COLLEGE OF ENGINEERING
COMPUTER SCIENCE & ENGINEERING
UNIVERSITY OF MICHIGAN

Dissertation Defense

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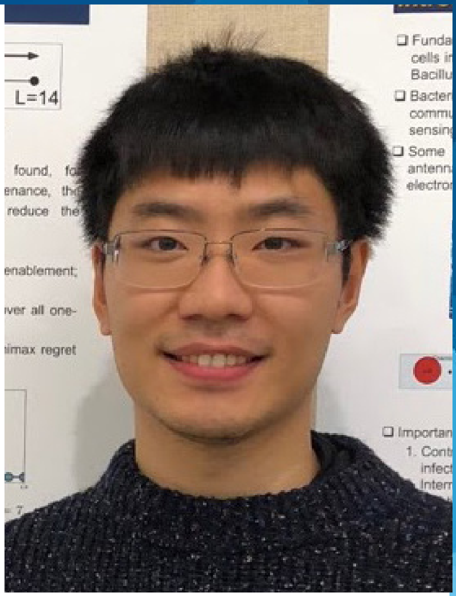
Making and Keeping Probabilistic Commitments for Trustworthy Multiagent Coordination



Tuesday, April 21, 2020
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ABSTRACT: In a large number of real world domains, such as the control of autonomous vehicles, team sports, medical diagnosis and treatment, and many others, multiple autonomous agents need to take actions based on local observations, and are interdependent in the sense that they rely on each other to accomplish tasks. Thus, achieving desired outcomes in these domains requires interagent coordination. The form of coordination this thesis focuses on is commitments, where an agent, referred to as the commitment provider, specifies guarantees about its behavior to another, referred to as the commitment recipient, so that the recipient can plan and execute accordingly without taking into account the details of the provider's behavior.

This thesis presents a set of contributions that address three core issues for commitment-based coordination. The first contribution is a principled semantics for the provider to exercise maximal autonomy that responds to evolving knowledge about the environment without violating its probabilistic commitment, along with a family of algorithms for the provider to construct policies that provably respect the semantics and make explicit tradeoffs between computation cost and plan quality. The second contribution consists of theoretical analyses and empirical study that improve our understanding of the recipient's interpretation of the partial information specified in a probabilistic commitment. The third contribution focuses on the problem of formulating probabilistic commitments for the fully cooperative provider and recipient; the thesis proves structural properties of the agents' values as functions of the parameters of the commitment specification that can be exploited to achieve orders of magnitude less computation.

Chairs: Profs. Satinder Singh Baveja and Edmund Durfee