



## Chapter I

# On Our Four Foci

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## Abstract

*In this chapter we give a brief overview of the history and the key developments of the concepts of agents and multi-agent systems that are relevant to the book, as preliminaries to the presentation of the theories in the subsequent chapters of the first section of the book.*

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## Introduction

For quite some time now, the computer sciences, especially artificial intelligence (AI), have been focusing on such programs, which as distinct entities would successfully compete with humans in solving complex tasks. The omnipresent digital computer, nowadays, has developed to a degree where it can deal with complex tasks such as running and helping to manage complicated manufacturing processes, medical diagnoses, and the design of new machines, but programs run on it have not been successful in the said competition in the eyes of many. All of these efforts are a result of the continuing rivalry between the human and the machine, and the efforts to humanize the machine, to raise the program on a level of a direct equivalent of the expert, capable of independently solving

problems in a given problem area. As the machine becomes more humane and human on the one hand, and on the other, we as humans tend to resemble the *machine* more. Technological advances not only make it easy for us to adapt to the machines but also to augment our body or replace nonfunctioning parts. But where are we as far as the intelligence in AI is concerned?

Newell, Shaw, and Simon (1957) state that the term *artificial intelligence* denotes research directions aimed at constructing an intelligent machine capable of executing complex tasks as if it were a human being. Their article focused on the automatic theorem proving, and arose an array of questions not only on the nature of AI itself. A more important question emerged; namely, if the machine *can think* and if it can be intelligent, should it be given a legal status similar to humans? All of these questions still stimulate intensive discussions that have lately been critical of what AI can or cannot do.

With the idea of illustrating the concept of an intelligent machine, Turing devised a test based on the assumption that a machine would be considered intelligent if it could not be differentiated from a human being in the course of a conversation. A machine would be considered intelligent not based on some intrinsic criterion, but based on the effect of *imitating* the human behavior. In this context, the intelligence separates the unit from the group; it is a feature of the individual agent, and not of the group of agents. In that sense, a computer program can be observed as a *thinker*, bound in its own worlds. This directly reflects the idea of expert systems as a computer program being able to replace the human expert (agent) in cases of extremely difficult tasks that require knowledge, experience, or specific reasoning.

This centralized and sequential concept conflicts with several theoretical and practical situations. On the theoretical level (Latour, 1989; Lestel, 1986), intelligence is not an individual feature detachable from the social context in which it is being exercised. A human does not develop normally if he/she is not surrounded by other humans. Without a corresponding social milieu his/her cognitive abilities are significantly limited. In other words, what we understand as intelligence is not based solely on the genetic predispositions and the neural networks in the brain, but also on the interaction with the environment.

## Agent(s)

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This section overviews the “natural history of agents” (Kampis, 1998). It stresses three features widely discussed in history, relevant for the definition of an agent. Our specific adopted definition is discussed in the next chapter.

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