Björn: An Interrogation Simulator

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Abstract. This work presents a conversational agent (CA) that functions as a prototype for simulating interrogations. The solution implements a cognitive model that focuses on the interpersonal relationships between the CA and the user. This model can adjust the interpersonal stance of the CA based on the sentiment and phrasing of the user's utterances. As a result, the CA updates the friendliness and truthfulness of its responses accordingly.

Keywords. embodied conversational agent, response model, interpersonal stance, interrogation, robot, sentiment, personality

1. Introduction

To get a confession it is often crucial to adopt an appropriate stance towards a suspect [1]. Based on a cognitive model [2] that focuses on the interpersonal relationships between the CA and the user, this work intends to create a prototype for an embodied interrogative interaction. The prototype is extensible and provides the basis to simulate interrogations which eventually may be used for training purposes.

2. Methodology & Demo

Furhat[1], a social robot, was used as the CA in this study (Figure 2). To model the interpersonal stance towards the user, a cognitive model proposed by Bruijnes et al. [2] was used which mainly consists of four components, shown in Figure 1. First, the interpersonal state component represents how the CA feels towards the user. During this study, the scope of the interpersonal state was simplified to only describe the CA's friendliness and truthfulness. We implemented the interpersonal state in such a way that additional stances (i.e. rapport, internal pressure) can be added with ease. Second, the question frame component allows the CA to understand the most relevant information from the user's utterances. For this study, the question frame contained both the sentiment and phrasing characteristics of the user's utterances. We based the phrasing characteristics on findings within the fields of linguistics and forensic psychology [3,4,5] mainly focusing on question phrasing within police interviews. The third component is the personality component. The personality in this context describes how sensitive the CA is to the variables within the question frame. Lastly, the response frame describes how the CA will

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[1]The Furhat, a social robot with the appearance of a bust sculpture, is developed by Furhat Robotics: https://furhatrobotics.com/

respond to the user. Whenever the interpersonal state is updated, the CA formulates a new response based on the values within the state. More specifically, the exact response utterance and non-verbal behaviour differs based on the interpersonal state.
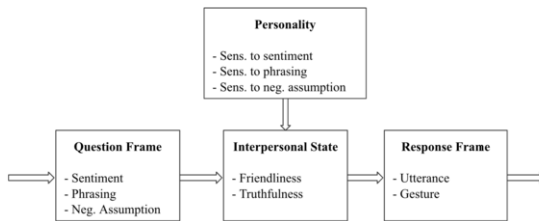

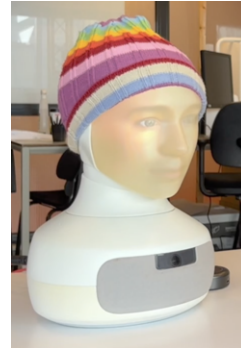**Figure 1.** Simplified version of the cognitive model

Figure 2. Björn during the interrogation

During the experiment, users are introduced to a scenario describing an incident with a soccer ball and Björn, a sporty young teenager (Figure 2). The goal of the interaction is to obtain a confession from Björn to have his parents cover part of the reparation expenses. Participants go through the same talk with the robot twice, freely asking questions related to predefined topics, such as how the agent is feeling or if it knows what happened. During the first conversation, participants are instructed to act as mean as possible to showcase that Björn's interpersonal state changes – this will most likely not result in a confession. Before the second attempt, however, participants get additional information about Björn's sensitivities. By using the newly acquired information, they should change their behaviour to successfully get a confession.

3. Results & Conclusion

The demo[2] has been tested with N=8 participants. Thanks to the evaluation form, based on O'Brian et al. user engagement scale [6], users reported noticing differences between interactions. Confirming users' impressions, the success rate has greatly increased when participants were informed on how the model works. By observing Björn's personal state, truthfulness was the dimension contributing the most to the scenario completion, showing that, in the model, friendliness is generally harder to increase.

The following items can be considered as future improvements. Firstly, the addition of both dialogue options and interpersonal state dimensions will contribute in making the conversation feel more natural. A possible approach could be implementing emotional dimension following emotion theories such as Plutchik's wheel model [7]. Secondly, to allow Björn to better understand the user, the question frame could be extended with i.e. the analysis of prosodic features and facial recognition. Lastly, inspired by Qu et al. [8], tracking the conversation context by making the agent remember pieces of information from previous utterances may improve the dialogue flow.

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[2]Showcase video: https://youtu.be/IdsSIWzdn54

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