COMPUTER SCIENCE & ENGINEERING
UNIVERSITY OF MICHIGAN

DISSERTATION DEFENSE

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Enabling Robot Arm Motion with Multiple Objectives Through Agent Representation and Reasoning

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1:00pm – 3:00pm
3725 Beyster
Hybrid: Zoom Passcode: 950667

ABSTRACT: Current robot systems assume that symbolic task reasoning and continuous motion planning can independently decide on an action and then implement it with a motion. Task-learning robots, however, may acquire many types of motion-relevant knowledge that imply different objectives for each motion, such as keeping a particular object visible or executing a motion quickly. Flexible objective use is a weakness of current robot systems, but we show that current limitations can be overcome through better coordination between the reasoning and motion subsystems. We present an integration approach for agent reasoning and arm motion planning based on a shared representation of trajectories and integrated motion processing. Our solution enables agents to express objectives for a motion according to their symbolic task or environment knowledge. To find trajectories that match the agent's chosen objectives, we use the Motion planning with Agent Selection of Trajectory (MAST) pipeline, a reordering of reasoning-motion information flow in which the motion subsystem first samples a set of valid trajectories, then task reasoning selects one to execute. We include a taxonomy of 49 different objective functions, 19 of which are implemented and evaluated for use with MAST or other motion approaches. The effectiveness and flexibility of our approach are demonstrated through an implementation of MAST in the Soar cognitive architecture and a collection of Soar agents that utilize the new pipeline in a variety of ways with a variety of objectives.

CHAIR: Prof. John Laird