Chapter V

Engineering Emotionally Intelligent Agents

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ABSTRACT

Interacting with intelligence in an ever-changing environment calls for exceptional performances from artificial beings. One mechanism explored to produce intuitive-like behavior in artificial intelligence applications is emotion. This chapter examines the engineering of a mechanism that synthesizes and processes an artificial agent’s internal emotional states: the Affective Space. Through use of the affective space, an agent can predict the effect certain behaviors will have on its emotional state and, in turn, decide how to behave. Furthermore, an agent can use the emotions produced from its behavior to update its beliefs about particular entities and events. This chapter explores the psychological theory used to structure the affective space, the way in which the strength of emotional states can be diminished over time, how emotions influence an agent’s perception, and the way in which an agent can migrate from one emotional state to another.
INTRODUCTION

This chapter examines the affective, core mechanism of the Emotionally Motivated Artificial Intelligence (EMAI) architecture: the Affective Space. The design of the affective space is motivated by research into the affective agent domain and the identification of the shortage of agent architectures that have the capacity for decision making influenced by a mechanism that simulates human emotional intelligence (Goleman, 1995). Picard (1997) affirms the importance of this type of emotionally influenced decision making in computers. She suggests that if affective decision making were integrated into computers, it would provide a competent solution to emulating the intelligence of humans, where decisions are often made with insufficient knowledge, limited memory, and relatively slow processing speeds. Emotions are an integral part of human decision making, and by giving machines a similar mechanism, it could help in problem solving, where options cannot be fully explored, data is incomplete, and processing time is short.

In recent times, there have been a number of architectures designed to produce artificial agents capable of expressing and processing emotions [Silas T Dog (Blumberg, 1997), PETEEI (El-Nasr, 1998), EBC Framework (Velasquez, 1999), Emotional Agents (Reilly, 1996), and Creatures (Grand et al., 1997)]. These models cover a wide range of affective phenomena and differ broadly between implementations. As a complete examination of these architectures would constitute a publication in its own right, a comprehensive review of these models will not appear in this chapter.

This chapter begins by examining a brief overview of the EMAI architecture. This is followed with an in-depth examination of the affective space; the architecture’s primary emotion-producing mechanism. The chapter continues by examining how emotions are produced and processed by the affective space. Finally, an examination of some future trends for the use of emotional agents is given.

OVERVIEW OF THE EMAI ARCHITECTURE

The EMAI architecture consists of several major processing and knowledge representation areas. These areas work together in a complex network of information gathering, manipulating, and updating. As shown in Figure 1, any agent implemented using the EMAI architecture receives external sensory data from its environment. It also processes internal sensory data from the Motivational Drive Generator in the Knowledge Area. Internal State Registers
Architecture and Implementation Issues
Ajantha Dahanayake (2002). *Successful Software Reengineering* (pp. 16-57).

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