



CDT SEMINAR SERIES

TRINITY TERM 2015

Wednesday 29th April - Professor Alex Rogers, University of Southampton

Title: *Decentralised Coordination of Large-Scale Autonomous Systems through Local Message Passing*

Abstract: A common goal in autonomous systems research is to coordinate and control a large number of autonomous vehicles or sensors in settings where short range communication makes centralised control unreliable or impossible. As such, decentralised coordination approaches typically focus on achieving system-wide goals through local message passing. This seminar will describe how these problems can be addressed through a family of well understood algorithms that have previously been used in many applications such as decoding convolution codes in communication systems and performing belief propagation in graphical models. Both the fundamental theory behind the approach, and also the practical details of implementing and deploying it in real autonomous systems, will be discussed.

Thursday 14th May - Dr Dave Parker, University of Birmingham

Title: *Probabilistic Model Checking and Strategy Synthesis for Robot Navigation*

Abstract: Probabilistic model checking is an automated technique to verify whether a probabilistic system satisfies a formally specified quantitative correctness property (e.g. "with probability at least 0.999, the airbag successfully deploys within 20 milliseconds of a crash"). The same techniques can also be used to synthesise a strategy (e.g. a controller for a robot) which then guarantees satisfaction of a correctness property (e.g. "the minimum probability of patrolling all rooms within 15 minutes is above 0.98"). This talk will give an overview of probabilistic model checking and strategy synthesis, including some recent directions such as multi-objective model checking (to investigate trade-offs between several conflicting properties) and permissive strategy synthesis (to generate flexible and robust controllers). I will also describe how these techniques have been applied to the problem of robot navigation, using the probabilistic model checker PRISM, and deployed on a mobile service robot.

Thursday 28th May - Professor Jeremy Wyatt, University of Birmingham

Title: *Robots in Our World: Uncertain, Incomplete and Unfamiliar*

Abstract: To make transfer to applications in everyday domains robots require the ability to cope with novelty, incomplete information and uncertainty. In this talk I will describe a line of work carried out over ten years that provides methods to tackle this. In particular I will focus on two problems: object search and manipulation. Both require the ability to reason about open or novel worlds. The results are demonstrated in a variety of robot systems: in particular the Dora and Boris robots. Dora is one of the first mobile robots able to plan in open worlds, using the notion of assumptions. Dora also uniquely attempts to explain and then verify explanations in the face of failure.

Boris is a robot system for manipulation that can grasp novel objects, and if there is time I will also describe algorithms we are developing for Boris that allow active gathering of information to support manipulation.