

UNIT-I

BASICS OF ROBOT

1.1 INTRODUCTION

Robots are devices that are programmed to move parts, or to do work with a tool. Robotics is a multidisciplinary engineering field dedicated to the development of autonomous devices, including manipulators and mobile vehicles.

Roboticians develop man-made mechanical devices that can move by themselves, whose motion must be modelled, planned, sensed, actuated and controlled, and whose motion behaviour can be influenced by “programming”. Robots are called “intelligent” if they succeed in moving in safe interaction with an unstructured environment, while autonomously achieving their specified tasks.

This definition implies that a device can only be called a “robot” if it contains a movable mechanism, influenced by sensing, planning, actuation and control components. It does not imply that a minimum number of these components must be implemented in software, or be changeable by the “consumer” who uses the device; for example, the motion behaviour can have been hard-wired into the device by the manufacturer.

So, the presented definition, as well as the rest of the material in this part of the WEBook, covers not just “pure” robotics or only “intelligent” robots, but rather the somewhat broader domain of **robotics and automation**. This includes “dumb” robots such as: metal and woodworking machines, “intelligent” washing machines, dish washers and pool cleaning robots, etc. These examples all have sensing, planning and control, but often not in individually separated components. For example, the sensing and planning behaviour of the pool cleaning robot have been integrated into the mechanical design of the device, by the intelligence of the human developer.

Robotics is, to a very large extent, all about system integration, achieving a task by an actuated mechanical device, via an “intelligent” integration of components, many of which it shares with other domains, such as systems and control, computer science, character animation, machine design, computer vision, artificial intelligence, cognitive science, biomechanics, etc. In addition, the boundaries of robotics cannot be clearly defined, since also its “core” ideas, concepts and algorithms are being applied in an ever increasing number of “external” applications, and, vice versa, core technology from other domains (vision, biology, cognitive science or biomechanics, for example) are becoming crucial components in more and more modern robotic systems.

1.1.1 Definition

The term comes from a Czech word, *robota*, meaning "forced labor." The word *robot* first appeared in a 1920 play by Czech writer Karel Capek, *R.U.R.: Rossum's Universal Robots*. In the play, the robots eventually overthrow their human creators.

An automatically controlled, reprogrammable, multipurpose, manipulator programmable in three or more axes, which may be either, fixed in place or mobile for use in industrial automation applications.

An industrial robot is defined by ISO as an automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes. The field of robotics may be more practically defined as the study, design and use of robot systems for manufacturing (a top-level definition relying on the prior definition of robot). Typical applications of robots include welding, painting, assembly, pick and place (such as packaging, palletizing and SMT), product inspection, and testing; all accomplished with high endurance, speed, and precision.

