Emotive Agents

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Abstract

This paper deals with the concept of emotive agents. Indeed, this aspect of agents based systems is to be taken seriously, as of the tremendous influence of emotions in humans real life: attention, stress, empathy are to be defined and considered. A review of different models of emotion is realized, and some application examples are given.

1 Introduction

"Computers cannot have feelings" [Ziff, 1959]. However, it has been remarked that emotions in general hugely affect human perceptions and reasoning. Thus, there is a gap between rigid-objective agent/machine and emotive users, introducing misuses. Actually, "people are known to anthropomorphize technologic items" [Silverman, 2001], so a solution would be introducing models of human behavior in order to improve the quality of these systems.

In this paper we will deal first with differents models of representing emotions, because they are seen either as a limited number of well defined situations (angry, happy, ...), or as continuous values (see the valence-arousal model in part 2.2); then we will present various examples of use situations.

2 Different models of emotions

2.1 Labels of emotions

"Oatley and Johnson-Laird cite four basic emotions derived from evolutionary origins: happiness, sadness, fear and anger", [Davis & Lewis, 2003]; another version of this theory, called OCC, is refered in the same paper as using twenty-two emotions types.

This simple system is already well spread: BDI (beliefs-desires-intentions) implementations are numerous and work well, although with limited range. Most of the time, behaviors are fixed according to a current state, and new information will radicaly change these state and behavior.

2.2 Valence-arousal model

According to [Kirke & Miranda, 2013], we can decompose any emotion in two factors: valence (from "negative" to "positive") and arousal (intensity). Figure 1 represents some emotions positions. This concept allows to give numerical coordinates to emotions, and apply some basic computation. The agent has an emotive position, and according to the emotive value he receives, he will move in a direction.

This model requires to give valence and arousal values to any element or event in the world's agent, in order for him to "feel". However, it's much more open than fixed labels. We give an example of use in part 3.2.

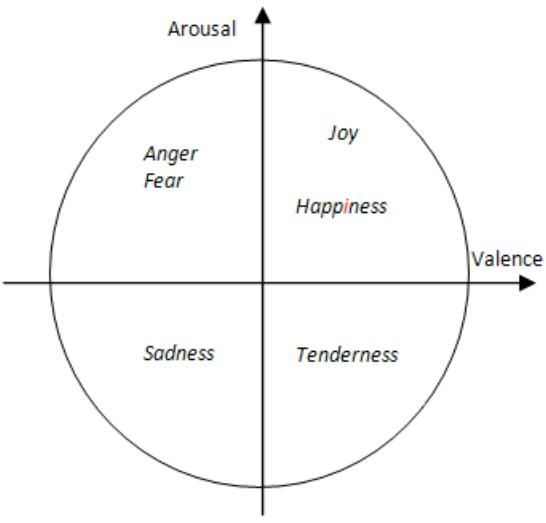

Figure 1: A valence-arousal representation

2.3 Appraisal theory

An other way to model emotions is called "appraisal theory" [Gratch & Marsella, 2005]. It consists of evaluating the impact of an event on the agent's current state of emotion, according to what has been lived before. This point of view can be explained by the differences of human reactions at same events: sometimes we may be extremely happy to see the sunshine, and another day, another mood, we would not feel anything about it. This idea has been first develop by Lazarus and expanded through various publications, amongst them [Lazarus, 1982].

In Figure 2, we have a computational view of appraisal theory. Environment produces signals whose perception is influenced by emotions; then these signals are interpreted through the process of appraisal and coping. This allows a huge flexibility as of what can be done with this emotive model. Of course, it would require more work to use it in comparison with simpler models.

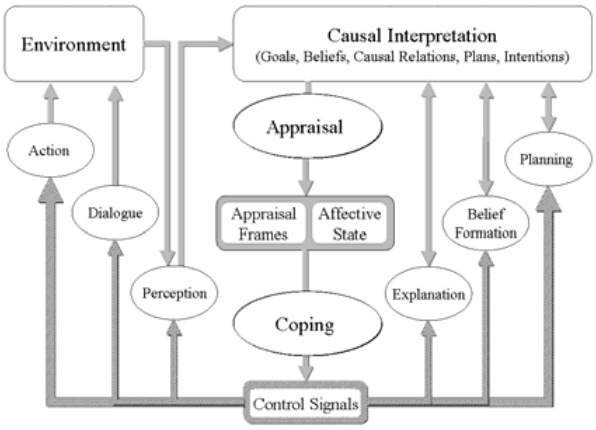

Figure 2: A computational view, Smith and Lazarus

2.4 Emotion Markup Language

As of 2006, the W3C began to work on an emotion standard language, called Emotion Markup Language. To sum it up, it allows to associate labels ("angry") with values (valence, arousal, but also intensity, ...). Current version was proposed on april, 2013.

3 Various goals and applications

3.1 Improved interaction with users

Although not dealing directly with any emotion language, Pawel Dybala and his team were working on a "humoroid", that is to say, a conversational agent like Alice, trying to induce positive emotions through humor [Dybala *et al.*, 2009]. The aim is to get people feel good while chatting with the bot.

Basically, the idea is that people will not get back chatting with a cold machine; but if they experience good feelings, like humor, they will associate the agent with a positive idea, and more probably come back.

3.2 Generation of poems

After his PhD thesis where he dealt with emotions and music creation, Alexis Kirke, associated with Eduardo Miranda, has published an article where a Multi-Agent System generates poems [Kirke & Miranda, 2013]. A words-database which associates a valence-arousal value to each word is used, and a group of agents exchanges emotions, adding new words to their in-creation poems.

Of course, this kind of poem is relatively meaningless (though a comparison can be done with some modern authors). It seems more to be a good way to evaluate the way agents can communicate their emotions and influence each other.

3.3 Increasing autonomy and reasoning of agents

Recent research linking IT and psychology suggested that emotions would be a basis for autonomy: "emotions constitute a very powerful motivational system that influences perception and cognition" [Davis & Lewis, 2003]. According to the emotion state, the agent could change its perception and its objectives, take decisions, ...

In this paper is introduced a string concept: dealing with emotions "will occur not only at the deliberative belief and goal management levels but over all layers of the architecture" [ibidem]. An architecture is proposed, on four layers including reactive and deliberative layers, and also a computer model of emotions, CRIBB (Children's Reasoning about Intentions, Beliefs and Behavior), even though it seems close to an improved BDI system.

3.4 Application in e-learning

A student doesn't learn efficiently if he's angry or in stress; on the other hand it seems possible to infere a comprehension problem from facial expression. Thus has been developed the idea to "watch" people participating in e-learning sessions, use an agent to infere his emotion state, and if incomprehension or stress is detected, propose a tutor to help specifically this student.

This system, called EMASPEL (Emotional Multi-Agents System for Peer to peer E-Learning), is proposed in [Ammar *et al.*, 2005]. It includes visual measurement of facial distances (as an example, variations on the mouth's size), classification of the emotion, takes into account the "curriculum" of the student, and should improve efficiency in e-learning process.

4 Conclusion

Recent works in psychology put in evidence the strong interaction between emotions and human reasoning, as of the influence upon perception and deliberation. Even if emotions have been considered during a long time as obstacles to the mind, it seems that it should be included more frequently in agents architecture.

On the first hand, it may allow to improve well-known BDI model, resulting in better reactions to environment and adaptative objective priorities. Even if the agent doesn't really feel emotions, it can percept and react "as-if", or even better, deal with it without getting its mind obscured or obsessed like humans may.

On the second hand, it can be used to model human user's emotions and help improve his experience, adapting to his state of mind. Of course we should keep in mind some privacy concerns: do we want mind-reading agents?

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