

Robots that learn from experience

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Specialist robots will learn how to act intelligently in real-world environments, supporting security guards or care home assistants, in a multi-million Euro project.

The aim of the research is to create mobile robots that are able to operate intelligently and independently, based on an understanding of 3D space and how this space changes over time, from milliseconds to months.



The £7.2 million STRANDS collaborative project led by the **School of Computer Science** ([/schools/computer-science/index.aspx](http://schools/computer-science/index.aspx)) at the University of Birmingham (UK) involves security company G4S Technology Ltd and the Academy of Ageing Research, an Austrian care provider, where the technology developed throughout the four year venture will be tested.

Funded by the European Union's Seventh Framework programme, the project also features the UK's University of Lincoln's School of Computer Science and the University of Leeds' School of Computing. Together with other partners, the researchers will develop the software to process the sheer volume of experiences the robots will encounter, allowing them to find meaning and structure in the variations they encounter every day.

Dr Nick Hawes ([/staff/profiles/computer-science/hawes-nick.aspx](http://staff/profiles/computer-science/hawes-nick.aspx)),

Senior Lecturer in Intelligent Robotics at the University of Birmingham, will coordinate the eight sites in the project, and also lead the research on enabling

a robot to exploit the patterns it finds in its experience. He said: *"Recent advances in robotics and artificial intelligence have enabled mobile robots to operate intelligently in predictable environments for limited periods of time. Our challenge is to develop robots which can go way beyond this, running reliably in dynamic real-world security and care environments for as long as they're required. This will make these machines truly useful assistants in our workplaces. However to do this, we must make great leaps forward in understanding how robots can understand their worlds using the information their sensors provide. For this problem, long run times are essential as they allow the robots to learn what normally happens around them every day."*

Professor Tom Duckett, who is Director of the Lincoln Centre for Autonomous Systems Research, will lead the research on creating 4D maps (3D mapping over extended time periods) of the environment and investigate methods for detecting changes and unusual situations. He said: *"The idea is to create service robots that will work with people and learn from long-term experiences. What's unusual about any environment depends on the context. In a security scenario a robot will be required to perform regular patrols and continually inspect its surroundings for variations from its normal experiences. Certain changes such as finding a person in a restricted area may indicate a security violation or a burglary. In a care home a robot will be required to act as an assistant for elderly patients, fetching and carrying things while also being alert to incidents such as people falling over."*

"It's not just about developing a care home or security robot. We are trying to enable robots to learn from their long-term experience and their perception of how the environment unfolds in time. The technology will have many possible applications."

As well as mapping the environment the robots will require capabilities for person detection, tracking and activity recognition. Dr Marc Hanheide, also from the University of Lincoln, will lead the research on how the robots gather information about their surroundings and use this learned knowledge to interact appropriately with human users.

Dr Hanheide said: *"The main idea is to deploy robots that run for a long time so they have the chance to develop a common-sense attitude on how the world should be and be able to spot the deviations. The robots are curious to learn about the environment - they will see if something has changed and whether that's a one-off or a regular occurrence."*

The project was officially launched at a recent coding camp held at the University of Lincoln. Following the research period the team will perform demonstrations of their systems at science museums, public events and trade shows. It is hoped the software solutions and theoretical concepts produced will be exploited by a variety of industries.

To see a video of the robots in operation go to [youtube \(http://www.youtube.com/watch?v=YSTZfK7GtAk&feature=youtu.be\)](http://www.youtube.com/watch?v=YSTZfK7GtAk&feature=youtu.be).

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Notes for editors:

Full project title: Spatio-Temporal Representations and Activities for Cognitive Control in Long-term scenarios.

Website: <http://strands-project.eu> (<http://strands-project.eu>)

Research partners:

University of Birmingham (UK)

University of Lincoln – School of Computer Science (UK)

G4S Technology Ltd (UK)

Akademie für Altersforschung am Haus der Barmherzigkeit (Austria)

Royal Institute of Technology (Sweden)

RWTH Aachen University (Germany)

The Vienna University of Technology (Austria)

University of Leeds

About the EU's Seventh Framework Programme:

'Framework programmes' (FPs) have been the main financial tools through which the European Union supports research and development activities covering almost all scientific disciplines.

For further information

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