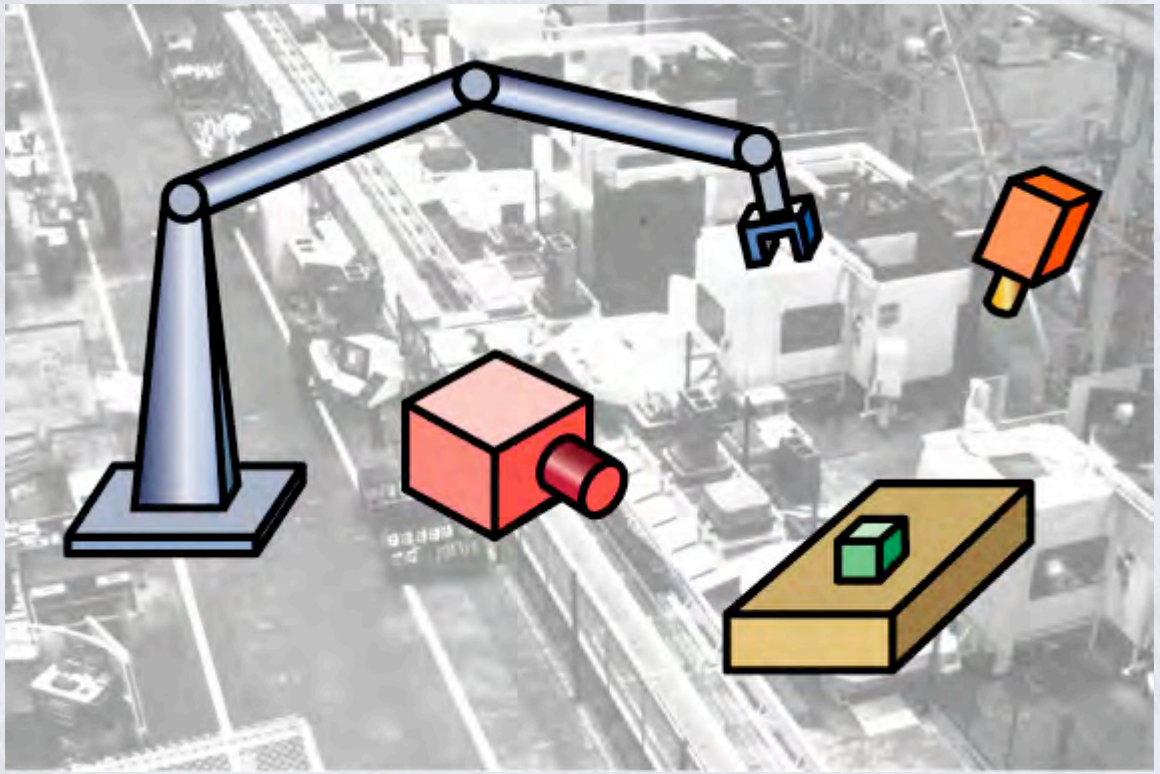
Chapter 39

Computer-Integrated Manufacturing Systems



Manufacturing, Engineering & Technology, Fifth Edition, by Serope Kalpakjian and Steven R. Schmid.
ISBN 0-13-148965-8.

Flexible Manufacturing Cell (FMC)

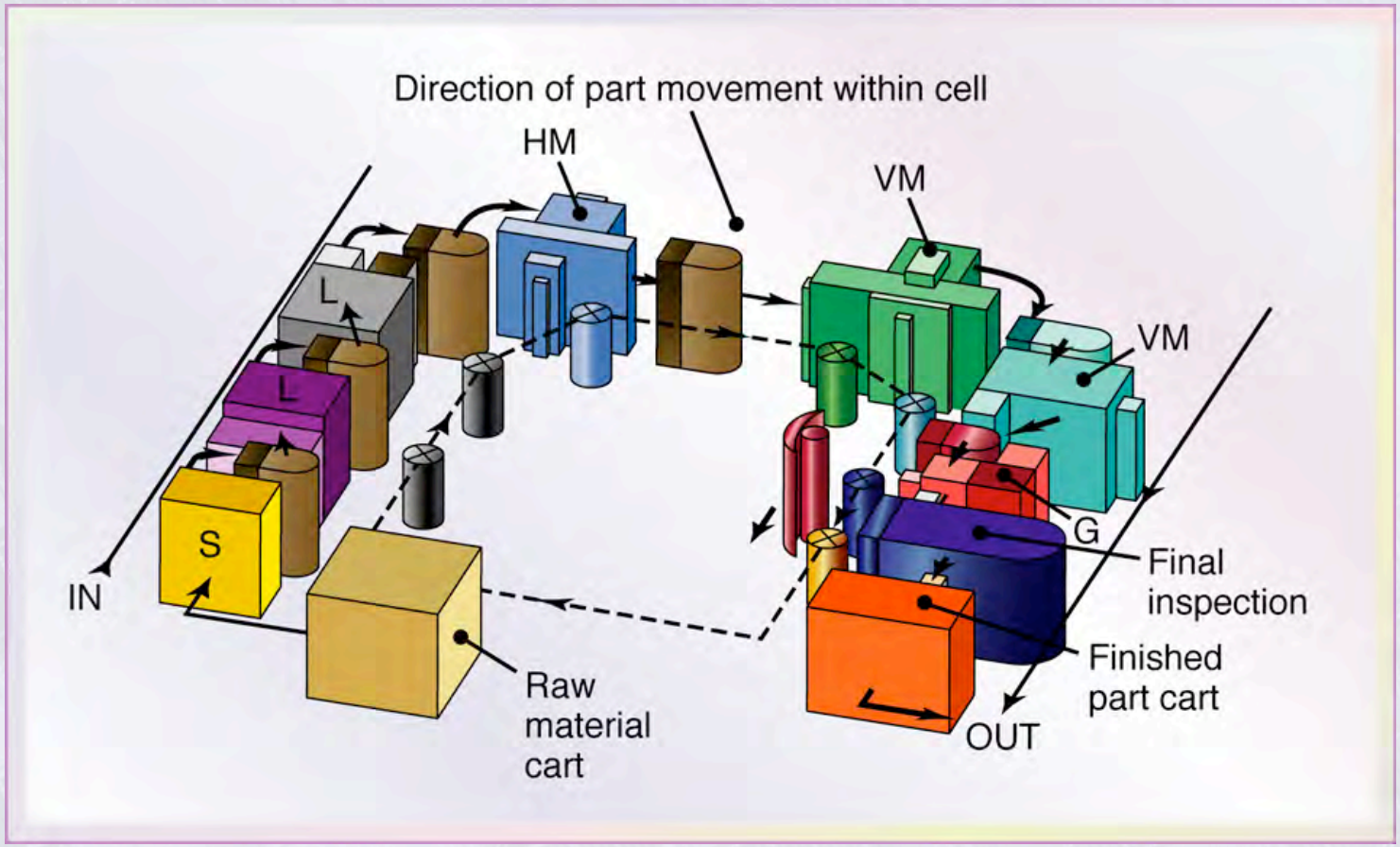


Figure 39.1 Schematic illustration of a manned, flexible manufacturing cell showing various machine tools and an inspection station. *Source*: After J. T. Black.

Flexible Manufacturing System

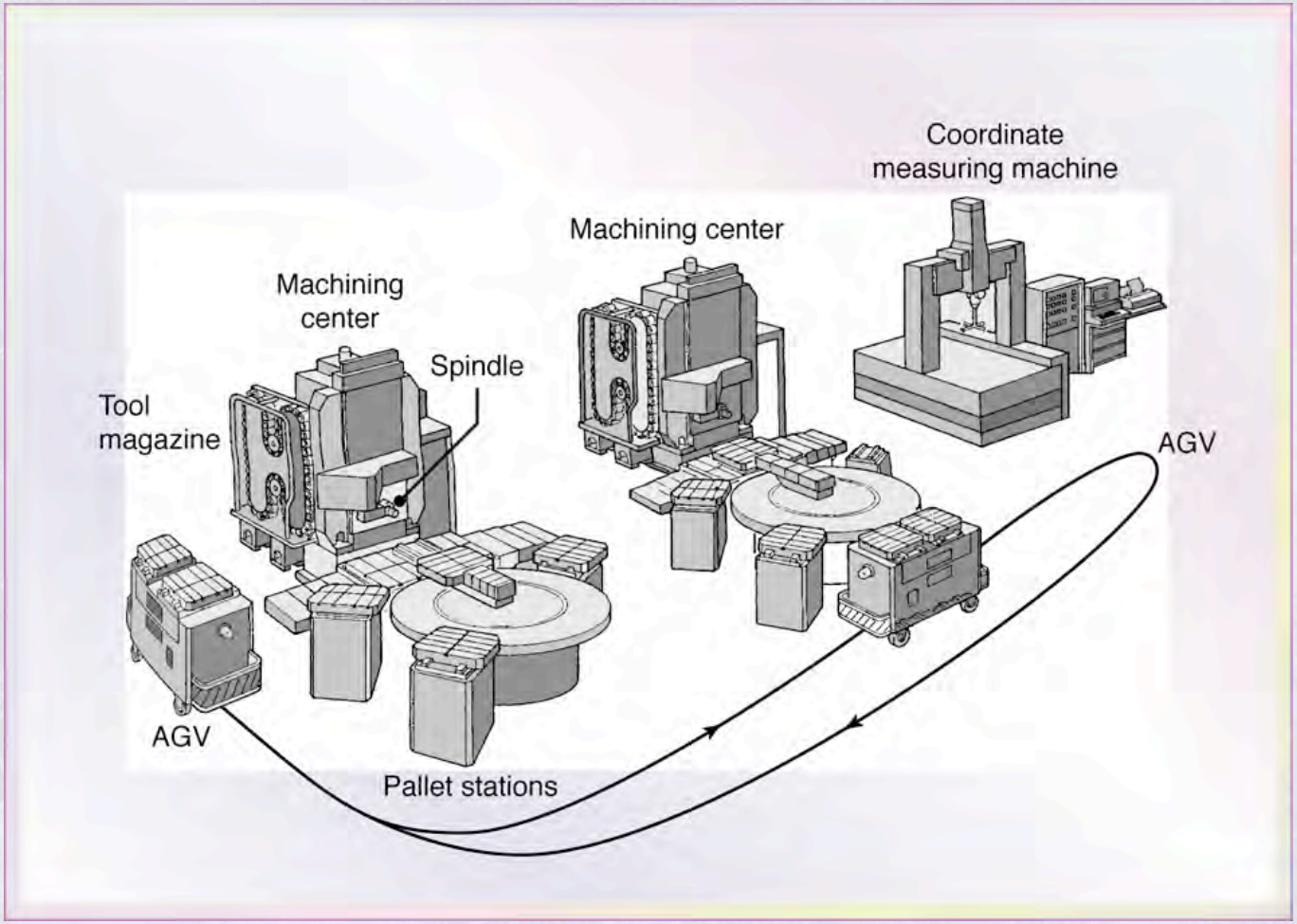


Figure 39.2 A schematic illustration of a flexible manufacturing system showing machining centers, a measuring and inspection station. And automated guided vehicles. *Source*: After J. T. Black.

General View of Flexible Manufacturing System

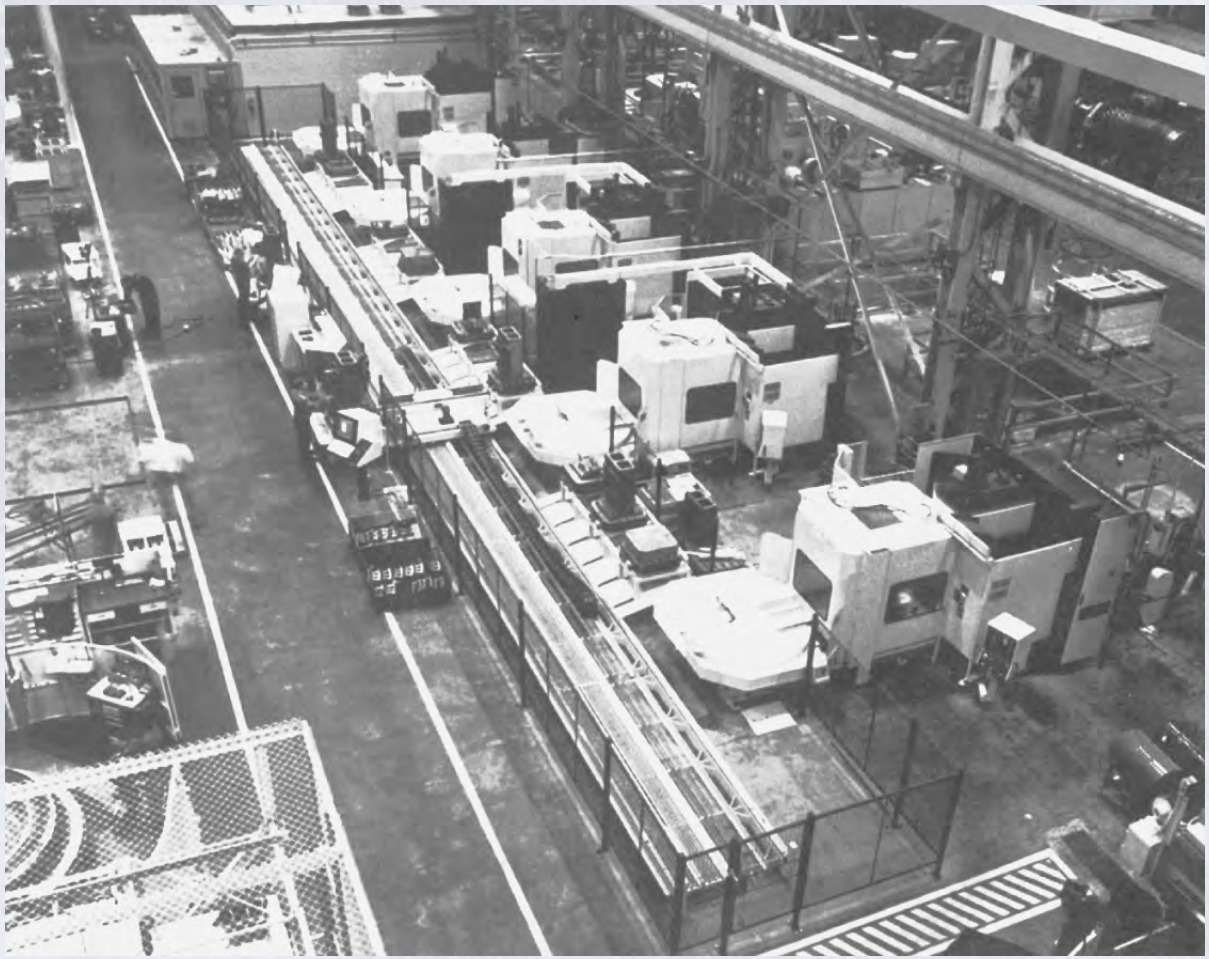


Figure 39.3 A general view of a flexible manufacturing system in a plant showing several machining centers and automated guided vehicles moving along the white line in the aisle. *Source*: Courtesy of Cincinnati Miacron, Inc.

Comparison of General Characteristics of Transfer Lines and Flexible Manufacturing Systems

TABLE 39.1

Comparison of General Characteristics of Transfer Lines and Flexible Manufacturing Systems

Characteristic	Transfer line	FMS
Part variety	Few	Infinite
Lot size	> 100	1-50
Part-changing time	Long	Very short
Tool change	Manual	Automatic
Adaptive control	Difficult	Available
Inventory	High	Low
Production during breakdown	None	Partial
Justification for capital expenditure	Simple	Difficult

Topology Types for LAN

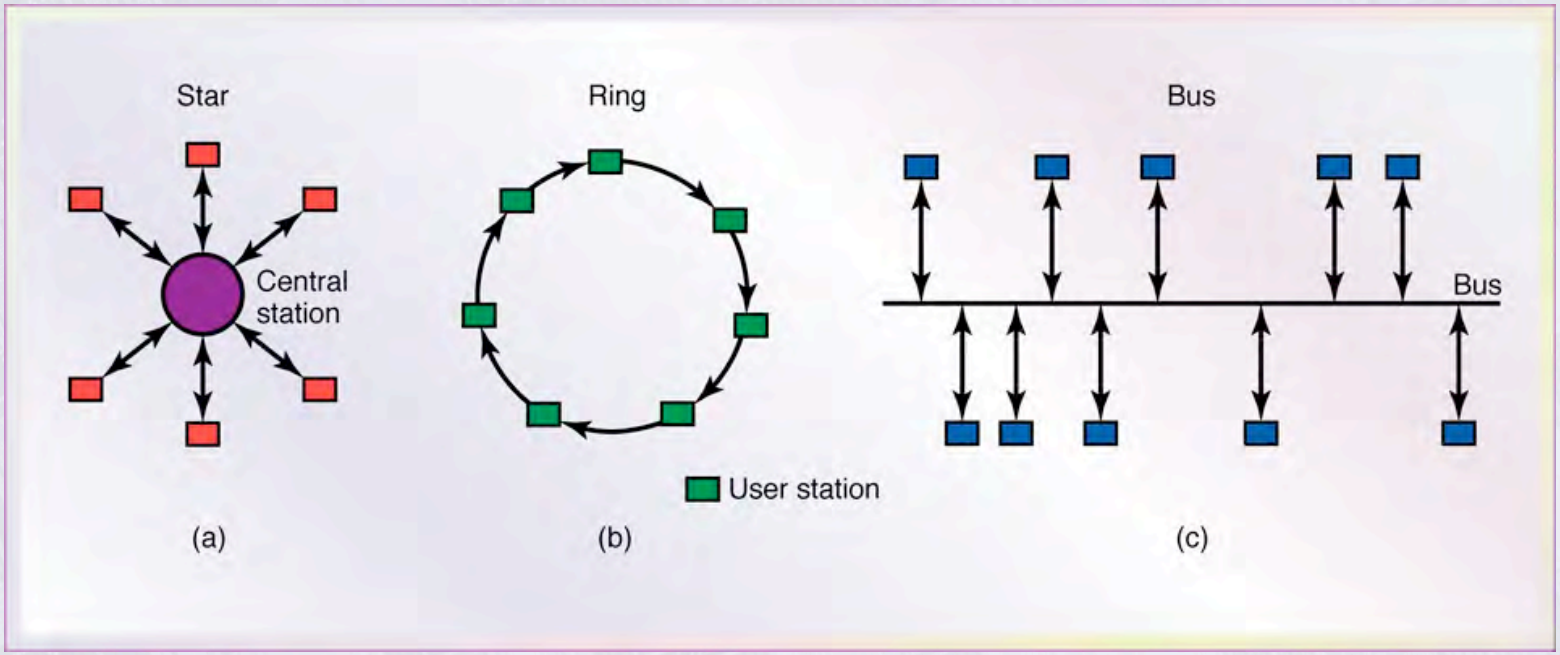


Figure 39.4 Three basic types of topology for a local area network (LAN). (a) The *star* topology is suitable for situations that are not subject to frequent configuration changes. All messages pass through a central station. Telephone systems in office buildings usually have this type of topology. (b) In the *ring* topology, all individual user stations are connected in a continuous ring. The message is forwarded from one station to the next until it reaches its assigned destination. Although the wiring is relatively simple, the failure of one station shuts down the entire network. (c) In the *bus* topology, all stations have independent access to the bus. This systems is reliable and easier than the other two to service. Because its arrangement is similar to the layout of the machines in the factory, its installation is relatively easy, and it can be rearranged when the machines are rearranged.

ISO/OSI Reference Model

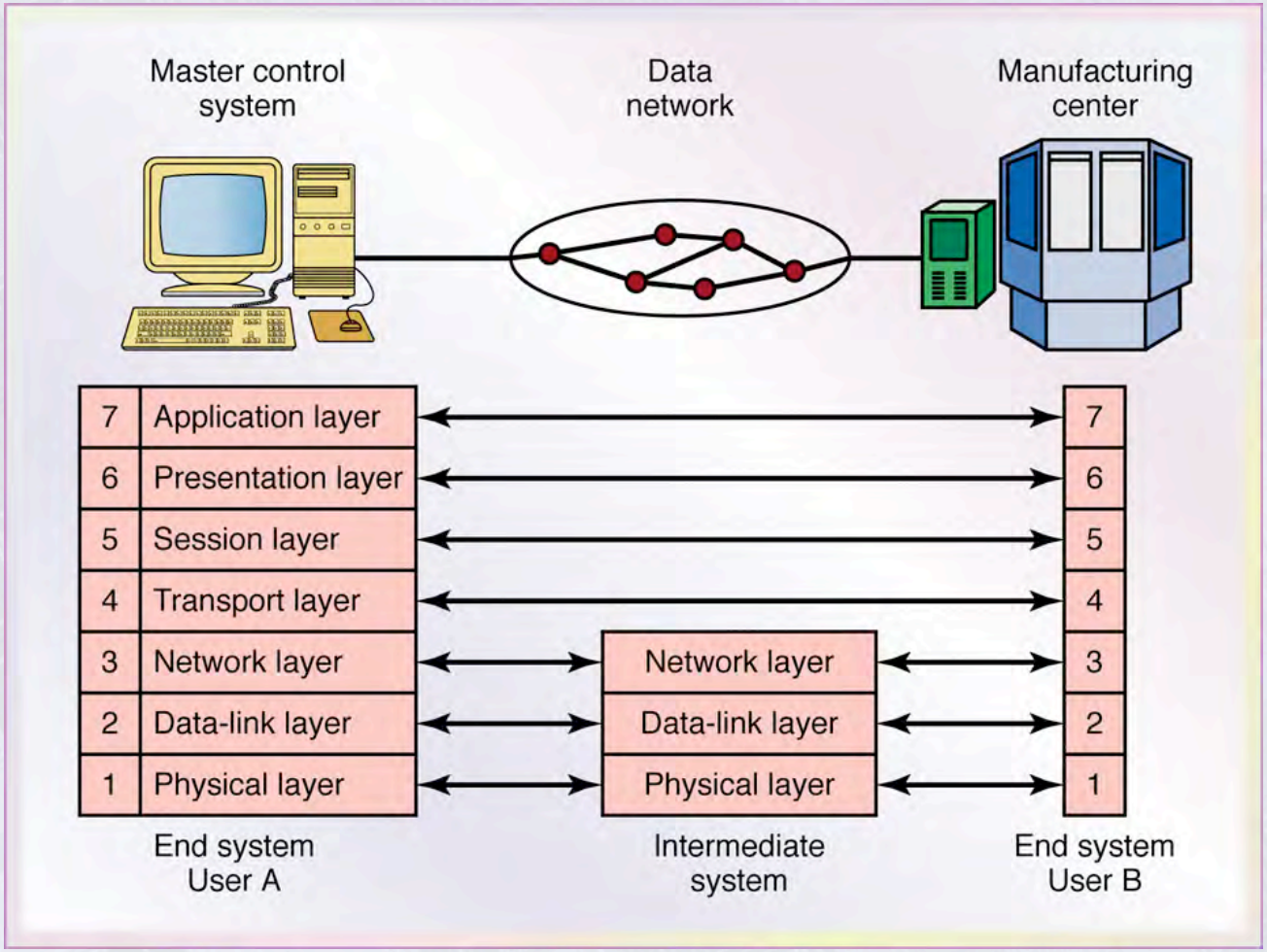


Figure 39.5 The ISO/OSI reference model for open communication.
Source: After U. Rembold.

Expert System

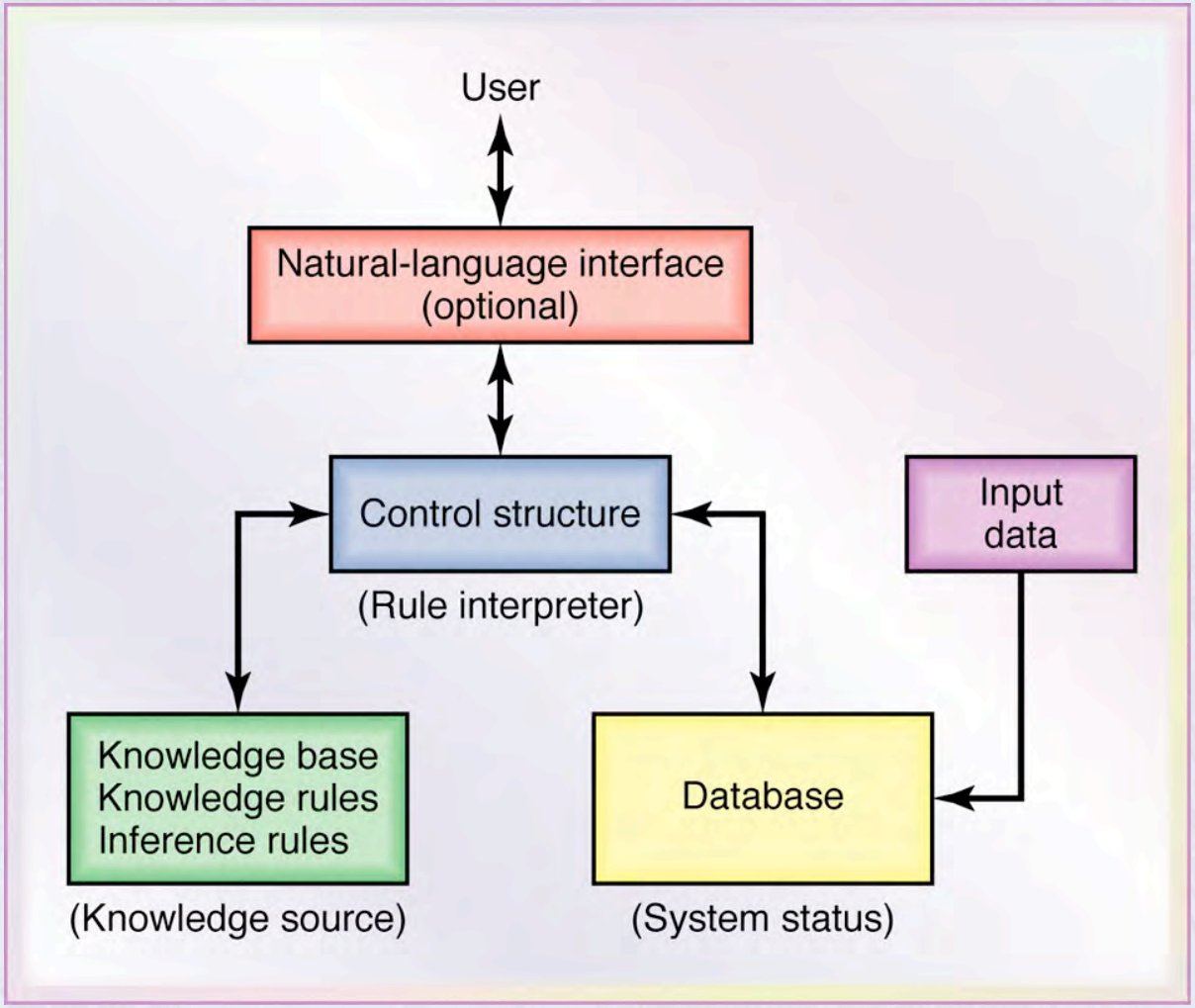


Figure 39.6 Basic structure of an expert system. The knowledge base consists of knowledge rules (general information about the problem) and inference rules (the way conclusions are reached). The results may be communicated to the user through the natural language interface.

Machine Vision

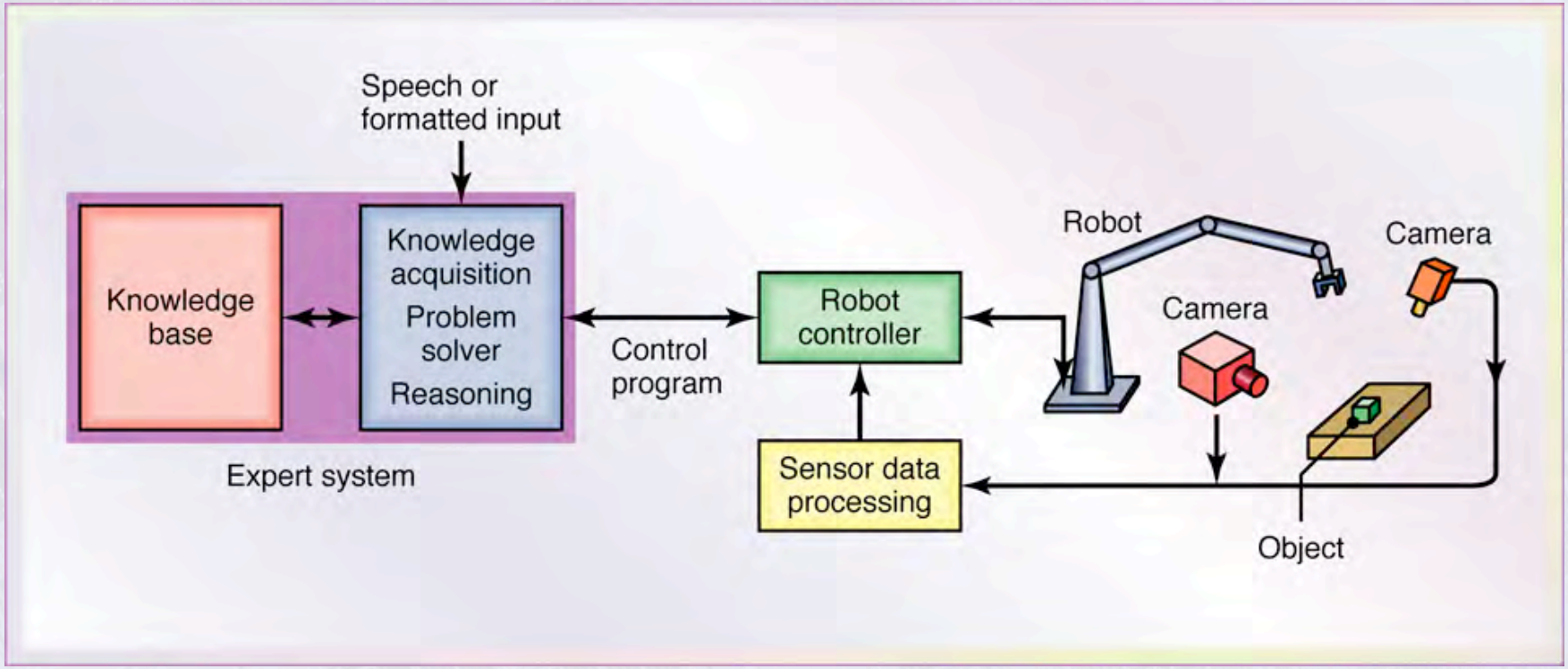


Figure 39.7 Expert system as applied to an industrial robot guided by machine vision.