Chapter 8
A Behavior Model Based on Personality and Emotional Intelligence for Virtual Humans

Héctor Orozco
Centro de Investigación y de Estudios Avanzados del I.P.N., México

Félix Ramos
Centro de Investigación y de Estudios Avanzados del I.P.N., México

Daniel Thalmann
École Polytechnique Fédérale de Lausanne, Switzerland

Victor Fernández
Centro de Investigación y de Estudios Avanzados del I.P.N., México

Octavio Gutiérrez
Centro de Investigación y de Estudios Avanzados del I.P.N., México & Grenoble Institute of Technology, France

ABSTRACT

In this chapter, we present a three-layered model based on the Triune Brain Model to simulate human brain functioning and human beings' behavior in realistic virtual humans. In order to implement this model, we use the ten personality scales defined by Minnesota Multiphasic Personality Inventory and the Emotional Competence Framework defined in the Emotional Intelligence Model to endow virtual humans with a real personality and emotional intelligence. In this model, we apply a set of fuzzy rules to change and regulate virtual humans' affective state according to their personality, emotional and mood history, and events they perceive from the environment. We also implement an EBDI-based intention selection using the Event Calculus formalism. This intention selection mechanism allows virtual humans performing actions based on their current affective state, beliefs, desires and intentions. Thus, these intentions define virtual humans' behavior for each situation they experience in the environment.

DOI: 10.4018/978-1-60960-077-8.ch008

INTRODUCTION

In Psychology, one of the most studied human factors that influence people's behavior is Personality. The term personality is refers to *"the set of psychological traits and mechanisms within the individual that are organized and relatively stable over time"* (Atkinson & Hilgard, 1996). These traits influence individuals' interactions and their adaptation to the environment. Psychological or personality traits represent forms of persistent patterns of perceiving, relating and thinking about the environment and oneself. These features distinguish one person from another and they are reflected in individuals' behavior in a wide range of contexts such as social and personal. In this manner, the characterization of individuals' behavioral patterns is used to explain in a more clear way how and why people react differently to the same events in their environment. In this chapter, we propose a three-layered model based on the Triune Brain Model (MacLean, 1973) to simulate human brain functioning and human beings' behavior in virtual humans. According to this model, human brain is formed by three-layered brains in one. Where, each of these brains emerged successively in the course of time in response to evolutionary needs. These brains are labeled as *reptilian brain* or *R-complex*, *mammalian brain* or *limbic system*, and *neocortex*, respectively. Each layer is geared toward separate functions of brain without operating independently of one another, but they interact by means of establishing numerous interconnections through which they influence one another. With the implementation of this model, we endow virtual humans with the ability of interacting in their environment according to their personality and emotional intelligence by controlling their affective state (emotional and mood states) taking into account their beliefs, desires and intentions. In our model, we use Minnesota Multiphasic Personality Inventory (MMPI) (Tellegen et al., 2003; Simms et al., 2005; Osberg, Haseley & Kamas, 2008). This inventory is one of the most widely used in psychometric practice and Psychology, because it is the best tool to assess individuals' major personality traits and their emotional disorders. The main objective of applying this test is to identify both individuals' personality profile and the detection of their behaviors and possible psychopathologies. Thus, the proposed model is valid from a psychological point of view, because it is supported by studies on Personality and resources provided by these studies. We take into account the most important behavior tendencies in each level of intensity (*very high*, *high*, *medium*, *low* and *very low*) of ten personality scales defined by MMPI. These scales are the following: *hypochondriasis (Hs*), *depression (D*), *hysteria (Hy*), *psychopathic deviate (Pd*), *masculinity-femininity for female and male (MF*), *paranoia (Pa*), *psychasthenia (Pt*), *schizophrenia (Sc*), *hypomania (Ma*), and *social introversion (Si*). We use the level of intensity of these scales to form different sets of fuzzy rules. These fuzzy sets are used to obtain an emotional influence, a mood influence over emotions, an emotional regulation, a mood influence, an emotional influence over moods, and a mood regulation, which modify and regulate virtual humans' affective state according to their personality, emotional history and mood history, taking into account the level of intensity of perceived events from their environment.

We also implement an Emotional-Belief-Desire-Intention-based action selection using the Event Calculus formalism to endow virtual humans with the ability to behave and perform intelligent actions based on their current affective state, beliefs, desires and intentions. These actions define virtual humans' behavior for each situation they experience in the environment. In this way, virtual humans' personality represents a set of personal characteristics that influence their cognition, motivation and behavior in different situations. Therefore, this set of values indicates the way virtual humans should react according to the situation. Our approach applies the principles