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Incorporation of Emotions in the Orphibs' Agent Architecture

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Abstract

We describe the incorporation an existing emotion model, the Belief-Desire Theory of Emotion, into the architecture of the agents present in Orphibs II, a Life Simulation videogame prototype. To our knowledge, this represents the first time such a model is employed in video games.

Orphibs II

Orphibs is a 2D Life Simulation game (Barreto, et al. 2014) where the player takes the role of a caretaker, represented by a hand, for alien-like creatures called Orphibs. The game world, featuring a day/night cycle, is populated by several objects (food, toys and a bed).

Orphibs are aliens are driven by five needs: eat, fun, social interaction, reproduction and energy. The previous agent architecture was based on an extended Goal-Based Behavior (Barreto, et al. 2014) and featured genetically evolved personalities.

Extending the Orphib's Agent Architecture

The revised Orphib's agent architecture features 6 modules: (i) visual sensors, to gather the objects' states (ii) a memory mechanism that stores the last perceived object state (iii) an emotional model based on the Computational Belief-Desire Theory of Emotion (Reisenzein 2009) – CBDTE (iv) a component for executing actions (v) a database that stores desires and (vi) a reasoning mechanism which selects actions according to originated emotions.

One of the crucial points of the new architecture was the inclusion of beliefs: an object state that has a decaying probability of being accurate. Alongside the memory mechanism, Orphibs can confront memorized and perceived beliefs. This allowed the development of a new gameplay mechanic namely, information exchange during Orphibs' conversations.

The Emotional Model

Emotions are generated whenever beliefs and desires are fed into the comparators and comprise: an intensity; a type, which identifies the generated emotion; and a sign. Since more than one emotion can be generated from the comparators, the agent reacts to the most intense one.

Emotions play an important role in the Orphibs reasoning system as actions are chosen, at random, from the top three with the most positive emotions. Besides influencing the reasoning system, emotions are also expressed visually through facial expressions. Yet, this is only used to convey what the Orphib is feeling to the player, as illustrated in figure 1:

There are two moments when emotions can be generated: before an action is selected (pre-effect) and during its execution

Figure 1 Orphib's facial expressions. From left to right: No Emotion, Fear, Surprise, Disappointment, Relief, Hope, Unhappiness and Happiness.

(post-effect). Pre-effect emotions can be described by fantasy emotions depicted in Reisenzein (2012). Since the Orphibs do not know the result of their actions, they express emotions resulting from the assumed outcome. Post-effect emotions, on the other hand, are the Orphib's reaction to events, more specifically, their reaction to newly perceived beliefs.

In the same manner as the genetically determined personalities present in Barreto, et al. (2014), we devised genetic emotional profiles by evolving the emotion's intensity functions (Reisenzein, 2009), as they are central to the reasoning mechanism.

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