Chapter 8

A “Consciousness”-Based Architecture for a Functioning Mind

Stan Franklin
The University of Memphis, USA

Abstract

Here we describe an architecture for an autonomous software agent designed to model a broad spectrum of human cognitive and affective functioning. In addition to featuring “consciousness,” the architecture accommodates perception, several forms of memory, emotions, action-selection, deliberation, ersatz language generation, several forms of learning, and metacognition. One such software agent, IDA, embodying much of this architecture, is up and running. IDA’s “consciousness” module is based on global workspace theory, allowing it to select relevant resources with which to deal flexibly with both exogenous and endogenous stimuli. Within this architecture, emotions implement IDA’s drives, its primary motivations. Offering one possible architecture for a fully functioning artificial mind, IDA constitutes an early attempt at the exploration of design space and niche space. The design of the IDA architecture spawns hypotheses concerning human cognition and affect that can serve to guide the research of cognitive scientists and neuroscientists. One such hypothesis is that consciousness is discrete.
Introduction

What is a mind? I have maintained for years, and still do, that the most useful way to look at a mind is as a control structure for an autonomous agent (see the next section). The continuing task of a mind is to produce the agent’s next action, to answer the only really significant question there is—what shall I do next (Franklin, 1995). Any theory specifying how to go about answering this question is a theory of mind. A theory is computationally plausible if it can be implemented or modeled on a computer, very likely on a virtual machine running on a computer (Sloman & Chrisley, 2003). If our theory is to be implemented or modeled on a computer, we must have in hand a computationally plausible architecture with which to implement or model it. If we have succeeded in implementing our architecture on a computer so that it supports our theory of mind on an autonomous agent, we have produced an artificial mind.

This chapter is devoted primarily to the description of one such, complex, functioning, artificial mind, and to some of the hypotheses about human affect and cognition that are derived from it. This artificial mind is the control structure of an autonomous software agent, IDA (Franklin, Kelemen, & McCauley, 1998; Franklin, 2001). IDA’s architecture implements global workspace theory, a theory of mind (Baars, 1988, 1997, 2002). It can be seen as an early contribution to the exploration of design space and niche space (Sloman, 1998).

Autonomous Agents

Artificial intelligence pursues the twin goals of understanding human intelligence and of producing intelligent software and artifacts. Designing, implementing, and experimenting with autonomous agents furthers both of these goals in a synergistic way (Franklin, 1997). An autonomous agent (Franklin & Graesser, 1997) is a system situated in, and part of, an environment, which senses that environment, and acts on it, over time, in pursuit of its own agenda. In biological agents, this agenda arises from evolved drives and their associated goals; in artificial agents from drives and goals built in by its designer. Such drives that act as motive generators (Sloman, 1987) must be present, whether explicit or expressed causally. The agent also acts in such a way as to possibly influence what it senses at a later time. In other words, it is structurally coupled to its environment (Maturana, 1975; Maturana et al., 1980). Biological examples of autonomous agents include humans and most animals. Nonbiological examples include some mobile robots and various computational agents, includ-
A Robust Facial Feature Tracking Method Based on Optical Flow and Prior Measurement
Guoyin Wang, Yong Yang and Kun He (2012). Developments in Natural Intelligence Research and Knowledge Engineering: Advancing Applications (pp. 234-245).
www.igi-global.com/chapter/robust-facial-feature-tracking-method/66451?camid=4v1a