

Cheah Jit Hong
School of Computing
University of Leeds

Dr. Matteo Leonetti
School of Computing
University of Leeds

Prof. Daniele Nardi
Department of Computer, Control, and Management Engineering
Sapienza University of Rome

Objective

My research seeks to progressively find better methods to utilise existing information to make decisions so that robots can autonomously carry out tasks such as navigation, motion, vision recognition and interaction. By improving our approach and strategies, we can develop A.I. that allow robots to complete more complex tasks as well as be more efficient.

Autonomous Service Robots

I applied my research on artificial intelligence to perform human recognition and interaction on TIAGo when participating in the international EU SciRoc challenges – taking the elevator.

I developed a human-robot interaction module that used vision to determine which people were taking the elevator with the robot. I also developed speech recognition and synthesis to communicate with other elevator takers and successfully acquire assistance to take the elevator. These modules were also used to detect and interact with someone showing interest in the robot. My system achieved the highest score in a single run at the competition.

RoboCup

I was able to apply my research in the worldwide international competition — RoboCup. RoboCup offers a publicly appealing but formidable challenge to promote development of Artificial Intelligence and Robotics. In RoboCup, the environment is dynamic and robots have to react and perform context recognition in real-time.

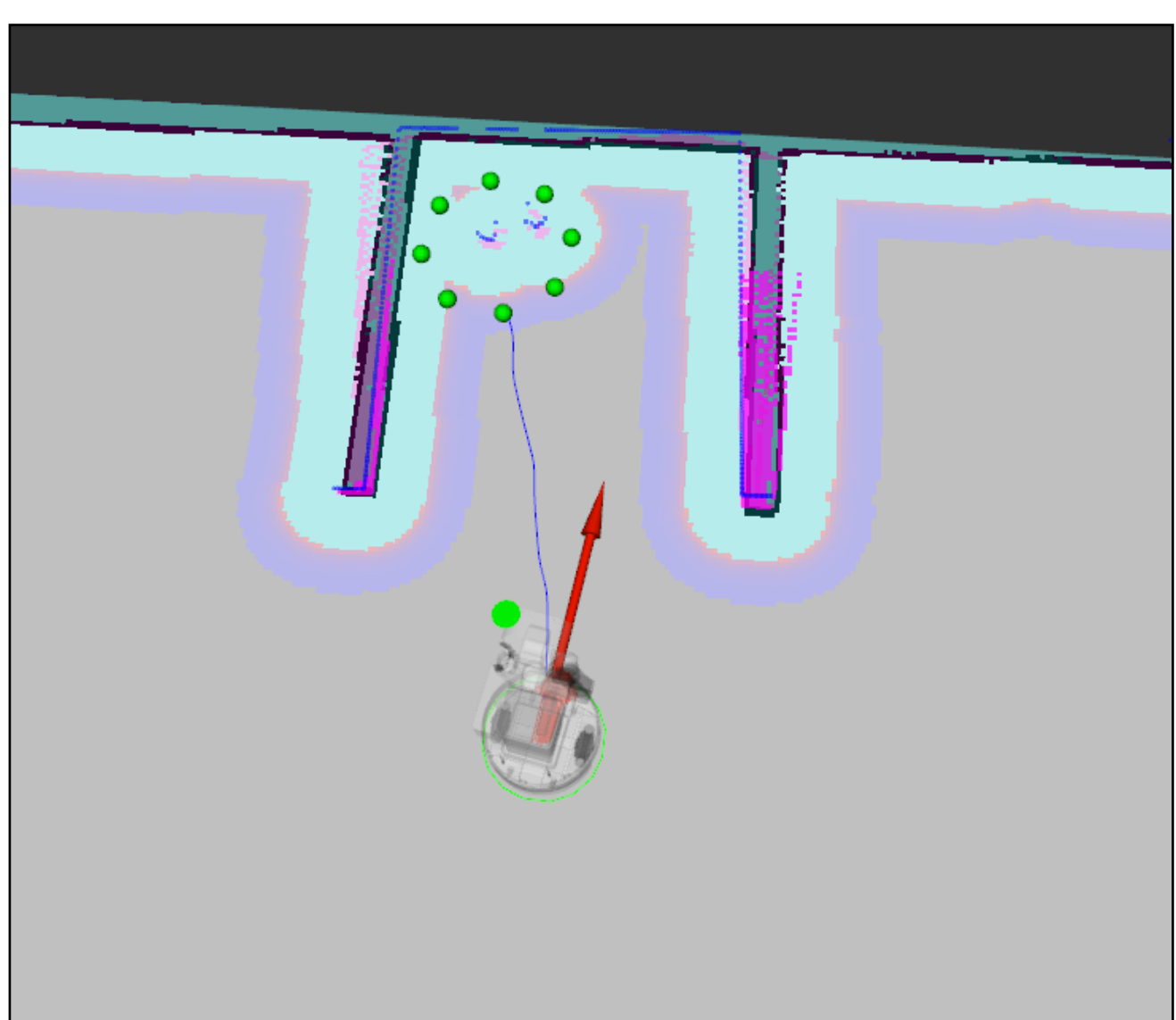
I worked with the Robocup team of Sapienza University of Rome and was in charge of developing the A.I. for the 2 midfield roles out of 5 total soccer robot roles as well as the A.I. to handle special cases such as goal free kicks and side kick-ins. The A.I. I developed enabled the robot to play autonomously at all times.



A processed image, providing distance and position estimation of the person. This allows the robot to detect motion.



An official RoboCup match between two teams of 5 robots each. (A penalised robot can be seen on the far side for illegal actions)



The robot making a plan into the elevator.



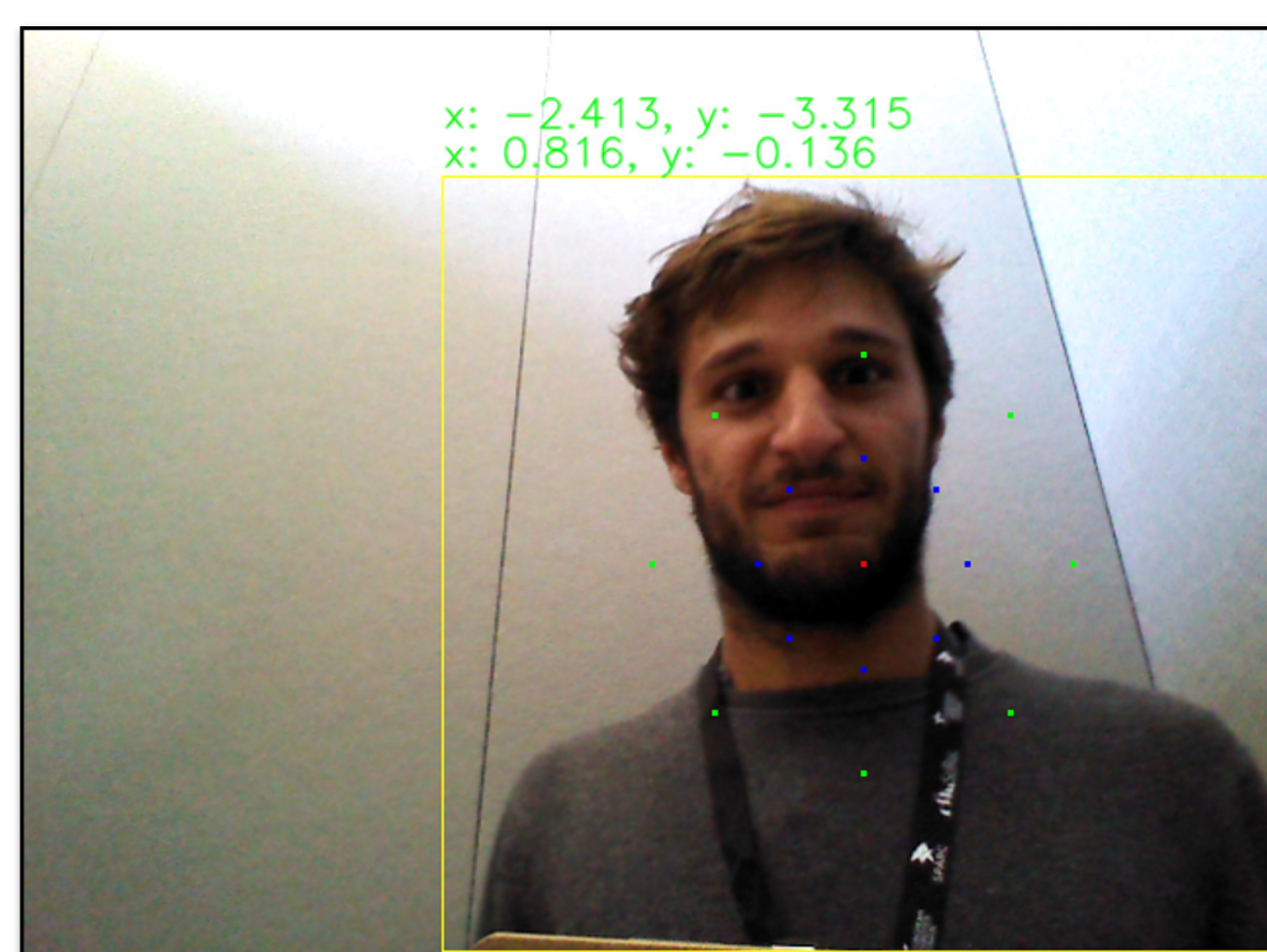
The robot is in the elevator, waiting to exit at the correct floor.



One robot moved in advance and is now ready to receive a pass.



The robot finds a person and looks at their face when speaking.



A robot dives to keep the ball from entering the goal.

Impact

The research work helped progress the development of Artificial Intelligence. Having applied my research in RoboCup and SciRoc shows that it will be possible to apply what I have learned during this period to other difficult real-world problems such as self-driving cars, unstaffed shops and autopilot systems.

By showing that robots can integrate in smart cities of the future, we are able to perceive a lifestyle where robots communicate with smart-city infrastructure to interact and assist its citizens.