A Tool to Simulate Affective Dialogs with an ECA

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Abstract

We describe a testbed for simulating affective dialogs with an Embodied Conversational Agent (ECA). We show how the dialog is influenced by the social context and the agent's emotional state and how this state is, in its turn, dynamically influenced by the dialog.

1 Introduction

Psychologists agree in claiming that cognition influences emotions and vice versa. According to some authors, activation of emotions in artificial agents is due to variation in their beliefs and high-level goals. On the other hand, affective states produce changes in active beliefs, in goal activation and priority and in the reasoning skills; they consequently influence learning, decision making and memory (Castelfranchi (2000), Forgas (2000), Picard (1997)). Simulating dialogues in domains in which affect plays a relevant role requires modeling these dynamic phenomena and building agents that are able to show a reactive behavior during the dialogue, as far the situation evolves. To this aim, models of emotion activation have to be built (Ortony et al. (1998)) and connected to the reactive component of the dialog planner. Emotions must drive reasoning behind the dialog and regulate it. If the dialogue occurs between the user and an Embodied Conversational Agent (ECA), the influence of emotional factors must also be visible in its 'body': this requires implementing the agent's ability to express emotions through face, gesture and speech (Cassell et al, 2000). Simulating affective dialogs therefore requires investigating which emotions the agent may feel during the dialog, as a consequence of exogenous factors (the user moves) or endogenous factors (the agent's own reasoning). It also requires studying how every emotion influences the dialog course: in particular, priority of communicative goals and dialog plans (de Rosis et al, 2003).

A testbed may enable designers to evaluate the role of the main variables involved in this simulation and to assess how they influence the dialog course. Examples of these variables are the social context in which the dialog occurs, the role played by the ECA, its personality, its relationship with the user and the environment in which interaction takes place. In this demo, we will show the testbed that we developed in the scope of Magicster. The system is driven by a Graphical Interface, which interacts with the user and coordinates activation of various modules and exchange of information among them:

- *Mind* initially receives information about the setting conditions and selects "personality", "context" and "domain" files accordingly. It subsequently receives an interpreted user move and sends back a list of "emotion intensities" that this move activates in the agent;
- *Dialog Manager* receives initial information about the dialog conditions. At every user turn, it receives an interpreted user move with a description of changes produced in the agent's affective state. It sends back an agent move, which is displayed in natural language. This move is annotated with an 'Affective MarkUp Language" (De Carolis et al, in press) and is stored as an XML file;
- *Body* reads this file and generates the ECA, which is displayed in the Interface. Due to the mind-body independence of our tool, several Embodied Agents may be employed to express the agent move. So far, we integrated a 3D-realistic character in a DLL of the Interface (face animation by (Pelachaud et al, 1996) and speech by (Festival, website)) and we developed a wrapper for MS-Agents (website).

Designers may employ this tool to simulate dialogs in various conditions. At the beginning of interaction, they set the simulation conditions: agent's personality, its relationship with the user, its 'body' and the application domain. They then input the user moves in natural language. The interface enables following the dialog in natural language and with the selected Embodied Agent by showing (in graphical form) how the agent's emotional situation evolves during the dialog.

The dialog is goal-driven: every goal, with a given priority, is linked by an application condition to a plan that the agent can perform to achieve it. Some goals are initially 'inactive': they may be activated if an emotional situation occurs or if the user needs to be persuaded to follow some suggestion In the first case, goals are activated with a priority which depends on the emotion felt. For example, if something undesirable occurs to the user and the agent is in an 'empathic' relation with her, it will feel *sorry-for* and will activate the goals enabling to show this emotion in verbal and nonverbal forms. These goals will take the priority over the current goals. If, on the contrary, the user rejects some suggestion, the high-priority goal becomes to persuade her to accept it: this requires activating the ability to provide burdens of proof and dialectical arguments (Carofiglio et al (in press)).

We employed our testbed to adjust the system components after evaluating their behavior in various situations. We tested the role of context and personality in the activation of multiple emotions, upgraded the dialog strategy and the plan library, revised interpretation of the user moves and improved rendering of the agent moves. The Interface was implemented with the Visual C++, while the sockets insuring the communication among the different processes are built-in classes of the Interface code. The dialog manager is implemented with TRINDIKIT (website); emotion activation and argumentation strategies are modeled with belief networks and are implemented with HUGIN APIs (website).

After refining the individual modules with the aid of our testbed, we plan to implement the final prototype within a mobile technology framework. The agent will be displayed on a high-resolution screen; the server side will process the agent's mind and body and the dialog manager by communicating, via socket, with a mobile device (a PDA). The main tasks of the PDA will be to handle the user input and to update a user model which will include affective aspects. We will assess advantages and disadvantages of developing a speech or graphical interaction through the PDA.

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