hungarian Optical Works; neutron dosimetric studies with a tracer detector, in cooperation with the Budapest Technical University, the Paks Nuclear Power Plant Enterprise and the Debrecen Medical Sciences University; a study of neutron sources and the radiation field of their collimated beams, in cooperation with the Debrecen Medical Sciences University and the National Radiobiology and Radiomedicine Research Institute; plant mutation and stimulation induced by neutron irradiation, in cooperation with the Debrecen Agricultural Sciences University and the Vegetable Production Research Institute; and radiobiological studies with neutrons for human applications, in cooperation with the Debrecen Medical Sciences University and the National Radiobiology and Radiomedicine Research Institute. [Passage omitted]

When foils are irradiated with high energy heavy ions channels can be produced by the chemical erosion of the foil at the site. Foils perforated in this way form nuclear

filters which can be used as fine filters in many areas of the economy (foodstuffs industry, pharmaceutical industry, environmental protection, etc.). Up to now we have had practically no way to produce nuclear filters. With the support of the Ministry of Industry significant developmental work is being done at the ATOMKI [Nuclear Research Institute] to develop a manufacturing technology based on a small cyclotron for the purpose of subsequent series manufacture. Series manufacture of the filters is expected to begin in 1990-91.

The semiconductor electronic elements and detectors of measurement instruments used in space research are exposed to the harmful effects of cosmic radiation. With the aid of the beams of the cyclotron these effects can be studied under terrestrial conditions and so it is possible to work out suitable protection as well. [Passage omitted]

TECHNOLOGY TRANSFER

Hungary: Mixed Enterprise Sells Robots to USSR

25020025B Budapest *COMPUTERWORLD*/
SZAMITASTECHNIKA in Hungarian 28 Jun 90 p 3

[Article by Zoltan Mikolas: "Mikromatika: Robot Technology Involving Six Countries"]

[Text] It started nearly 10 years ago as an economic work group with five members but by the end of last year Mikromatika Ltd. had 150 employees, a mixed enterprise working with American, British, Liechtenstein, West German and Austrian partners, dealing primarily with robot engineering and the development and manufacture of controls.

At their stand at the Budapest International Fair British and Czechoslovak robot mechanics were operated by control units from Mikromatika. The robot development chief Marta Makany told us: "Our general procedure is to buy the mechanics from the robot manufacturer and put in our own controls. We use mechanical elements from General Electric, Nokia/Puma and Siemens/Manutec but we also work on a Czechoslovak (SAM Myjava) and Bulgarian base. Our biggest customer is the Soviet Union. Last year we sold 24 robots there and we would like to stay on this powerful market. But our systems also work here at home, for example at the Boiler Factory in Kecskemet."

If needed Mikromatika delivers the entire technology. Their speciality is painting robots and they can provide the customer with a complete technological environment for these.

The head processor for their controls is an industrial (protected) version of a 16 megahertz AT with 1 megabyte RAM, a 287 auxiliary processor and at least two floppy disk units on which they run the software they have developed themselves, in the C language. They use an 8085 based axis control card for each robot axis being controlled. They guarantee the reliability of the control for each part and do a complete burn-in. The user can

buy a finished program, having the system taught, and then all he has to do is push the buttons of the control cabinet; or he can write the robot control program himself. The intelligent, easy to handle system software provides all support for this.

Finally, concerning robot prices. There are two painting robots here, for examples. The IRIS 12 (with SAM Myjava mechanics) costs 5 million forints while the IRIS 52 (with General Electric mechanics) costs 10 million forints, depending on the options.

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