Lux – A Multimodal Receptionist Robot for University Open Days

Nicola Bellotto and Huosheng Hu
nbello@essex.ac.uk, hhu@essex.ac.uk

Introduction
Human-robot interaction is one of the most exciting research fields in contemporary science. Good communication skills are not the only ones necessary for a successful interactive robot, but also its capability to detect and approach possible communication partners in crowded environments, selecting them according to identity and level of interest.

In this work we illustrate our recent experience with Lux, a mobile service robot that acts as receptionist and entertainer during the university's open day. Lux makes use of legs and face recognition algorithms to simultaneously track and identify people in the surround. After having selected an interested interlocutor, the robot approaches and engages him/her in a multimodal interaction using voice, facial expressions and visual information.

Multisensor human detection and tracking
Lux is equipped with a color camera and a laser range finder which are used, respectively, for detecting faces and legs. Applying probabilistic techniques, the robot can therefore track the people in the environment, estimating their position, orientation, velocity and height.

Clothes, face and height recognition
Using the color histogram of the torso, Lux is able to recognize the clothes of a person from a few meters distance. When close enough to locate his eyes, the robot can also recognize the face. Clothes and face recognition are fused to the tracking information, including human height, with a bank of Bayesian filters. The latter estimates, simultaneously, position and identity of the observed subject. Lux can therefore decide who is the next person to approach for possible interaction.

Multimodal interaction
Lux has a synthesized voice and can generate facial expressions with his robotic head in order to show emotional states. The user can interact with the robot through numerous touch sensors, including a screen with an intuitive GUI that provides visual information.

Experimental results
Approach of a staff member. Lux recognizes him with a greeting of acknowledgement, but avoids the interaction and looks for visitors.

Human-robot interaction. For more than one hour, during the university open day, Lux approaches visitors and interacts with them using voice, facial expressions and the touch-screen.

Conclusion and future work
This work shows how the simultaneous integration of relatively weak information can produce a more robust estimation of people's position and identity, with a consequent improvement of the interaction skills with a mobile service robot.

In the future, we would like to provide Lux with learning capabilities in order to automatize the update of the human database and recognize new people.

References