WoZ Pilot Experiment for Empathic Robotic Tutors: Opportunities and Challenges

Amol Deshmukh, Srinivasan Janarthanam, Helen Hastie, Shweta Bhargava, and Ruth Aylett

School of Mathematical and Computer Sciences
Heriot-Watt University, Edinburgh UK
a.deshmukh@hw.ac.uk

Abstract. We discuss the challenges and opportunities in building empathic robotic tutors based on a preliminary Wizard-of-Oz (WoZ) pilot study. From the data collected in this study, we identify situations where empathy in a robotic tutor could have helped the conversation between the learner and the tutor. The video presented with this paper captures these situations where two children participants are interacting with a map application and a robot tutor operated by a wizard.

1 Introduction

Wizard-of-Oz frameworks have been used in several studies [1] in order to collect human-computer dialogue data to help design dialogue systems. WoZ systems have been used to collect data to learn [2] and evaluate dialogue management policies [3]. The main objective of this pilot WoZ experiment was to collect multimodal data namely video, audio, user-wizard interaction to help understand the requirements for building an artificial embodied intelligent tutoring system to engage in *empathic* interactions.

The WoZ setup described in [4] comprised of the wizard interface, interactive touch table with map application, cameras and the robot. The participants aged 8-10 had to solve a treasure hunt map-reading activity and follow the tutor's instructions in a step-by-step manner. In this paper[1], we give a preliminary qualitative analysis of the pilot data gathered to inform requirements for an empathic tutor.

2 Opportunities and Challenges

There are clear challenges involved in such a WoZ data gathering experiment. In this section, we describe these challenges and discuss lessons learned and requirements going forward. Firstly, when the map application faltered (i.e. zoomed in,

[1] This work was partially supported by the European Commission (EC) and was funded by the EU FP7 ICT-317923 project EMOTE. The authors are solely responsible for the content of this paper and video

became non-responsive, etc), users looked frustrated. They seemed helpless and did not know how to proceed until there was some other form of intervention to reset the application.

Secondly, on occasion there were circumstances when a human tutor could have easily pointed out where some of the map features are (e.g. when finding the train station, etc) or directions when users are confused. However, it is challenging for a robot to do so using its arms. This presents us with an opportunity to utilise multi-modal outputs through the application running on the touch-table, for example pointing out map features by overlaying shapes such as circles, bounding boxes and arrows on top of the map.

Thirdly, response times of the robot (i.e. wizard) were perceived as too long as evidenced by the children's "blank" expressions after giving an answer and waiting for a response. It is important to intervene quickly when the user is about to make poor choices (such as walking in the wrong direction or looking in a totally different zone for answers). This presents us with the challenge of effective turn management wherein the tutoring system needs to decide how to stall during diagnosis (for examples using backchannels or encouragement), which dialogue move to select and when to intervene by continuously monitoring the state of the map application.

3 Conclusion and Future work

The scenarios described above present the tutor with opportunities to be empathic and help the learner to handle difficult situations while staying inside the zone of proximal development. It has been shown through this initial study, evidenced in the video, that key to this empathic behaviour is responsiveness and expressivity of the robot tutor.

Future work includes a full WoZ experiment whereby the data will be used to understand how human tutors, through a robotic interface, adapt to learners' emotions and cognitive states in tutorial tasks. The intention is then to use these data to learn appropriate pedagogical moves and dialogues strategies for an autonomous empathic agent.

References

1. Fraser, N.M., Gilbert, G.: Simulating speech systems. Computer Speech and Language **5**(1) (1991) 81 – 99
2. Strauss, P.M., Hoffmann, H., Scherer, S.: Evaluation and user acceptance of a dialogue system using Wizard-of-Oz recordings. In: 3rd IET International Conference on Intelligent Environments. (2007) 521–524
3. Cuayahuitl, H., Kruijff-Korbayova, I.: An Interactive Humanoid Robot Exhibiting Flexible Sub-Dialogues. In: Proceedings of The 2012 Conference of the NAACL-HTL: Demo Session. (June 2012)
4. Bhargava, S., Janarthanam, S., Hastie, H., Deshmukh, A., Aylett, R., Corrigan, L., Castellano, G.: Demonstration of the Emote Wizard of Oz Interface for Empathic Robotic Tutors. In: Proceedings of SIGdial. (2013)