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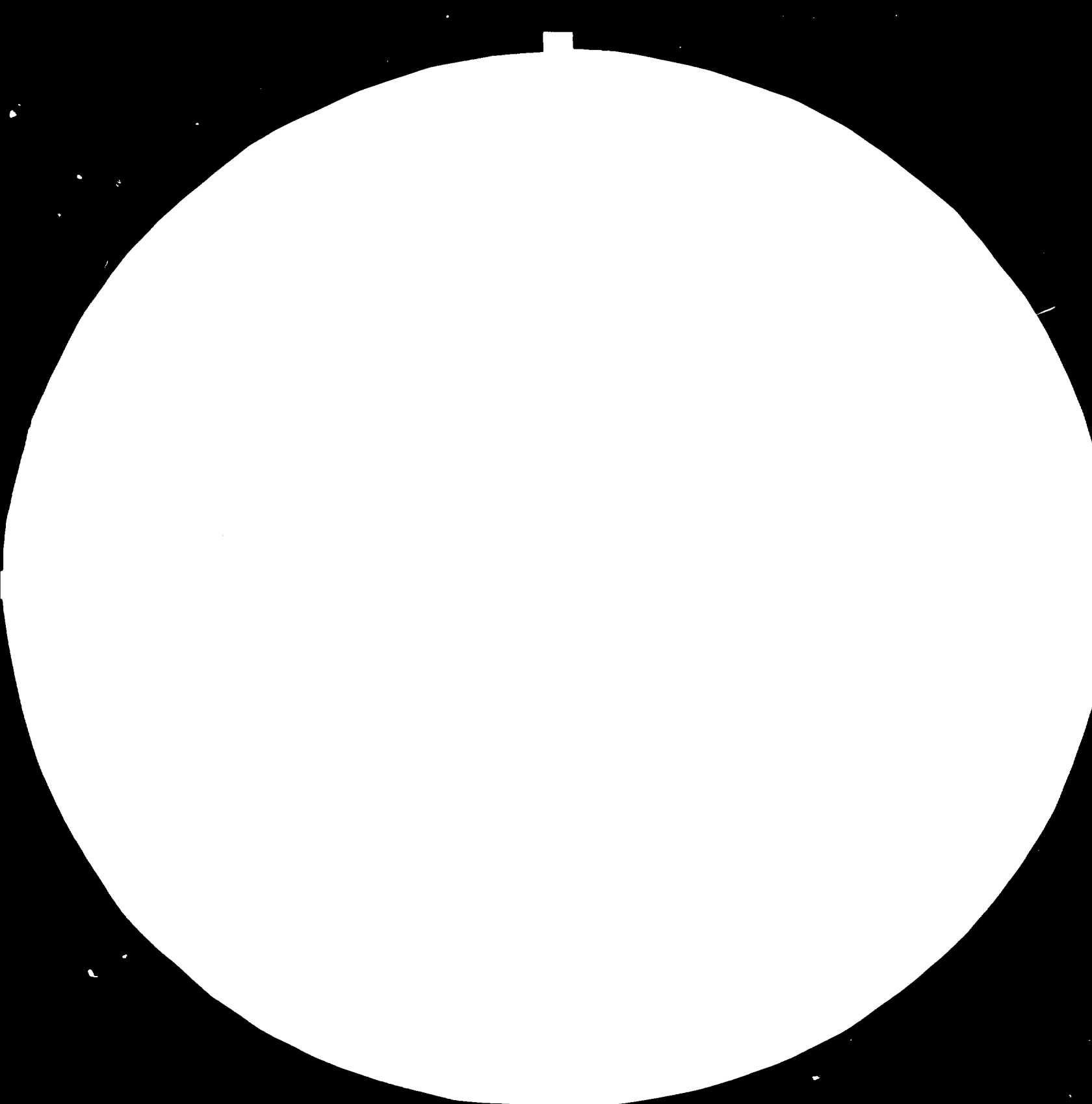
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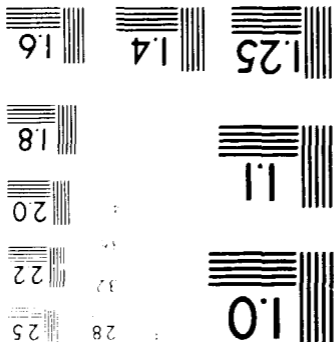
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14080

DP/ID/SER.B/472
11 September 1984
English

China.

TRAINING AND DEVELOPMENT OF MICROCOMPUTER
SYSTEMS APPLICATION

DP/CPR, 30/050

CHINA

Terminal report*

Prepared for the Government of China
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Tak K. Wong,
consultant in microcomputer operating systems

United Nations Industrial Development Organization
Vienna

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Abstract

DP/CFR/80/050/11-59/31.9.C.

Consultant in Microcomputer Operating Systems

Duration : One month

The objectives of the project have been expanded to provide consultative services in microcomputer operating systems, microcomputer applications and robotics after discussion with Prof. Chinte Liu, Officer in Charge of this project.

The following recommendations have been concluded:

The Chinese government should initiate a standardization program on the methodology for the entry of Chinese characters into computers.

An expert in microcomputer buses should be invited to present a detailed analysis of the existing and future microcomputer bus standards.

A training program for computer*technicians should be initiated as soon as possible. This program must include the use of modern digital diagnostic tools. An expert may be needed to assist the development of the course.

A Robot Application Centre should be formed to assist the introduction of industrial robots in industry.

1. Introduction

This project is the continuation of a previous project DP/CFR/ 79/020. The major objective of the project is to help the country to accelerate the development of electronic technologies through the application of microcomputer systems, in particular, to assist in the improvement of the quality and in the diversification of electronic products by means of training of technical personnel. The author is the first of six consultants who will be taking part in this project. The project is not expected to be terminated till end of 1995. The original duties of the author is to provide assistance in the field of microprocessor operating systems. After discussion with Prof. Chinde Liu (Officer in Charge of the project), microcomputer applications and robotics are also included. A Hero Educational Robots is assembled under the supervision of the author by the staff of the microcomputer laboratory for demonstration purposes.

2. Activities

The major activities of the author in Chengdu Institute of Radio Engineering are the provision of lectures on three topics, namely, Microcomputer Operating Systems, Microcomputer Applications and Robotics.

Lectures on Microcomputer Operating Systems included lectures on the implementation of the Unix Operating System and discussions with the staff in the Microcomputer laboratory on the implementation and special features of the Apple Disk Operating System. The audience of the lectures are generally familiar with both Unix and AppleDOS and appeared to appreciate the detail explanation of how the operating systems operate.

Lectures on Microcomputer Applications included an overview of how microcomputers are used in general with detail examples of projects undertaken by the author in areas such as process control, instrumentation, scientific applications and communication. The audience appeared to be able to appreciate the effort in using microcomputers as a tool in areas other than computer science yet they apparently lacked the actual experience in applying microcomputer technology in industry.

Lectures on Robotics included the social issues, the working principles of modern industrial robots and the research effort at the moment. Lectures on the current status of research in Mobile Robots, Vision Systems and Speech Systems are also included. The lectures were at introductory level and was meant to stimulate a general interest in one of the most important areas of microcomputer application -- robotics. The lectures were well received with audience from other parts of the country.

Under the supervision of the author, a HERO educational robot (manufactured by Heath Company of U.S.A in kit form) was assembled by the staff of the microcomputer laboratory. The kit is part of a teaching aid brought along by the author. It is used to demonstrate

some principles in robotics as well as the use of a microcomputer as a robot controller.

3. Findings

The audience who attended the lectures on microcomputer Operating Systems are apparently competent users of either single-user operating systems such as AppleDOS, CPM, MSDOS or multi-user operating systems such as Unix and RSX-11M. The author is surprised to find that there is still no standardized methodology for entering Chinese characters into a computer under any system. From discussions with the staff and audience, there are apparently ten different methods for entering Chinese characters into computers and none of them are compatible. Input/output facilities are one of the major functions of a computer operating system, a standardized method for Chinese character entry should be placed at high priority. Since Unix Operating System is likely to become the industry standard for 16-bit supermicrocomputers, a standardized package for entering Chinese characters under Unix should be developed. It is worth pointing out that microcomputers are great tools only if it is accepted by the users. Normally, these users do not want to learn a foreign language or complicated operating procedures to use the computer. A standard method for Chinese character entry not only ease up the learning process for these users, it is also helpful to the computer engineers who have to design and implement application packages for their users.

The audience are competent computer scientists, they know very well how to use a microcomputer. It is unfortunate that they also lacked experience in using the microcomputer as a tool to serve industry. This may be due to the short history of computer applications in China. It is also found that there is again lack of a standard in microcomputer buses and peripheral functions. This lack of standard not only cause a problem in compatibility and duplication of very similar work, it is also impossible to provide off-the-shelf interfaces for the user and will need custom design solutions unless the applications are exactly the same. A much greater number of skilled computer engineers are needed for such an ad hoc approach in microcomputer applications.

There seems to be a lack of training programs for computer technicians for maintenance. With the rapid growth of microcomputers in China, an acute shortage of computer maintenance personnel will appear very soon. A training program at technician level is urgently needed.

It is clear that robots are needed immediately for releasing human workers from hazardous working environments. It is also considered to be useful in areas where human workers are not suitable such as super clean rooms for manufacturing of high technology products, deep sea exploration, etc. Productivity gains by robots are less important at present. However, with the present trend of population growth, the ratio of retired workers is expected to rise from the present 9 per 100 to 50 per 100 at 2040 if the birth rate is kept at 10 millions per year, or 33 per 100 if the birth rate is 16.7 millions per year from now (Fig. 1). Productivity gain will be a very important issue in

another 5 to 10 years time when the standard of living also rises. Experience and knowledge on robotics cannot be acquired overnight and the processes of cumulating experience in the application and manufacturing of robots should start now. Although the author has read published results on the development of robots in China, they are simple and limited. In general, the author feels that China lacks experience and expertise in both application and structure of robots.

4. Recommendations

The Chinese government should start a standardization program on the methodology for the entry of Chinese characters into computers. Standard software packages for Chinese character I/O should be developed for popular operating systems in China.

An expert in microcomputer buses should be invited to present a detailed analysis of the existing and future microcomputer bus standards such as the Eurobus, Multi-bus and Multi-bus II, VME and VMX buses and the Futurebus.

A training program for computer technicians is required urgently. The program should include the use of modern diagnostic equipment and should concentrate on maintenance of computers and other peripheral equipment such as printers, terminals, disk drives, etc. An expert may be needed to assist the development of such a course.

An Robot Application Centre should be formed to assist the introduction of robots in industry. At present, the major drive should be application of robots in hazardous environments. As experience built up within the country, the effort should shift to productivity gain through the application of robots and the production of robots. The Centre should have two sections. The function of the first section is to provide application services to the industry which will include work study, equipment selection and design, installation, training and maintenance. The functions of the second section are research and development. The area of research will include the structure and associated sensory devices for robots, new applications and manufacturing technology. This section will provide the nation with a knowledge foundation for a future robot industry. A new program will be needed to implement this Centre.

Appendix I

Course outlines

1. Microcomputer Operating Systems

The Implementation of Unix Operating System

The I/O of Unix

2. Microcomputer Applications

Overview of microcomputer applications in commerce, industry, instrumentation, scientific research and communications.

Case studies :

- (a) A microcomputer controlled analytical system for a pilot plant for the conversion of methanol to hydrocarbon
- (b) The development of a low cost logic analyzer
- (c) The development of an impact tester for material strength testing
- (d) A microcomputer system for neurophysiological research
- (e) A microcomputer controlled communication station between 7 Apple II microcomputers and a PDP11 minicomputer.

3. Robotics

Overview of robotics: its current applications, social issues and its importance in China.

The geometry of modern industrial robots and the relative merits of each of them.

Common drives for modern industrial robots and their relative merits.

Common methods of robot control and programming with emphasis on their relative merits and disadvantages.

An introduction to homogeneous transformation -- a very useful tool in robot control

The importance of end-effectors and some design examples.

An introduction to both internal and external sensors for robot installations with actual application examples.

An introduction of mobile robots and their problems.

An introduction to vision systems.

An introduction to speech systems.

Appendix II

Staff of the Microcomputer Development Laboratory

| | |
|---------------|--------------------|
| Liu Jin-Te | Professor |
| Lu Xianglang | senior Lecturer |
| Xiong Guangze | Senior Lecturer |
| Zheng Jiazhi | Senior Lecturer |
| Zhen Youpeng | Lecturer |
| Tang Zhaonan | Engineer |
| Lee Zhuoqin | Senior Lecturer |
| Sun ZhenYung | Senior Lecturer |
| Liudi | Teaching Assistant |
| Lu Wenbin | Teaching Assistant |
| Wang Zhongren | Lecturer |
| Lee Yianzhi | Secretary |

Appendix III

Contacts Outside the Microcomputer D & T Center

| | | |
|--------------|--|-------------------|
| Guo Xinpin | Sichuan Mechanic Research Institute | Engineer |
| Zhen Zongcai | Chengdu Electronic Research Institute | Engineer |
| Zheng Xiohua | Hangzhou Electronic Industry Institute | Lecturer |
| Shau Yuan | Hangzhou Electronic Industry Institute | Graduate |
| Zhou Pin | Gueilin Electronic Industry Institute | Teaching Asistant |
| Yang Guowei | Dept. of Computer Science of CIRE | Senior Lecturer |
| Liu Xinsong | Dept. of Computer Science of CIRE | Senior Lecturer |
| Xiong Shihe | Dept. of Electronic Mechanic of CIRE | Lecturer |
| Su Min | Dept. of Computer Science of CIRE | Graduate |

