Making Human-Robot Quiz Dialogue More Conversational by Adding Non-Quiz Talk

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Abstract

We present on-going work from the EU-funded project Aliz-E on long-term social human-robot interaction. Our conversational system implemented on the Nao robot engages a user in several activities chosen to support children hospitalized due to diabetes. Here we focus on Quiz, a knowledge-exchange activity about health-related concepts. We recently started to add non-activity talk to Quiz, with the aim to encourage the child to disclose its habits and experiences related to nutrition and diabetes. We will present initial observations about the structure of non-activity talk and the responses elicited from children in an experiment.

Children are keen users of new technologies and new technologies can provide interesting opportunities to enrich children's experience, e.g., for educational and therapeutic purposes (Tartaro and Cassell, 2006). As children are not small adults, it is necessary to research their specific needs and develop systems that address them. The project ALIZ-E develops cognitive robots for adaptive social interaction with young users over several sessions in real-world settings (Belpaeme. et al., 2013).[1] The conversational system developed in ALIZ-E using the Nao robot[2] engages a user in several different activities chosen with regard to the target application domain of the system, namely long-term interaction with children hospitalized due to metabolic disorders, in particular diabetes. More detail about the ALIZ-E system are available in (Kruijff-Korbayová et al., 2011; Kruijff-Korbayová et al., 2012). Here we concentrate on Quiz, a knowledge-exchange activity meant to support learning of health-related concepts.

Figure 1: *Left*: Nao in a measurement setup in a sound lab. *Right*: The Quiz activity during experiments in the San Raffaele hospital in Milan.

During the Quiz activity the child and the robot ask each other series of multiple-choice questions from various domains, including diabetes and healthy nutrition, as well as sport, geography and history. Besides activity-specific conversation, the interactions involve also a social component, such as greetings and introductions. During an activity the robot provides performance feedback to the user. The social aspect here requires careful handling of the evaluation process so as not to discourage the user with negative feedback. As the system is designed to have multiple encounters with a user, the robot's behavior differs in various aspects from the first session (meeting for the first time) to the subsequent sessions ("knowing" the user and their performance). To increase the feeling of familiarity between the robot and the child, the robot uses the child's name and it refers to experiences in previous sessions.

Due to its predominantly verbal character and naturally constrained interaction structure the Quiz activity is a good testbed for speech-processing technologies.

Recently we started to experiment with adding what we call *non-activity talk* to the Quiz interactions. We conceive of non-activity talk as being similar in character to *small talk*. However, small talk is typically considered to be "a conver-

[1] The EU-FP7 project ALIZ-E (ICT-248116): http://aliz-e.org/

[2] http://www.aldebaran-robotics.com/en

sation for it's own sake", "an informal type of discourse that does not cover any functional topics or any transactions that need to be addressed"[3], while our non-activity talk has specific topics and a defined purpose. Its purpose is to elicit talk from the child, in particular, to encourage it to disclose its habits and experiences related to nutrition and diabetes. If successful, non-activity talk could provide a therapeutically valuable instrument.

In collaboration with two psychologists at the San Raffaele hospital in Milan we defined the following topics for non-activity talk:

- Hobbies: typical day; activities in spare time
- Diabetes: checking glycemia; checking insulin; injections; hypoglycemia
- Nutrition: eating habits; food choices
- Friends: discussions about diabetes; handling diabetes when with friends
- Adults: behavior w.r.t. diabetes; advice

We then formulated system utterances eliciting talk about these topics (several utterances per topic). For the time being these utterances are implemented as canned text in the system. The system might for example say:

- Hobbies: *What do you like to do in your spare time?*
- Diabetes: *At home, do you check glycemia yourself?* or *If your glycemia is low, what do you do?*
- Nutrition: *How often do you eat fruits and vegetables?*
- Friends: *When you go out with your friends, do you bring with you glucometer and insulin?*
- Adults: *How do your parents behave with you with respect to diabetes?*

At relevant points during the Quiz, such as a question with semantically related content, the robot tries to engage the child in non-activity talk. It first says something to "escape" from the Quiz talk, e.g., *Now, I am curious about something.* Then it raises the respective topic as illustrated above. The utterances on a given topic can be chained in order to create a more complex extended sub-dialogue. The system resumes the Quiz activity by saying, e.g., *OK, now let's do another quiz question.*

We carried out a Wizard-of-Oz experiment with children at a Diabetes Summer Camp in Italy in August 2013, where we collected first insights about non-activity sub-dialogues in sessions with 14 different children. In the system used in the experiment the Wizard simulated the recognition and interpretation of the user's speech and the next system action w.r.t. the non-activity talk. The next system action in the Quiz activity was selected and verbalized automatically, while the Wizard had the possibility to override the automatic selection if needed. Spoken output was synthesized using Mary TTS (Schröder and Trouvain, 2003) with an italian voice developed in the project (Kruijff-Korbayová et al., 2012).

In the poster we will present the overall scenario and experiment setup and then focus on our initial observations about the structure of non-activity talk in the collected dialogues, the responses elicited from the children and how the non-activity talk influenced the dialogue flow.

[3] http://en.wikipedia.org/wiki/Small_talk

References

T. Belpaeme., P. Baxter, R. Read, Wood., H. Cuayáhuitl, B. Kiefer, S. Racioppa, Kruijff-Korbayová, G. I., Athanasopoulos, V. Enescu, R. Looije, M.A. Neerincx, Y. Demiris, R. Ros-Espinoza, A. Beck, L. Cañamero, A. Hiolle, M. Lewis, I. Baroni, M. Nalin, P. Cosi, G. Paci, F. Tesser, G. Sommavilla, , and R. Humbert. 2013. Multimodal child-robot interaction: Building social bonds. *Journal of Human-Robot Interaction*, 1(2):35 – 53.

I. Kruijff-Korbayová, G. Athanasopoulos, A. Beck, P. Cosi, H. Cuayáhuitl, T. Dekens, V. Enescu, A. Hiolle, B. Kiefer, H. Sahli, M. Schröder, G. Sommavilla, F. Tesser, and W. Verhelst. 2011. An event-based conversational system for the nao robot. In *IWSDS 2011*, Granada, Spain, Sep.

I. Kruijff-Korbayová, H. Cuayáhuitl, B. Kiefer, M. Schröder, P. Cosi, G. Paci, G. Sommavilla, F. Tesser, H. Sahli, G. Athanasopoulos, W. Wang, V. Enescu, and W. Verhelst. 2012. Spoken language processing in a conversational system for child-robot interaction. In *Workshop on Child-Computer Interaction*.

M. Schröder and J. Trouvain. 2003. The German text-to-speech synthesis system MARY: A tool for research, development and teaching. *International Journal of Speech Technology*, 6(4):365–377.

A. Tartaro and J. Cassell. 2006. Using virtual peer technology as an intervention for children with autism. In *Universal Usability: Designing Computer Interfaces for Diverse User Populations*, pages 231–262. New York, John Wiley & Sons, Ltd.