2.1 THE APPLICATION DOMAIN, AND DESIGN TOOLS

Embedded systems are informally defined as a collection of programmable parts surrounded by ASICs and other standard components, that interact continuously with an environment through sensors and actuators [5]. In today’s world there is a wide proliferation of such electronic devices in everything from tea kettles to life-critical systems. Up till very recently, embedded systems have been designed in an ad hoc fashion based on manual interference and guidance. With increasing complexity, formal methodologies that incorporate HW/SW trade-off analysis and evaluation, and validation at the highest possible abstraction level have become essential. Obviously, an overhead is incurred in this top-down process: quality of the final output is typically traded-off with increased productivity, but as we will show, this overhead can be again managed and put within bounds if the methodology includes constraint-driven optimizations; the subject of the upcoming Chapters.

2.2 EMBEDDED SYSTEM DESIGN

The broad areas and concerns of the embedded system design methodology are shown in Figure 2.1. We will cover and discuss in this text mainly the following major areas: Design Representation, Evaluation (of the optimization, trade-off, and co-design), and Synthesis.

Hardware / Software Co-design (HSC) is a recent field that emerged out of the pressures of the always shrinking time-to-market and the ever-increasing de-
Figure 2.1  Major Roles in Embedded System Design