ROYAL INSTITUTE OF TECHNOLOGY

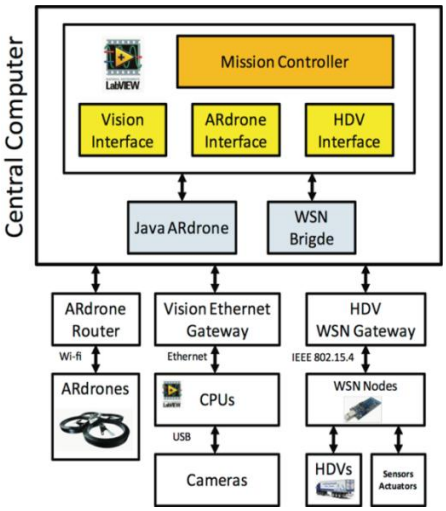
Centre for Autonomous Systems

Master Thesis / Semester Project

Simulation and Implementation of Temporal Logic-based Motion Planning for Autonomous Vehicles

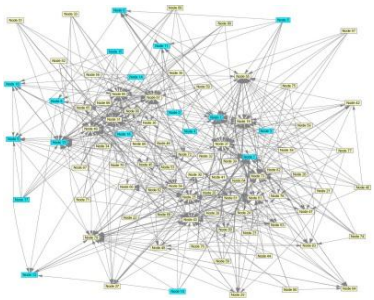
Description:

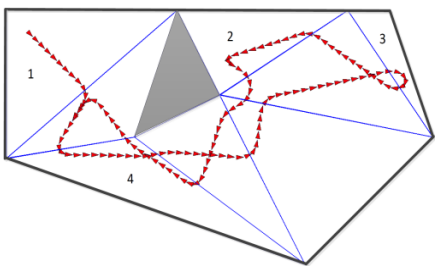
Temporal-logic-based motion planning (TMP) provides a fully automated correct-by-design controller synthesis approach for single or multiple autonomous vehicles, under much more complex missions than the traditional point-to-point navigation. A high-level discrete plan is first found by the off-the-shelf model-checking algorithms [1]. This plan is then implemented through the corresponding low-level hybrid controllers. Some interesting examples can be found in robotic team deployment [2] and symbolic motion planning [3].



The goals of this Master Thesis project are to: (1) learn the state-of-art TMP algorithms; (2) construct a generic framework as MATLAB function scripts; (3) design and implement relevant demonstrations in the **Smart Mobility Lab**.

An experimental testbed for autonomous vehicles has been built at the **Smart Mobility Lab.** The primary architecture of the testbed is shown in the figure above, consisting of the Qualisys MotionCapture system, distributed wireless sensor networks, several quadrotors and small scale ground vehicles. This testbed is an excellent practical system to implement and evaluate the TMP for automated cooperative guidance and control of the aerial and ground vehicles.





Prerequisites:

Good at Matlab programming, Courses in Automatic Control and general programming skills

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Reference:

[1] C. Baier, J.-P Katoen. Principles of model checking. *The MIT Press*, 2008.
[2] X. Ding, M. Kloetzer, Y. Chen, C. Belta. Automatic deployment of robotic teams. *IEEE Robotics Automation Magazine*, 18: 75-86, 2011.
[3] C. Belta, A. Bicchi, M. Egerstedt, E. Frazzoli, E. Klavins, G. J. Pappas. Symbolic planning and control of robot motion. *IEEE Robotics and Automation Magazine*, 14: 61-71, 2007.