The On-Line-72 international conference, organized by the On-Line association created expressly for sponsoring conferences and exhibits on computerization, was held in September, 1972, in Axbridge (England). On-Line-72 was the first major international conference devoted to the design and applications of computer systems operating with active human participation in real time, i.e., what have come to be known as interactive computer systems.

The conference drew about 1000 specialists from 17 countries, to hear over a hundred reports. In addition, the latest equipment in the field was exhibited, science films in popular style pertaining to the topics on the conference agenda were given showings, and discussions were held on the most important topics. The principal problem under discussion at the conference was the establishment of close contacts between users and designers of interactive data-processing systems.

The agenda of the conference covered the following principal topics:

1) design of interactive computerization systems: development of large systems, graphical displays, communication lines between remote parts of a system, special dialog languages, software for the systems and graphical displays, programs for checking the performance of the systems, etc.;

2) applications of interactive systems in science and industry: for mathematical and statistical calculations, in scientific research, in development and research work on electronic systems, in devising mechanical structures and systems, in architecture and civil engineering, in medicine, etc.;

3) use of interactive systems in social and humanitarian endeavors, as in large data processing systems, for editing and processing texts, in learning and training systems, etc.

The balance sheet of the conference shows that interactive computer systems have experienced vigorous growth and development in recent years, and have won great and widespread popularity in various fields of human activity. Systems of that type have been instrumental in greatly improving the effective use of electronic computers, and have opened up new paths for computer applications in new areas. Interactive computer systems have already won themselves a firm place in loading branches of science and industry, and have become commonplace tools. The human operator or user interacts with the electronic computer through interactive graphical displays on which the results of intermediate computer calculations are read out in lucid form (most often in the form of different graphs, schemata, or texts). Special devices make use of estimates of the intermediate computer readouts to keep feeding additional operational information back to the computer to determine the direction of the computer's further work on the problem.

Analysis of the reports presented to the conference shows that, despite the fact that interactive systems are being used in the most varied fields of applications, we can single out the range of problems being solved most efficaciously with the aid of interactive computer systems, and arrive at the typical structure of the system. Interactive computer systems are used most often in science and in industry to solve such problems as control of the progress of an experiment or production process, design and simulation of the performance of flowsheets, projects, and installations, recognition of patterns, mathematical analysis and statistical analysis.

The principal device in sophisticated interactive systems is the graphical display on a cathode-ray tube, with additional equipment available for generating standard image elements (vectors, symbols,
circles, etc.) and a variety of devices for operational input of data to the electronic computer in the system. The display is usually hooked up to a desktop computer which is hooked up in turn to the large (principal) computer in the system, which operates in a multiprogramming mode, often at a remote location. The large electronic computer is used only for complicated calculations, while the small computer handles image regeneration functions, transformation of the data format, simple calculations, dialog with the operator, etc. This combination is acknowledged as an optimum one for most scientific and engineering applications, since it offers certain advantages over direct hook-up to the large computer.

In terms of the type of display units on the cathode-ray tube, the graphical displays used can be divided into three types: units with arbitrary access to any point on the display screen, television (frame or raster) units, and charge-shortage tube units. Close attention has been given to the arbitrary-access type display as the most versatile one. But displays with charge-shortage memory tubes are the most popular ones at the present time, since they are comparatively cheap and do not require continuous access to the memory locations in order to regenerate the image.

Software for interactive computer and data processing systems which plays a major role in determining the possibilities of the systems and their convenient use, received its share of attention. It includes both the intermediate language (e.g., BEISIC) intended for communications between the human operator or user and the electronic computer, and the generally accepted programming language (e.g., FORTRAN) used for programming specific programs. New variants of intermediate languages were proposed in some of the papers.

An introductory review paper by K. Hammer (USA) dealt with the role played by interactive systems at the present time, and the outlook for the development of such systems in the future. The most pressing problem at present is how to device large-scale computer systems for solving scientific and engineering problems and also for solving problems of general national interest. These systems harbor enormous potentialities which must be combined with simple operation so as to provide access to the system for all those who lack any special training in computer practice. At the present level of complexity of computerization, the problem of how to develop simple means and methods of communication between the human operator or user and the computer is a fundamental problem. It has been suggested that the problem of how to write information into a computer directly from the human voice of the user or operator will be solved by 1980.

We should take note of several papers presented by nuclear physics research centers. A report by D. Cardwell (Oak Ridge National Laboratory, USA) demonstrated the experience acquired to date in the use of large general-purpose digital computers installed at general-purpose computing centers, for research in the field of nuclear reactors and plasma physics. With the development of interactive data processing systems, only desktop and intermediate-size computers connected by telephone lines to large general-purpose computers should be used. These systems provide economy of means and more complete utilization of the possibilities inherent in large computers.

One of the papers, presented by CERN, reported on communication lines linking a central computing and data processing complex consisting of a combination of large CDC computers and systems still in experimental testing areas. The communications link was established through the CDC-3100 computer, to which a small HP-2116 computer was hooked up. Depending on the data transmission rate and distance required, several alternate types of communications lines, capable of handling anywhere from 300 to $4 \cdot 10^6$ bits/sec, can be selected.

Another CERN paper dealt with the development of a special computer language for the interaction between the human operator or user and the computer machine in solving problems in computational mathematics. This language is a combination of the GAMMA and AMTRAN languages already in use. The structure and syntax of the language, and its utilization in a GAMMA interactive system, are discussed.

An exhibit organized to run parallel to the conference drew participation from about 40 firms in capitalist countries. Small and intermediate computers, displays, interactive graphical systems, and also information of practically all existing recent prototypes of small computers fabricated by concerns in the USA or in Britain were represented. These computers are intermediate, in terms of their structure and the organization of their performance, between the third and fourth generations of computers. They make use of integrated circuitry of a medium degree of complexity, feature a semiconductor memory for microprogramming purposes, and the circuitry is designed to handle floating decimal point operations. The