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COMMISSION OF THE EUROPEAN COMMUNITIES

Multiannual Programme of the Joint Research Centre 1980-1983

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INFORMATICS

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— Teleinformatics
— Euroeopi
— Esis

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1. INTRODUCTION

The programme «Informatics» includes those activities in which efforts have to be concentrated in order to make contributions to the Commission policy in this field and to promote the use of advanced and efficient systems for the automatic collection, analysis, automatic treatment and dissemination of information and the underlying techniques.

Three main items make up the programme, selected out of the public service activities, that can be expected to be performed by the JRC and on the basis of the specific experience available:

— contribution to the research work in the field of Teleinformatics which shall lead to extend and improve the communication between geographically disseminated computers. The research is centered on the two subjects of «network» (language, operation, protocol) and «data» (databanks, standards, processing).

— management of the EUROpean COmputer Programme Institute (EUROCOPI), with the aim to integrate closely the research and service activities in software evaluation and dissemination. The research is oriented on programming techniques and software information transfer problems; the information service is pursued by setting-up a computerized data base on program information and by the organization of a program distribution and program information service.

— running the European Shielding Information Service (ESIS), which in a specific field, where very relevant experience has been accumulated at Ispra, fulfills the task of analysing, evaluating and synthetizing information on shielding data and calculation methods, as well as performing a shielding benchmark experiment. This information is exchanged with the interested organizations and firms in the European Community.

The work is in general pursued in collaboration with a range of bodies in the Community countries and is closely coordinated with the activities of the Commission services which are in charge of the various European actions in the field of Informatics.

2. RESULTS

Teleinformatics

The Teleinformatics activities are intended to explore the problems related to the connection of heterogeneous data processing systems via public data transmission networks. The logical connection of computers of different kinds requires the definition of network wide standards and the adaptation of real environments to these standards. The availability of the public services provided by EURONET and similar national networks and the development of satellite networks, suggest new applications to be proposed and tested.

The rapid growth of the market of miniinformatics and distributed processing also requires research efforts aimed toward the integration and standardization of the facilities for interconnection.
The activities within the project have been defined according to current trends in teleinformatics research. Indeed the interest is rapidly moving from the area of low band networks to high speed networks. The terrestrial data transmission networks already provide the appropriate service for supporting the transaction oriented applications such as information retrieval and data collection. The challenge for research activities arises now in the fields of local networking and satellite data communication.
These two technologies are both providing wide band with transmission means which can properly support the traffic for the new types of applications such as office automation, file transfer and distributed data base. In particular the rapid evolution of the microcomputers, which allow an effective decentralization of the functional capabilities, requires that new flexibility and capacity be provided at network level.

Computer network

A minicomputer internal network was made fully operational at the beginning of the year and includes a gateway function for interconnecting it to other types of networks (like EURONET, satellite networks or other local networks).
Such network constitutes the very first private network which is fully compatible with the existing and emerging international standards. The network software runs as a distributed process on several interconnected minicomputers (SOLAR 16).
The internal architecture of the system reflects recent recommendations by ISO in terms of Open Systems Interconnection. Indeed the modularity of the design allows for complete independence from the characteristics of the physical links for data transmission and from the nature of the network services.
A peculiar characteristics of the network is that the user of our informatics services are not concerned with our internal addressing scheme. They can select the required service by name without any further knowledge of where the service has physically been installed.
This flexibility is the result of a parallel service to the virtual call service which is called «broadcast».
The broadcast service provides for a common data structure which is present on each node and whose instances are kept synchronized by a distributed broadcasting algorithm.
The overall effect is similar to a television transmission.
Each network application owns a «screen» and can select the «channel» and therefore be informed about the required information.
A network application can also act as a «transmitting station».
The broadcasted data structures normally represent status information of general interest. This is the case for the gateway process: whenever a service is activated on the internal network, its name and its address are broadcasted all over the network. Wherever the gateway functions are installed, they can consult the «television screen» and perform the mapping between the requested service and the appropriate internal address on behalf of the remote user.
The mechanism is complicated by the possibility for two or more processes to offer the same service (ex. duplicated access points for reliability or performance purposes). Simple strategies have been adopted so far, but more sophisticated resource allocation strategies can also be introduced in the system.
At its present state of development the internal network represents a flexible tool for carrying out experiments in the field of internetworking and for supporting new applications of the teleinformatics technology.
Indeed with its terminal handlers, interfaces to mainframes and gateways the network offers full accessibility to local/remote terminals/applications and to other types of networks.
The network of the SOLAR systems represents the kernel around which other types of networks can be interconnected.
In 1981 progress was made for the installation of a network of micros which is best suited to concentrate the simple terminals which are spread all over the buildings. In addition, two other technologies were under investigation: a fiber optic approach and the satellite networks.
The fiber optic approach is an interesting solution for local networks.
It presents some undoubtful advantages as compared to coaxial cables and in particular it is characterized by low attenuation and low sensitivity to external sources of electromagnetic noise.
With the adoption of fiber optic trunks, the ring networks can be extended up to remarkable distances (several Kms).
Apart from the traditional connection oriented service, the fiber optic ring will offer a multidestination transport capability which is best suited for supporting the new types of applications such as computerised conferencing, distributed process control, and distributed data bases.
Regarding the satellite networks, after a series of preliminary contacts with the two ongoing European projects on satellite data transmission (STELLA and SPINE), we decided to contribute to the set up of a new research venture in the framework of COST 11 bis project.
This new project is intended to make the best use of the experience accumulated within STELLA and SPINE and to explore the feasibility of utilising the satellite link for high speed internetworking between local area networks.
Due to the uncertainty on the lifetime of the OTS satellite and in absence of alternative solutions, we connected our link driving computer to CNUCE (Pisa) which is already equipped with an earth station to OTS.
The technical solution will allow us to contribute to the implied software developments, but obviously our connection is penalized in terms of throughput to/from the satellite link.
The lack of a direct link to the satellite, apart from the bandwith offered, will have no further implications on our software and protocol developments.

Information networks

This activity is intended to demonstrate the feasibility of an advanced information distribution service based on the latest developments in three relatively unrelated fields i.e.: data base management, network services and equipment for office automation.
The project takes into consideration recent announcements concerning new services offered by the European PTTs (ex. Teletex, Telemail) and the preliminary studies which are carried out in the framework of INSIS. We recall that the Interinstitutional Information Service project is a Commission action aimed at the realization of a teleinformatics system which allows the exchange of information in its various form (voice, text, image) between the European Institutions and the National Administrations.
The JRC actively contributes to the technical working groups of INSIS. We are also designing some prototype systems which can be considered as test beds for the major project.

SCRIBA is the name of our prototype information distribution system which integrates the services offered by the word processors, the printing stations, the network data transfer capabilities and the data bases which support the overall distribution service.
The data base function of SCRIBA is currently in the implementation phase and some preliminary demonstration will be offered by spring 82.
A number of SCRIBA systems will cooperate exactly in the same way as regional post offices cooperate for performing the overall distribution function, each of them taking care of its local subscribers.

Standardization

The JRC is contributing to the overall process of standardization. The implied activities are carried out at various levels of technicalities and in the framework of various contextes.
In particular, in the framework of EURONET a service on the Reference and Test Center for EURONET higher level protocols is offered by JRC. This service is provided for the benefit of the implementors of the EURONET-compatible terminals (the European manufacturers). It provides fully automated assistance in debugging and testing the realization of the recommended protocols. With the set up of the Remote Printing Test Facility the full set of EURONET protocols is covered.
In the future the RTC concepts and facilities will be applied to the fields of local networking and interconnection of equipment for office automation.

Human and organizational aspects of office automation

This activity, which forms part of the general EC project known as INSIS has as its primary goal the identification of and response to human and organizational constraints likely to impede the large-scale introduction of high-technology office systems in Community institutions and national administrations - as envisaged in the full project.
The first year of the activity coincides with the planning and design phase of INSIS. During this phase much of the activity relates to organization. INSIS has an inter-service steering group, with the actual ground-work being performed by an inter-service working group. The activity involves participation in this working group, chairing one of the sub-groups (Sub-Group IV: «Human and Organizational Aspects»), and liasing with other sub-groups.
An important part of the activity consists of gaining - in the company of other sub-group participants - genuine «hands-on» experience of using the new technology under discussion.
Another task to be performed as part of the activity is the organization and co-ordination of a major expert workshop, aimed at bringing together the latest professional knowledge on a range of subjects ranging from the utility of user participation techniques in the introduction of new technologies to the latest findings on office machine ergonomics.

Data Base query language

Two lines of activity have been followed during the reference period.
The first concerning the development of a general query language, able to deal with factual and bibliographic banks, and compatible with the Common Command Language (CCL), (using the same command names, syntax and grammar whenever possible), as recommended for use in EURONET-Diane.
The second one regards the automatic indexing of documents in the framework of the computerized documentation. For this second activity, a contractual study in collaboration with the Linz University has been completed and the software developed has been fully tested as well as an automatic procedure suitable for evaluating the advantages of this new option, in comparison with the already existing automatic indexing system.

Eurocopi

The main purpose of the EUROCOPI project is to help the users of scientific/technical computer programs by performing research activities in the field of programming and program library techniques and by providing a program information and a program distribution service.

Programming techniques

Only a limited effort was devoted to this chapter of the activity during the reporting period, priority having been given to the development of the data base for program abstracts. Nevertheless a theoretical manual for a structural design language (STRUDL) was completed. This is a subsystem of the Integrated Civil Engineering System (ICES) and forms an important part in technology transfer by computer programs.
In addition, a study on the conversion problems for FORTRAN programs from one dialect to another was performed. The study covered a systematic analysis, an enquire on tools available and the editing of user guidelines.

Data base development

During 1981 the in-house test operations on the data base was successfully finished and now the first external operation phase, the so called «experimental period» with a limited number of abstracts (about one thousand) is taking place.
The appropriate documentation for using the data base from outside has been printed and consists of three parts:

— Vol. 1: General Documentation, which reports on data content and data structure, the files and its relations, etc.

— Vol. 2: User's Manual, which reports in more detail on the concept and use of the interrogation language.

— EASI-L: a Reference Card, which reports on all interrogation commands in a table form.

The Interrogation Language was implemented, tested, and is working without any problem.

Program library

As far as the service of the program library is concerned there was a steady emphasis on implementation and maintenance of large engineering packages used in other research fields within the JRC and continuous direct user support in the application of these packages.
In addition, the total library material (manuals, user - and implementation documentation, sources, etc.) was checked with the aim to reach an updated material status of the library, corresponding to present user needs.
Since 1975 EUROCOPI undertook the task of maintaining and distributing the computer programs of the Integrated Civil Engineering System (ICES) on behalf of the ICES Users Group, an international user association with more than 500

members. The main reasons for this undertaking by the JRC were:

— to gain experience in the field of maintaining a software library

— to establish close contacts with the ICES user community for a flexible exchange of know-how in the field of computational engineering

Now, by 1981, both aims have largely been achieved.
EUROCOPI obtained sound experience in program library handling and the expertise gained on the ICES System serves many research teams of the Joint Research Centre. The frequent contacts with other users especially brought important scientific benefits. It was decided to terminate at the end of the year the activity of the distribution agency at JRC and the task was passed on to a new distribution agency (NAG: Numerical Algorithms Group, Oxford, U.K.).

Esis

ESIS is a service activity in the field of radiation shielding dealing mainly, but not exclusively with fission reactors. Its principal aim is to develop and maintain high level competence in shielding problems allowing for qualified support to reactor projects in the European Community.
In particular ESIS is working on cross section assessment for shielding and material damage applications, on the testing and developing of shielding computer programs and on the execution of a shielding benchmark experiment. To remain in close contact with current design problems ESIS participates in the calculations of a few reactor shield configurations. To facilitate information exchange it also maintains and updates a shielding data bank and issues regularly a newsletter.

Nuclear data for shielding

Fast neutron flux measurements for the iron benchmark experiment continued in 1981 in the EURACOS facility installed in the thermal column of the TRIGA type reactor at Pavia University.
Sulphur detectors at penetration depths up to one meter were used and the work on the data adjustment procedure continued with particular emphasis on three-dimensional uncertainty analysis.
Preparatory work was performed for the data adjustment calculations of the ASPIS experiment, carried out at Winfrith.

Computation method development

The theoretical work carried on in the reporting period concerned studies on perturbation Monte Carlo methods; in particular, the mathematical relationship between correlated sampling and a differential Monte Carlo perturbation algorithm could be established. Furthermore a general Monte Carlo procedure for calculating the complete sensitivity matrix was elaborated.

Technical support to shield design

The contribution to shield design concerned the determination of gamma ray buildup factors for iron-lead and lead-iron shields. Iron slab thicknesses of 2-40 cm near the source followed by 32 cm of lead were considered, and lead slab thickness of 1 to 10 cm, followed by 60 cm of iron.

In addition, a set of easy to use approximation formulas for the calculation of gamma shielding was set up. They allow a quick and rather precise estimate of a wide class of photon penetration problems.

Information service

Regular dissemination of information was insured by the publication of the quarterly ESIS Newsletters.
The operation of the Shielding Data Bank was also pursued.

3. CONCLUSIONS

During the year 1981, the work for the Informatics programme developed along the three projects: Teleinformatics, EUROCOPI, ESIS.
A considerable increase of effort and a broadening of the scope took place for the Teleinformatics project. This activity covers research in an up-to-date and very dynamic field today: computer networking by terrestrial or satellite connections and the related data management and transmission problems. The JRC, working in tight collaboration with the Commission General Directorates in charge of the Community policy in the field, plays for a number of subjects a central role for the European research activities, by contributing or leading cooperative research actions and by developing and testing prototypes.
In particular the JRC contributes substantially to the COST 11 bis action whose technical secretariat is hosted at the Ispra Establishment. A Reference and Test Centre for higher level protocols to be used in EURONET is now operated at Ispra. A general research support to the Commission project for an Interinstitutional Information Service (INSIS) is currently given through participation to and animation of working groups and by testing and developing prototype installations and protocols.

The EUROCOPI project was reorganized to some extent, giving priority to the service activities, in particular to the Data Bank for computer program abstracts.
This project responds to the ever lasting need of facilitating the software sharing by increasing the portability of computer programs, avoiding duplications and disseminating the information. Beside a limited research activity in the field, EUROCOPI provides a service by a Data Base on computer program abstracts which was made available through EURONET for a first experimental phase and by operating a computer program library specialized in the fields in which JRC is active through its research programmes.

The work for the ESIS project was somewhat reduced in the course of the year 1981, although progress was made for the preparation of the set up of a new bench-mark experiment.
ESIS is a project based on an existing long experience of work in the field of radiation physics and reactor shielding at the JRC Ispra. It has been orientated so to provide an information service to the European shielding community and it is actually a way of keeping strong links among the European research laboratories active in this field. The work performed on nuclear data for shielding, including the current benchmark experiment on iron blocks and the forthcoming experiment with sodium, complemented by the theoretical interpretation and developments, gives an acknowledged contribution to the improvement of basic data useful for shielding designers.

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