What if agents become more human?

Bexy Alfonso[1]

Doctorado en Informática

Directors: Emilio Vivancos[2] and Vicente Botti[3]

{[1]balfonso, [2]vivancos, [3]vbotti}@dsic.upv.es

UNIVERSITAT POLITÈCNICA DE VALÈNCIA

DSIC GTI IA

Abstract

Current domains demand more realistic behaviors of agents' simulations which extends to several and diverse applications fields. G3A: a General Affective Agent Architecture, extends a traditional BDI agent architecture by improving a practical reasoning with more "human" characteristics.

Introduction

Several approaches have addressed the issue of modeling an agent that can not only "think" but also "feel". This feature allows to take decisions more aligned with human behavior. Neuroscience methods have found significant evidence that emotions are associated to regions in the brain in charge of controlling the related functions. Psychological and cognitive sciences have also made important contributions to subsequent research on *emotional computing*.

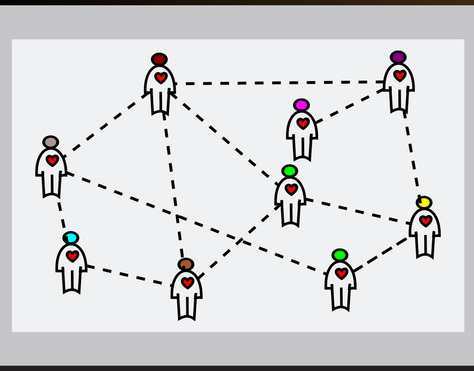
Hypothesis: A multi-agent simulation with affective agents will allow to better reflect real situations of human interactions.

Goal: Create an agent architecture with emotional components for an agent with a practical reasoning. Perform multi-agents simulations of real situations and compare their results with real ones.

Background

Among psychological theories, the cognitive perspective has special relevance for affective computing due to its suitability to be used in computational applications[1]. Moreover, in the neurological field, important works have laid the foundations for future applications in artificial intelligence and human-computer interaction areas [2]. Interdisciplinary works have allowed that several approaches can embody agents or virtual characters with affective traits and expressive functions. The OCC model of emotions is one of the most significant [3].

Motivation



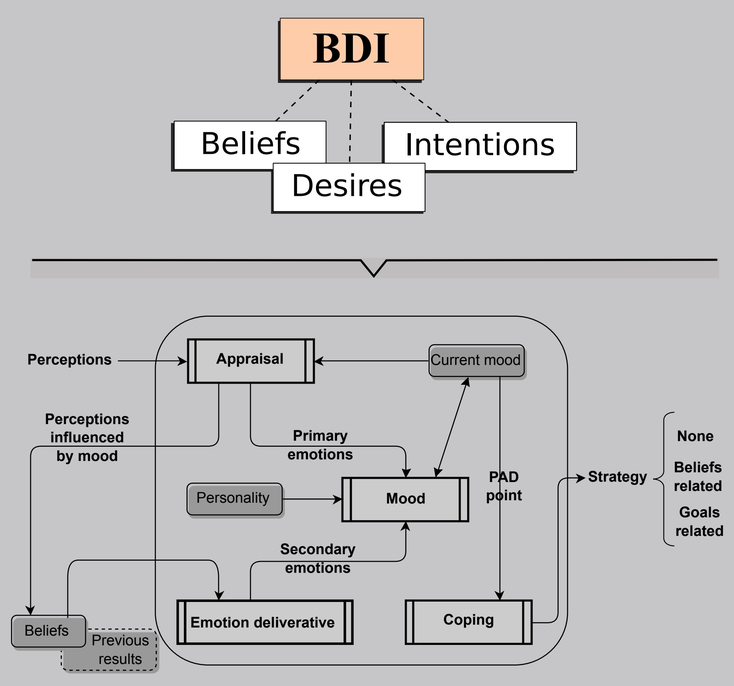
Sometimes we find ourselves wondering why something got out of control when everything was previously well calculated. Some situations are highly determined by our decisions in our condition of human. Panic can emerge in a disaster situation in the moment of evacuating a building; or maybe we are victims of fear when participating in a monetary transaction. Simulating human behavior and interactions in such environments becomes then an interesting challenge.

Proposal: G3A

Emotions: Reactions as a consequence of agents, other actions and/or objects [3]

Personality: A set of individual characteristics which generally influence motivations and behaviors of the agent [1]

Mood: Not necessarily associated with a cause, lasts longer and has lesser intensity than emotions.



1: $B \leftarrow B_0$; /*B_0 are initial beliefs*/
2: $I \leftarrow I_0$; /*I_0 are initial intentions*/
3: $M \leftarrow M_0 = initialize\_mood(P)$; /*$P$ is the agent personality*/
4: **while** (true) **do**
5: get next percept ρ via sensors;
6: $B \leftarrow get\_new\_beliefs(B, \rho, M)$;
7: $PEm \leftarrow get\_primary\_Em(B, \rho, M)$;
8: $SEm \leftarrow get\_secondary\_Em(B, \rho, M)$;
9: $M \leftarrow update\_M(PEm, SEm, M, P)$;
10: $D \leftarrow get\_options(B, I)$;
11: $I \leftarrow filter(B, D, I, M)$;
12: $\pi \leftarrow plan(B, I, Ac, M)$; /*$Ac$: set of actions*/
13: **while not** ($empty(\pi)$ **or** $succeeded(I, B)$ **or** $impossible(I, B)$) **do**
14: $\alpha \leftarrow$ first element of π;
15: $execute(\alpha)$;
16: $\pi \leftarrow$ tail of π;
17: observe environment to get next percept ρ and EM_ρ
18: $B \leftarrow get\_new\_beliefs(B, \rho, Em_\rho, M)$;
19: $PEm \leftarrow get\_primary\_Em(Em_\rho, M)$;
20: $SEm \leftarrow get\_secondary\_Em(B, Em_\rho, M)$;
21: $M \leftarrow update\_M(PEm, SEm, M, P)$;
22: **if** ($reconsider(I, B)$) **then**
23: $D \leftarrow get\_options(B, I)$;
24: $I \leftarrow filter(B, D, I, M)$;
25: **end if**
26: **if not** ($sound(\pi, I, B)$) **then**
27: $\pi \leftarrow plan(B, I, Ac, M)$;
28: **end if**
29: $SuccRate_\pi \leftarrow upd\_succ\_rate(SuccRate_\pi, \pi)$;
30: **end while**
31: **end while**

Architecture components: Four main components control the agents' emotional issues. **Appraisal:** obtains *Primary emotions* and *Perceptions influenced by the mood* which become the agent's *Beliefs*. **Emotion deliberative:** derives *Secondary emotions* as the result of a more complex reasoning. **Mood:** feeds on the agent's *Personality* to establish the agent's initial mood and to update the *Current Mood*. **Coping:** decides if the changes in the *current mood* deserve to take actions in the cognitive processes of the agent and which would be these actions. Mood can be represented in a three dimensional space where dimensions are *Pleassure*, *Arousal* and *Dominance*.

Test cases design

Individual tests	Group tests
ECONOMIC EXPERIMENTS	
Ex: Influence of loss aversion on economic decision making.	Ex: Influence of emotions on a prisoner dilemma situation.
JOB MARKET	
Ex: Influence of emotional state on the decision of opening a new business.	Ex: Simulation with participants roles and analysis of tendencies

Expected results

- G3A architecture for agents, which offers a general structure that combines the main characteristics of humans in a set of components that interact in order to influence the agent cognitive processes.
- A what-if tool that allows to make forecasts based on tangible facts but also on the human way of behave on certain domain.
- A base for further lines of research, for them to improve G3A with new elements like the one that are derived from interactions and also with new elements from other domains.
- A tool for comparing traditional ways to address prediction of results on groups of people interacting with a new approach.

Conclussions

G3A offers a general agents structure, with an open components implementation in order for it to be applied in any domain. Its integration on a typical BDI process allows to combine practical rational elements with more "human" features what results in believable behaviors for the agents.

References

[1] R. M. Ryckman: *Theories of Personality*, ser. PSY 235 Theories of Personality Series. Thomson/Wadsworth (2007)

[2] A. R. Damásio: *Descartes' error: emotion, reason, and the human brain.* Quill (1994)

[3] A. Ortony, G. L. Clore, and A. Collins: *The Cognitive Structure of Emotions.* Cambridge University Press (1988)

Acknowledgements

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