The University Of Sheffield.

Automatic Control and Systems Engineering

The Department of Automatic Control & Systems Engineering
is pleased to announce the following seminar:

Multi-Robot Control: Remote and Augmented Perception using Communication

Professor Keith Clark
Emeritus Professor, Department of Computing, Faculty of Engineering
Imperial College London, UK

Wednesday, 24 January 2018 at 13:00
LT02, Sir Henry Stephenson Building

Abstract

We introduce a three-threaded robotic agent architecture in which the threads share, atomically query and update a *Belief Store* of facts. This records symbolic interpretations of:

- sense data received from outside the agent from sensors usually mounted on the robot or robotic devices it controls but possibly free standing and fixed
- communications from another robotic agent **Ag**, using a common ontology, of:
    - **Ag**'s sense data, or facts inferred from this data
    - A query from **Ag,** or an answer from **Ag**
    - **Ag**'s intentions
    - forwarded data from **Ag**

The three agent threads are: a *message handler*, a *percept handler*, and a *control thread*. The first is the public interface of the agent.

We demonstrate the use of the agent architecture with a multi-robot control application. Each agent separately controls a track following robot navigating to a destination room through doors that are exogenously opened and closed. The navigation done without risk of robot collision on tracks, and with continuous re-computation of the shortest track path through doors believed to be open.
See https://www.doc.ic.ac.uk/~klc/pathFollowers.mp4

The agents compute a new track path immediately they see, or are informed by another agent, of the change of the open/closed status of a door on the untraversed part of their current path. They also keep one another informed re their current room location, and their path following intention, by broadcasting this information whenever it changes. The information used for the avoidance behaviour. In this application communication is as important as perception. Indeed, the robots cannot see each other.

Background on TeleoR programming non-communicating robotic agents is given in the paper:
Robotic Agent Programming in TeleoR, Clark and Robinson, ICRA 2015, IEEE.
downloadable from: www.doc.ic.ac.uk/~klc/icra.pdf

Biography

Keith Clark has first degrees in both Mathematics and Philosophy and a PhD in Computational Logic. His first CS lecturing position was at Queen Mary College, London in 1969. With a colleague he developed a new course on automata theory more suited to CS students, based on a novel approach proposed by Dana Scott. The outcome was a text book, "Programs, Machines and Computation" published in 1975

The same year he moved to Imperial College to join Robert Kowalski in setting up the Logic Programming group, which became the Logic and AI section of the Computing Department. He is now an Emeritus Professor at Imperial, an Honorary Professor at UQ Brisbane, UNSW Sydney and UC London. This year he is also a Visiting Researcher at Stanford University.

His research has covered: theoretical results in computational logic, design and implementation of new logic programming languages, including concurrent languages, rule languages for programming multi-tasking communicating software and robotic agents. With students he has explored AI, multi-agent and robotic control applications of these languages.

He has consulted for the Japanese Fifth Generation Project, Hewlett Packard, IBM, ICL, Fujitsu and two start-ups, one in Sweden and one in California. He is a co-founder of the Prolog software and consultancy company Logic Programming Associates (LPA).

He has taught computing course at: Stockholm and Uppsala Universities in Sweden, Syracuse, UC Santa Cruz and Stanford Universities in the US, University of Queensland in Australia, Makerere University in Uganda, and at the British University in Egypt. Many years ago he taught mathematics at a high school in Sierra Leone.

Light refreshments will be served in the foyer of
the Sir Henry Stephenson Building