

Chapter 1

Introduction to Robotics

1.1 Introduction

This chapter gives an overview of *robotics*, the engineering discipline which focuses on the study of robots. I will introduce relevant topics from the angle of manufacturing, which serves as a convincing basis to justify the usefulness and importance of robots in industry. For those who are actively undertaking research in the area of artificial intelligence, I also describe a framework from which to understand human intelligence. In the later part of the chapter, I discuss the major concerns of robotics, for the purpose of illustrating the simple, unifying theme, *motion*. An understanding of this theme would make the rest of the chapters easier to read.

1.2 Manufacturing

The word manufacture comes from the combination of two Latin words, *manus* (hand) and *factus* (to make). Thus, the literal meaning of manufacture is, “to make by hand” either directly, by producing handicrafts, or indirectly, by making use of re-programmable machine tools. Since ancient times, our ancestors exercised their creativity to the fullest, in making things by hand. This creativity led to the invention of *tools*, which made the process of “making things” much easier and more efficient. Most importantly, the discovery of *engineering materials*, such as metal, ceramics, and polymers, enlarged the scope of “things” which can be made by hand, with or without the help of tools. This, in turn, fuelled people’s creativity in inventing various *processes* for making “things” of different complexity, property, and scale.

A direct consequence of the activity of “making things by hand” was