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Chapter V

On Learning

Abstract

In this chapter we explain how Interactivist-Expectative Theory of Agency and Learning (IETAL) agents learn their environment and how they build their intrinsic, internal representation of it, which they then use to build their expectations when on quest to satisfy their active drives.

Introduction

As we develop our view of agency, we give a central part to the Piagetian *inborn scheme*. This inborn programming is the mission that we are equipped with when we are born (defined with the actions that we can do and constricted by the limitations of our body). Piaget (1977) states:

I think that all structures are constructed and that the fundamental feature is the course of this construction: Nothing is given at the start, except some limiting points on which all the rest is based. The structures are neither given in advance in the human mind nor in the external world, as we perceive or organize it. (p. 63)

In English translations of Piaget's work, the words scheme and scheme are used interchangeably as translations of either one of the French *schème* and *schéma*. Siraj-Blatchford (n.d.) explains the difference between these terms:

The term 'scheme' […] was used by Piaget in his later work to refer to operational thoughts, or 'schemes of action' and […] the difference between schemes and scheme represent fundamental differences between operative and figurative thinking. […] For Piaget, a scheme was thus a pattern of behaviour into which experiences were assimilated. As a result of experimental play, children from a very early stage in their development, apply a range of action schemes to objects and begin to categorise those that are suckable, those that are throwable and so on. As these categories develop further, complex structures of knowledge and understanding are formed.

Schemas are cognitively more complex concepts. Schemes are more *atomic*. When our agent learns, it uses its inborn scheme that for the purposes of our modeling and simulations, translates into a predefined sequence of actions from the agents action repertoire that it wants to realize/do, as a given mission/ programming in its interaction with the environment. As the agent starts interacting with the environment based on its inborn scheme, limitations from the environment (obstacles, for example) will enable it to realize either the full sequence of actions or just a few of them. In realization of these actions it *remembers* the percepts of the new *states* it is in, and thus it starts building its operative, intrinsic representation of the environment. In this chapter we focus on the learning procedure(s).

Building the Intrinsic Representation

The *intrinsic representation* is a simple table (that we refer to as *contingency table)* where sequences of action and percept pairs are paired together in a fashion not unlike that one of a finite automaton. The contingency table is not,