Chapter XIV
Hybrid Emotionally Aware Mediated Multiagency

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ABSTRACT

Emotions influence our everyday lives, guiding and misguiding us. They lead us to happiness and love, but also to irrational acts. Artificial intelligence aims at constructing agents that can emulate thinking processes, but artificial life still lacks emotions and all the consequences that come from them. This work introduces an emotionally aware framework geared towards multi-agent societies. Basing our model on the shoulders of solid foundations created by pioneers who first explored the coupling of emotions and agency, we extend their ideas to include inter-agent interaction and virtual genetics as key components of an agent's emotive state. We also introduce possible future applications of this framework in consumer products as well as research endeavors.

INTRODUCTION

We as human beings are influenced by many factors as we carry out our daily activities and routines. Emotions in particular play an important role that often provokes biased decisions. Emotion as it influences one's behavior can do so in erratic and unpredictable ways with variations between individuals and circumstances. The unpredictability of emotion based responses can lead to many variations of interaction. This would certainly apply to interactions between humans, but also to interactions between humans and environmental artifacts and also to human-agent interactions. Decisions biased by a particular emotional state can produce erratic, impulsive or risky decision making behaviors within a given context (Loewenstein, Weber, Hsee, & Welch, 2001). If these states can cause a person to act in a potentially destructive fashion we should investigate ways to limit these effects. Various factors can contribute in eliciting such states and can be influenced by events in the environment, mental defect or disease, genetic disposition, traumatic events, social interactions or based from ones own

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perceptions. (Selyse & Fortier 1950; Loewenstein et al., 2001; Ohman & Wiens, 2004). Our approach is to use these behaviors and emotional models together with human and non human agents as the foundation for hybrid emotionally aware agent architecture for multiagent systems.

Due to the nature and complications associated with emotions, our aim is not to simulate complex emotional states or conditions within agents themselves, but to investigate how simple emotional simulations can be used to for a variety of purposes. Such phenomena can be modeled within a homogenous multi-agent system composed of emotionally enhanced sets of agents given both a finite set of options and emotional states. Our agents have limited abilities and actions based on their current emotional well being. Following previous experimentation with limited perceptual context for a given agent and its combined effect on understanding and formation of personal goals, we now apply emotion in limiting an agent's perception and motivational attributes (Trajkovski, Collins, Braman & Goldberg, 2006). In experimentations by Trajkovski, a hybrid interaction between human users and non-human agents can form a system that attempts to learn and adapt from each other in various conditions and contexts (2006). Emotions in our framework create a limiting heuristic that is directly associated with an agent's ability to sense and interact within the system.

The current state of an agent is derived from its ability to satisfy its drive to find "goal" locations within the environment. Similar to human behavior, an agent may become distressed or agitated if they fail at their attempts to find these simulated goals. These agents can compute the length of time that has past and/or the number of moves they have made; this compounded with the introduction of obstacles along its path will elicit a angry response as it becomes frustrated at the rise in difficulty or lack of a drive satisfier. In other cases in conjunction to these influences, agents may come into contact with others within the system. Agents in our framework however are limited to perception in a limited sensory field.

We see emotions as both a dynamic and prevailing influence over response mechanisms for an agent. Often emotions are attributed to "clouding" one's ability to make rational decisions which implies that they have a tendency to interfere with rational thinking and our ability to interpret perceptual information (Artz, 2000). In other situations they can however be extremely useful in making certain decisions "by rapidly reducing the options that one can consider" (Greenberg, 2002). Agents (human or non-human) while working with large amounts of data or available options will want to be able to filter, select and restructure it, with least possible effort (Shneiderman, 2005). In a similar application, emotions can be used in these situations to help filter out certain options. These changes in perception and available options are areas being explored by attributing certain basic states in goal seeking agents and examining its overall consequence.

Often a human emotional response is induced by an event or an "object" that has been given meaning which is part of a particular stimulus. With various stimuli are attributed meanings which are a result of an appraisal process that derives significance to such stimuli or events (Planalp, 1999). Objects, events and interactions are interpreted by each individual agent which contributes to their particular state. Following the distinct emotional conditions established by Elkman & Friesen (1975) which identify six emotional states that are innate across cultures, which are based on facial expressions (Anger, Fear, Sadness, Disgust, Surprise and Joy) we have chosen two emotions in which to focus our research. From these basic states, anger and joy (or happiness) has been selected for this framework. These two states can be attributed to individual factors concerning the achievement of goals (Planalp, 1999).

Generally those who are in a less stressed condition or in a happier state of emotion are less inclined to make riskier judgments. People in a happier state would not wish to take actions with risky or potentially negative outcomes so as not to disrupt their current positive state (Isen, Nygren & Ashby, 1988). An angry person or someone in a "bad" mood is more likely to make poor judgments (Loewenstein et al, 2001). Anger often can influence us to act in ways that are not in our best interest (Borcherdt, 1993). Fear and anxiety often play a role in behavior patterns as one avoids the object or causal of such stress. Depression as related to stressors can also distort judgment and the interpretation of perceived information as obtained from the environment (Gotlib, 1983). We envision

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