EFAA - A Companion Emerges From Integrating a Layered Cognitive Architecture

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ABSTRACT

In this video, we present the human robot interaction generated by applying the DAC cognitive architecture [1] on the iCub robot. We demonstrate how the robot reacts and adapts to its environment within the context a continuous interactive scenario including different games. We emphasize as well that the artificial agent is maintaining a self-model in terms of emotions and drives and how those are expressed in order affect the social interaction.

Categories and Subject Descriptors

I.2.9 [**Commercial robots and applications**]: Layered Cognitive Architecture for Distributed and Adaptive Control of a social robot.

General Terms

Experimentation, Human Factors, Theory

Keywords

robot companion; social interaction; synthetic emotions; allostatic control

1. INTRODUCTION

As robots skills are increasing and their cost are decreasing, soon offices and homes environments will soon include robotic agents. Whatever is their role in a social community, they will have to behave in a human like manner in order to be accepted. On one hand, they will have to integrate in their decisional model the human's actions and intentions. On the other hand, to be considered as autonomous agents, they should maintain and demonstrate their own internal state and goals which serves as a motivational engine for action. Such a level of interaction requires a solid cognitive architecture that closes the perception / action loop at various different scales ranging from the motor reflex level to the cooperation with human on a shared plan [2]. DAC [1] is such architecture: it handles different levels of representation and control through a layered structure. We implemented a generic sensor abstraction mechanism that allows the architecture to encompass any number of sensors, while using the humanoid robot iCub as the main actor [4]. Our setup also includes an interactive table that allows easy implementation of multiplayer games involving physical manipulation of objects in a shared space. Humans, objects and more broadly sensory representations are maintained within the robot's world state, which allows him to react to perceptual events (a human enters the room, a tactile contact, a collision between objects, etc.). At a higher level, the architecture is also computing more semantic events (e.g. winning or losing at a game). All events are carrying an intrinsic emotional value that has an effect on the internal model of the robot in term of emotions (e.g. a caress is triggering positive emotions while pinching will arise negative ones) and utility (effects on the robot drives). While the internal model is regulated by the external world, it is also guiding the actions of the robot through the mechanism of allostatic control [3]. The most systematic way of sharing the robot inner state is through facial expressions and speech: they increase a lot its life likeliness and influence the attitude of humans towards him. In term of stability, we can assess that the architecture reached a mature stage as it is running on a daily basis, making the robot to interact with naïve people in a fluent way. All the code is open source and available at http://sourceforge.net/projects/efaa/

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3. REFERENCES

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