Seminars series on Software Architectures for Robotics

Title Dealing with real-world and distributed software architectures for robots

Speaker Dr. Ali Paikan, Italian Institute of Technology

Date and time Thursday, 27th of November 2014, 8:30-11:00

Place INFAL1 room, building G

Abstract

Part 1

Real-Time operating systems are important in all those applications where timing constraints on task execution play a fundamental role, such as control systems in general and robotics in particular. Conventional real-time schedulers aim to assign tasks to resources based on primary properties of each task and their timing constraints. However, these types of schedulers are often inadequate to deal with the complexity of intelligent systems, where it is important to schedule tasks not only on the basis of their timing constraints, but also to choose between available tasks depending on the current context. The first part of the talk provides an introduction to the semantic-aware real-time scheduler (SeART) in Robotics, an extension to conventional operating systems, which deals with complex real-time robotics applications. SeART addresses the problem of selecting a subset of tasks to be scheduled depending on the current operating context: mission objectives, other tasks currently executed, the availability or unavailability of sensors and other resources, as well as temporal constraints. SeART is able to represent the semantics of tasks to be scheduled and to use this information in the scheduling process.

Part 2

Software engineering and best practices promote modularity and composability to reduce debugging and development time of software applications in robotics. These approaches may increase the complexity of the system and the effort required to properly orchestrate the interactions between modules especially in distributed architectures. The second part of the talk covers the coordination problem of modules in distributed architecture and describe an approach in which coordinating logic is transparently inserted into separated reusable components along with application-dependent data transformations. The coordination and arbitration can be carried out directly by exploiting connections that deliver data messages between modules. For this reason, it intrinsically reduces the number of links required for coordination and it can be built without changing existing modules.

Bio-sketch

Dr. Paikan is currently a Postdoctoral researcher at the Istituto Italiano di Tecnologia (IIT) in the iCub Facility department. He accomplished his Ph.D. in Robotics at the IIT in 2014 and he received the double M.S. degree from the University of Genova, in 2010, Italy and from the Ecole Centrale de Nantes, France in 2009, within the joint European Master on Advanced Robotics (EMARO). During his research period (2005 - 2007) at the Mechatronics Research Laboratory (MRL), Iran, Ali was actively involved and awarded in various RoboCup competitions. He has an extensive background in robotics and his main research interests include software architectures for robotics, software reusability and real-time systems. Recently, Ali has been involved in different European FP7 projects such as WALK-MAN, XPERIENCE and POETICON++ and has a close collaboration with Karlsruhe Institute of Technology (KIT).

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