Gamble v2.0 — Social interactions with multiple users

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ABSTRACT

Gamble[1] is a test-bed for affective multiparty interactions which allows us to investigate social behavior of an agent towards users and vice versa. The CASA paradigm [9] claims that agents are regarded and treated as social actors. Whereas in 1:1 interactions it was shown that people tend to consider their "traffic-rules" of social interaction, we know little about scenarios in which more than one user is interacting with the same agent at the same time.

1. SYSTEM DETAILS

The setting is a small turn-based game of dice where at least one of the player's is substituted by an embodied conversational agent (ECA), the Greta[2] Agent ([1]). The game can only be won by deceiving the other players and by detecting such attempts from the other players. Imagine it is player one's turn. He casts the dice, examines his cast without letting the other players know the result and announces a result. Player two may now believe him and cast the dice herself. In this case she will have to announce a higher result. If player two decides not to believe player one, the actual result is revealed. If the actual result is identical to the announced one, player two has lost this round, otherwise player one.

This demonstration is characterized by a sophisticated combination of multimodal input and output devices that allow for an engaging and immersive interaction with other human and virtual characters. Figure 1 gives an overview of the architecture and the spatial setting of the system. In the current version, the players use a cup of dice with a USB-web cam mounted on top of it (Fig. 1a). Thus, the game server which keeps book of the game progress, knows the actual result of the cast. The players announcements

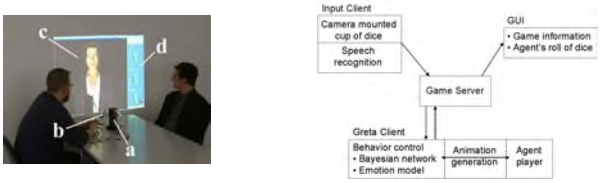

Figure 1: Gamble: setting and architecture.

of their results are captured by a microphone between them and analyzed by the speaker independent Esmeralda speech recognition system (Fig. 1b; [5]). So far, the possible results and some yes/no variants are recognized. The agent's behavior is controlled by a Bayesian network that is augmented with a two dimensional emotion model ([6]), capturing the aspects of valence and arousal. The players are sitting left and right of the Greta agent which is projected to the wall at the end of the table (Fig. 1c). Thus, the agent can be said to be sitting with the players around the table. On the left side of the agent (Fig. 1d) a GUI with some game relevant information is displayed. In case of the agent's turn, a short movie of casting dices is shown.

2. RESEARCH INTERESTS AND RELATED WORK

Gamble allows us to study the following aspects of human-agent interactions:

1. Influencing the user's affective state: Prendinger et al. [8] have shown how the display of emotional cues in an agent influences the user's appraisal of a situation. In Gamble, highly emotional situations are created, e.g. when the agent blames the user for deceit or when the user detects such an attempt and the agent has to react to it. This enables us to investigate how subtle emotional signals employed by an ECA are perceived by the human user. In particular, we want to study how emotions need to be conveyed in order to increase the user's trust in an agent. Measuring the user's affective states by means of physiological sensors, we will investigate how different expressive behaviors of the agent exert an influence on these states.
2. Multiparty interactions: According to Reeves and Nass [9] users tend to regard their social rules even in interacting with computers. And indeed, a number of studies of face to face interaction between an user and an ECA have confirmed that this tendency exists (e.g.,

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[7], [2]). Less is known about the effects that arise if multiple users interact with a single agent. In Gamble, the user's attention is divided between another human player and the agent. Thus, engaging the user in the interaction with the agent becomes less predictable. Sidner et al. [11] describe gaze as one crucial engagement behavior an agent should exhibit. A first user study was conducted to inform the design of a model of gaze behavior in such a multiparty scenario because apart from a study by Vertegaal et al. [12] no information is available on multiparty gaze behaviors.

3. User reactions to deceiving ECAs: De Rosis et al. [3] describe a model of deception for agents that focuses on the cognitive mechanisms for deliberately choosing to deceive others. In the game of dice realized in Gamble it is inevitable to deceive the other players from time to time and to detect such attempts by the other players. Gamble now allows us to investigate in a principled way if and how users react to behavioral clues of deceit, if they are exhibited by an agent. Following Ekman's [4] description of facial clues to deceit, the agent in Gamble is able to show some of these clues like asymmetry or masking smiles. A thorough discussion of the results obtained by a first user study can be found in ([10]).

3. FUTURE WORK

The video recordings of the first user study revealed that the agent was accepted as a competent game partner. But off topic talk by the users naturally excluded the agent from the interaction. Although the game is round-based and thus allows for a thorough control of turns, all kind's of social behavior could be seen, from testing the agent's domain competence over commenting on the agent's and/or the other player's moves up to a collaboration of players against the agent. Being able to spot off topic talk might allow the agent to draw the attention back to the game. At them moment we are experimenting with the recognition of phrases like "she has", "she tried to" which are used to comment on the agent's performance and behaviors.

An analysis of users gaze behavior during the interaction revealed some similarities with Vertegaal et al.'s study of human multiparty gaze behaviors but also some peculiarities that seem to be due to the fact that one of the interaction partners is not a human player. This analysis informs our modeling of the agent's gaze behavior which will allow the agent to actively engage in the interaction with the users.

Although the agent's decisions are influenced by an emotional model and a simple model of the agent's personality, the user's affective state is disregarded at the moment by the agent. Following Ball's approach to employ copies of the same Bayesian network for diagnostic as well as generative ends, it is planned to integrate an assessment of the user's emotional state into the system based on the emotion model used to generate the agent's expressive emotional behavior.

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