A novel model for believable emotions in human-robot interaction

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I. INTRODUCTION

Several findings in research of social interaction indicate the importance of expressing and understanding emotions [3]. So every interaction between humans is emotionally colored [2]. A study conducted by Eyssel and Colleagues [1] exemplifies the relevance of emotions in human-robot interaction. They found that people sympathize more strongly with a robot if it communicates emotions.

Another important point is the response given by the emotional display. So people form expectations about the behavior. They wait for reactions which they often express themselves in their real-life interactions [5]. In other words: There are many emotion expressions in human-human interaction (HHI), and therefore people presume the same for human-robot interaction (HRI).

With regard to the account of alignment, postulated by Pickering & Garrod [4], there are communicative mechanisms, which lead to an adaptation between the interlocutors.

Concerning emotions, we understand a communication as emotionally aligned if both interaction partners show adequate reactions to expressed emotions. This can be a simple mirroring or copying of the emotion expression, an emotional reaction based on emotional contagion or an empathic reaction.

Developing a computational model of emotional alignment requires building a system which is able to produce the similar phenomena and behavior that can be observed in human-human interaction. On a interpersonal level such phenomena might be emotional mimicking or empathy, on an intrapersonal level the system has to anticipate in which manner the currently computed emotion will influence the actual interaction.

II. COMPUTATIONAL MODEL

In the proposed model (Fig.1) the processing of the emotional feedback may occur on several layers of complexity. On the one hand the choice of the level depends on the level of understanding, i.e. in case of non-understanding only the level of automatically emotional alignment can be reached. On the one hand the necessity is a crucial factor in selecting the level of processing.

On the lowest level (automatic) the copy process maps the received features into motor-commands or prosodic features of the emotional display.

The middle level (schematic) uses the features previously extracted by the underlying level to compute a hypothesis with respect to the observed expression. So a motor program produces an emotionally aligned output on all relevant channels.

On the third level (conceptual), the situational context as well as the internal emotional state of the robot is taken into account. So the process of adaption is influenced by the current emotional state of the robot.

III. CONCLUSIONS

With this computational model of emotional alignment an approach is presented which includes communicative adaptation processes and can be observed in human-human interaction. It will also be able to form expectations in which manner the currently computed emotion will influence the actual interaction.

REFERENCES


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*This research is partially supported by the German Research Foundation (DFG) in the Collaborative Research Center 673 “Alignment in Communication”.

Fig. 1. The proposed computational model for emotional alignment.