With the growing cost of human resources and the pressing need for increased productivity, industry is turning more and more towards automation, specifically the use of robots. But exactly what is a robot? The word itself comes from the Czech word robota, meaning work, and Webster's calls it "an automatic device that performs functions ordinarily ascribed to human beings." However, with that description, even a washing machine can be considered a robot. The Robot Institute of America gives a more precise definition and introduces some key concepts:

A robot is a reprogrammable, multifunctional manipulator designed to move material, parts, tools, or specialized devices through variable programmed motions for the performance of a variety of tasks.

In short, a robot is a reprogrammable, general-purpose manipulator with external sensors that enable it to perceive and recognize its environment and to perform assembly tasks. As such, it must possess some "intelligence," which is normally due to the computer unit associated with its control system.

The type of robot we are concerned with in this issue is the practical industrial robot described above, not the humanoid type depicted in movies and science fiction. This type does exist but is primarily for show and does very little work. Indeed, the industrial robot is merely a simulation of a human arm, which when combined with its controlling unit can accomplish a wide range of tasks.

We know that these robots are potentially useful in industry, but we do not yet know the extent of their utili-
ty. Hopefully, robots will either reduce the cost of production, improve the quality of the output, or accomplish both. They are already proving valuable in material handling, product assembly, and automatic product inspection and are successfully completing spraying, welding, and simple assembly tasks. At present, the limitations of robot use in industry are due primarily to low flexibility and high cost. However, the need for high-performance, intelligent robots exists; they can be used for sophisticated assembly, mining, exploration, and prosthetics, for example.

All the articles in this special issue deal in some way with improving the flexibility of industrial robots. The first four focus on aspects of computer vision and recognition systems. Rafael C. Gonzalez and Reza Safabakhsh give a tutorial on computer vision techniques for machine parts recognition and robot control. Major pattern recognition methods used for automatic inspection are briefly described in the next article. A special technique for curved surface measurement and recognition in robot vision is then presented by Ernest L. Hall et al. John F. Jarvis summarizes a workshop report regarding the research directions in industrial machine vision.

The last two articles discuss other, equally important, elements of robotic systems. C. S. George Lee discusses robot arm kinematics, dynamics, and control, and Susan Bonner and Kang G. Shin give a comparative study of robot languages.

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