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MiRo: Social Interaction and Cognition in an Animal-like Companion Robot

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ABSTRACT
Future companion and assistive robots will interact directly with end-users in their own homes over extended periods of time. To be useful, and remain engaging over the long-term, these technologies need to pass a new threshold in social robotics—to be aware of people, their identities, emotions and intentions and to adapt their behavior to different individuals. Our long-term goal is to match the social cognition ability of companion animals who recognize people and their intentions without linguistic communication. The MiRo robot is a pet-sized mobile platform, with a brain-based control system and an emotionally-engaging appearance, which is being developed for research on companion robotics, and for applications in education, assistive living and robot-assisted therapy. This paper describes new MiRo capabilities for social cognition that support the adaptation of behavior towards people and other robots.

Keywords
Developer platform, companion robot, robot-assisted therapy, brain-based control, animal-like social cognition.

1. INTRODUCTION
The MiRo robot (Figure 1, left) is a fully programmable mobile developer platform for companion and social robotics and one of the few animal-like robot platforms that aims to be biomimetic in both aspects of its form and control. For example, MiRo is controlled by software modelled on the layered architecture of the mammalian brain [1] and generates animal-like sounds using a model of the mammalian vocal track parameterized to fit an animal of a similar size to the robot [2].

Over the past year, we have been developing improved social cognition and interaction for MiRo. This work has focused on perceptual filters for social perception, and on developing novel behaviors to improve engagement that will be demonstrated at HRI 2018. In particular, we have extended the range of stimuli to which the robot will respond to include human faces and other MiRo robots. The new behaviors we have added based on these stimuli make the MiRo robot much more reactive to the people and the other robots in its environment.

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2. RESULTS AND ONGOING WORK
Example output from the MiRo robot detector is shown in Figure 1 (right), these new perceptual filters are readily available to developers via a ROS interface.

Ongoing work is focused on the development of multi-modal person recognition and on tuning behavior to match the emotional state of known individuals. In this way, MiRo can become visibly accustomed to its owner over time. This development will be informed by current research at the University of Sheffield on robot learning and memory [3]. Work is already underway to extend face detection to include face and voice recognition. For example, MiRo will cluster faces over time such that it develops a familiar set of faces with which it can associate previous experiences and affect. Users will be able provide names for familiar faces via the MiRo app.

Figure 1. The MiRo Robot (left) and an example of successful robot detecting (right).

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3. REFERENCES
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