

A PANEL ON INDUSTRIAL APPLICATION OF ROBOTICS

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Objectives

This panel deals with issues of computer controlled manipulators and computer vision applied to industry. The main issues include the followings.

1. What progress has been made during these five years?
2. What are the fundamental and practical limitations of our current techniques?
3. What kinds of approach should be taken to solve the problems?
4. What are the potential applications of robotics?

Background and Some Questions

Many industrial robots are now working in factories. But they are not much different from those developed fifteen years ago except that current computer controlled manipulators have some flexibility to change jobs by choosing a program stored in computer. Most of them work only by position control. Some have tactile sensors. Few have eyes. Is there no demand for sophisticated sensors or computer vision?

Recently, much progress has been achieved in the application of computer vision. In Japan, for example, many electric companies produce and use automatic wire bonders with TV cameras for IC assembly. There are also equipments for inspection of printed circuit boards, IC chips and LSI mask patterns.

Most of the systems employ special hardwares for processing binary input images. The success of computer vision application might owe mainly to the cheap hardware cost. But few systems deal with gray images. Hardwares for processing gray images are now being developed in the PIPS project in Japan, in the ARPA project in the USA and so on. Are they going to make a contribution to industrial application?

Now the cost of computer is still considerably high. Some systems take a hierarchical organization of one computer and many image processors or actuators. The processor cost is getting less these years. Then, what will be suitable system organizations? What kind of processors are required?

Another problem is how to make computer programs efficiently. Robots usually interact with the environment which can not clearly be determined beforehand. Languages are now being developed for arm control such as AL. In computer vision, many studies have been made for learning by showing. Are they really applicable to industry?

Some researchers find importance of three-dimensional modeling for CAD/CAM and for computer vision. If such a three-dimensional model can easily simulate the environment, it may greatly decrease programming efforts for arm control and vision.

Participants and Background

Toshiro Numakura, Hitachi Production Engineering Research Laboratory: Productivity technology

Walton A. Perkins, General Motor Research Laboratories: Industrial application of computer vision

Masahiko Yachida, Osaka University: Machine parts recognition, image sequence analysis

Yoshiaki Shirai, Electrotechnical Laboratory: 3-D computer vision

Ed Fredkin, Massachusetts Institute of Technology, Artificial Intelligence Laboratory.