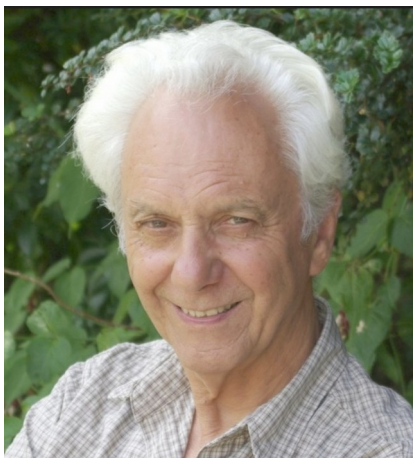
SEMINARS



Tuesday May 15 10:30-11:30, Meeting room, Alan Turin building, III floor, DISIM@UnivAQ

Introduction to Control of Communicating Robotic Agents Using Teleo-Reactive Programs

Keith Clark, Emeritus Professor Imperial College,
(joint work with Peter Robinson, University of Queensland)

We introduce a multi-thread-threaded robotic agent architecture in which the threads atomically query and update a shared *Belief Store* of dynamic facts which can be queried using fixed knowledge rules. The *Belief Store* 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 robotic agents are programmed in two rule based languages: **TeleoR** and **QuLog**.

QuLog is a flexibly typed multi-threaded logic+function+action rule language. Its declarative subset is used for encoding the agent's dynamic beliefs and static knowledge. Its action rules are used for programming the agent's threads.

TeleoR is an extension of **QuLog** used for programming task threads for controlling robotic devices. **TeleoR** procedures comprise sequences of **Q ~> A** guarded action rules. The **Q** guards are **QuLog** queries to the *Belief Store.* The **A** actions comprises one or more robotic actions to be executed in parallel, or a single call to a **TeleoR** procedure, which could be a recursive call. Both may be paired with a sequence of **QuLog** belief update and communication actions.

We introduce the use of **TeleoR** and **QuLog**, and the multi-threaded agent architecture, with two robot control applications.

A co-operative two robot bottle collecting application in which the robot's controlling agents avoid collisions by enhancing simple vision capability using communication
Control of a robot arm using a multi-tasking agent that fairly interleaves the use of the arm in multiple configuration tasks

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Thursday May 17 14:30-15:30, Meeting room, Alan Turin building, III floor, DISIM@UnivAQ

Teleo-Reactive Programming with Dynamic Planning and Fair Concurrent Use of Multiple Robotic Devices

Keith Clark, Emeritus Professor Imperial College
(joint work with Peter Robinson, University of Queensland)

This seminar is a sequel to the first introductory talk on Teleo-Reactive Programming. It describes how the following two applications can be programmed using relatively simple **TeleoR**/**QuLog** programs:

A multi-tasking agent controlling two independent robotic arms in multiple construction tasks. Colleagues at UNSW Sydney have ported this to a Baxter robot. See https://www.doc.ic.ac.uk/~klc/20160127-LABCOT-HIx4.mp4
Communicating agents each controlling a track following robot to navigate via open doorways to a destination room. The doors may be exogenously opened and closed. The navigation is done without risk of a robot collision on a track, and with continuous re-computation of the shortest path plan of open doorways. The agents keep one another informed about their current room location, any changed open/closed status of doorways in that room, and their current path following intentions. The information is used for the avoidance behaviour. In this application communication is as important as perception.See https://www.doc.ic.ac.uk/~klc/pathFollowers.mp4