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Chapter II

On Agency

Abstract

In this chapter, we present the Interactionist-Expectative Theory on Agency and Learning (IETAL). Our intention is to provide remedies for the observed deficiencies in the existing approaches to the problem of autonomous agents design. A brief critical overview of the relevant agent-oriented research is given first.

Introduction

Although we agree with some of Brooks' (1991) criticism of traditional AI, we disagree on some crucial points, particularly on those regarding learning. We agree with his view that:

[The] problem-solving behavior, language, expert knowledge and application, and reason, are all pretty simple once the essence of being and reacting is available. That essence is the ability to move around in a dynamic environment, sensing the surroundings to a degree sufficient to achieve the necessary maintenance of life and reproduction. This part of the intelligence is where evolution has concentrated its time — it is much harder.

But in his work, he neglects the first prerequisite he points out by concentrating only on the *essence of reacting*. Denying the need for representation, he concentrates on generating behavior by using behavioral modules. This situation is similar to what happened with behaviorism during the first part of the 20th century. Behaviorism discarded any theoretical construct or introspection and focused on the *stimuli* and *reactions*, attempting to describe *behavior*. Then Tolman, Ritchie, and Kalish (1996) pointed out the difficulties of the present *radicalism* by explaining results of his experiments with rats learning to solve maze problems. He emphasized the role of *expectancies* and *cognitive maps* in explaining the learning process.

The Key Notions: Expectancy and Interaction

Here we consider the two key notions of IETAL, expectancy and interaction. Refocusing on these phenomena enable us to consider existing problems from different viewpoints and formulate other problems, relevant and practically significant for autonomous agents in a single-agent environment.

In our uniagent (single-agent) theory the two key notions are *expectancy* and *interaction* (with the environment). The notion of interaction augments its meaning as we move towards multi-agent systems of homogenous agents later in the text, including the interaction with the other agents as well.

Expectancy emphasizes *being* in an environment (world). It is the agent's ability to *anticipate* the effects of its own actions in the environment. We say that the agent is *aware* of the environment if it can *anticipate* the results of its own actions in it. This means that given some current percept the agent can generate *expectancies* about the resulting percepts when certain actions from its repertoire are applied. Anticipation does not mean that surprises do not happen. After inhabiting some environment for a certain time, the agent builds a network of expectancy triplets percept-action-percept, thus building the agent's cognitive maps (MacCorquodale & Meehl, 1953) in Tolmanian sense.