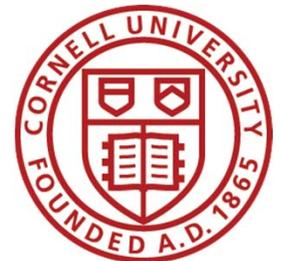


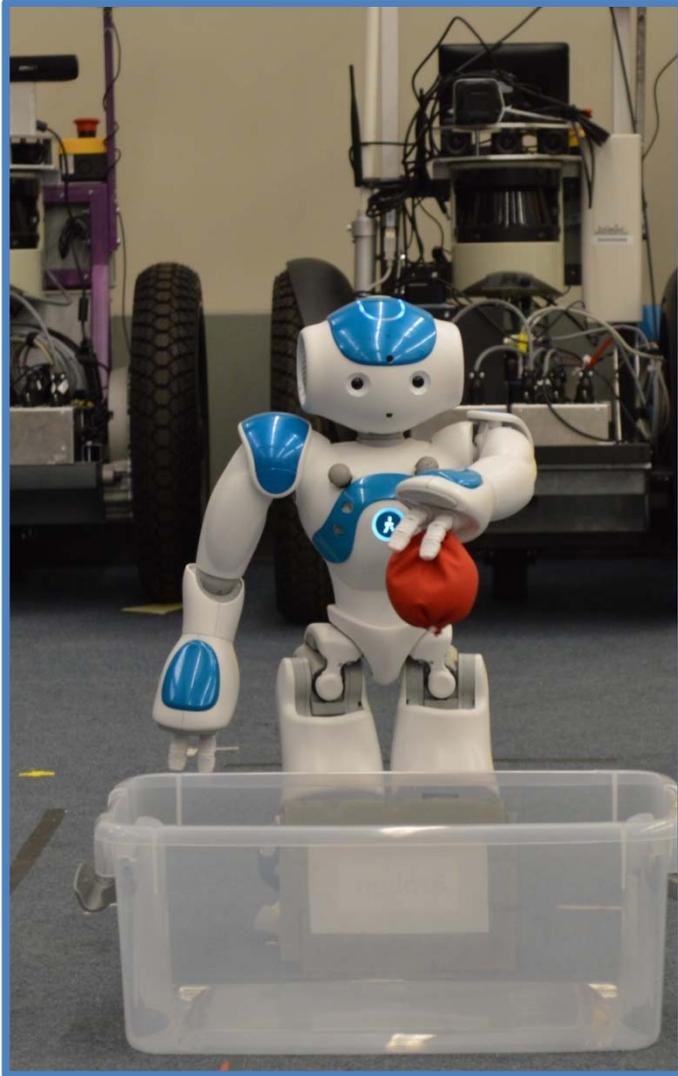
High-Level Verifiable **Robotics**

Hadas Kress-Gazit

**Sibley School of Mechanical and Aerospace Engineering
Cornell University**

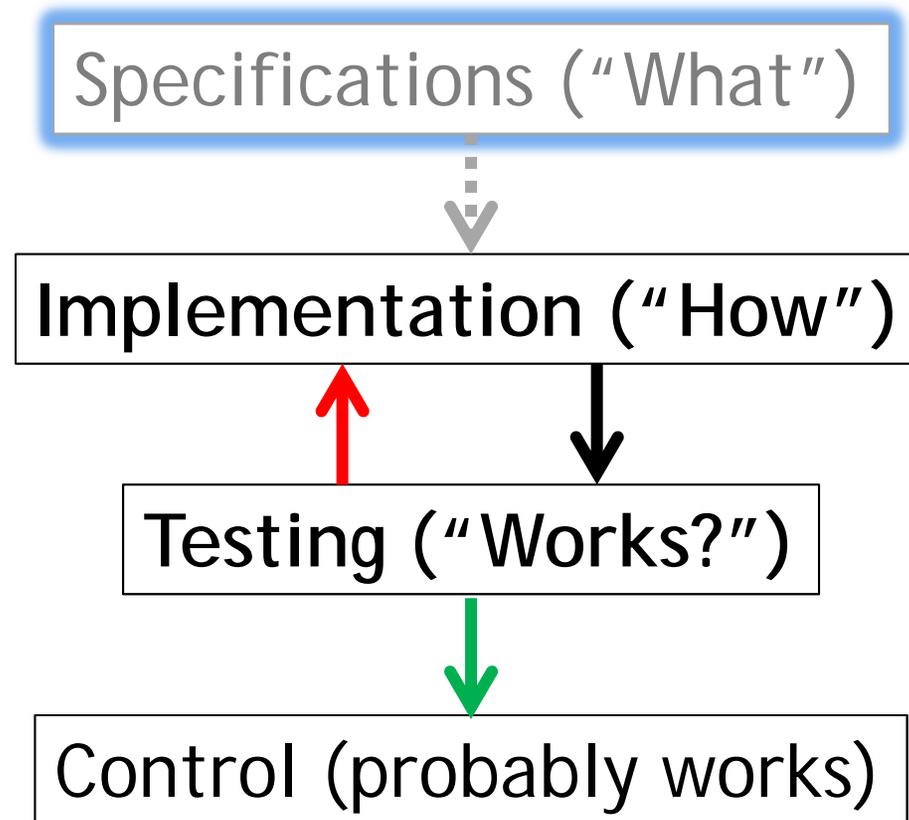
**hadaskg@cornell.edu
verifiablerobotics.com**

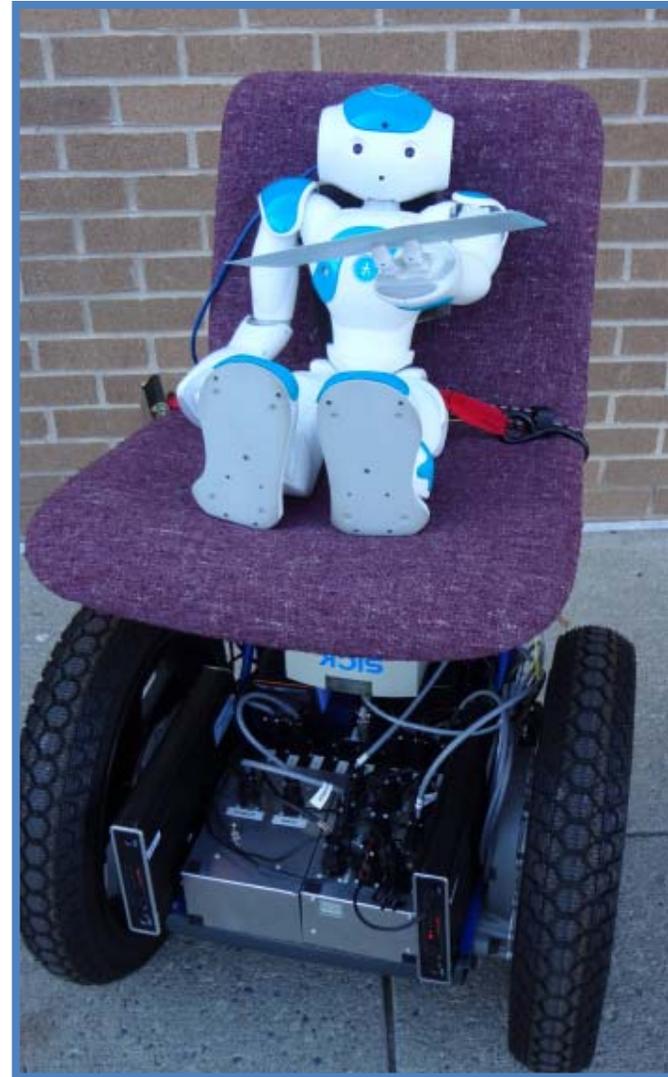
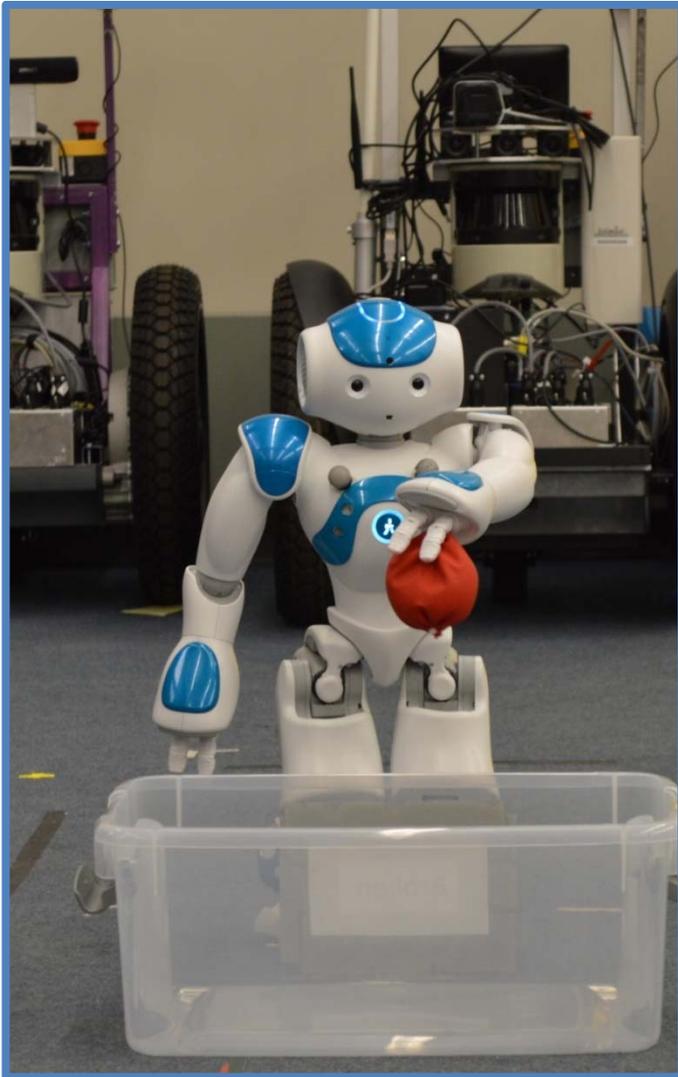






Usually





Ideally

Specifications ("What")



Automatic
Correct-by-construction
Synthesis*



Control (works!)

Approach in a nutshell

- **Abstract** the continuous problem (sensing, actuation) into a discrete one
 - True/False propositions
 - Specification as **Linear Temporal Logic** formulas or **English**

$$\varphi ::= \pi \mid \neg\varphi \mid \varphi \vee \varphi \mid \bigcirc\varphi \mid \square\varphi \mid \diamond\varphi \mid \varphi\mathcal{U}\varphi$$

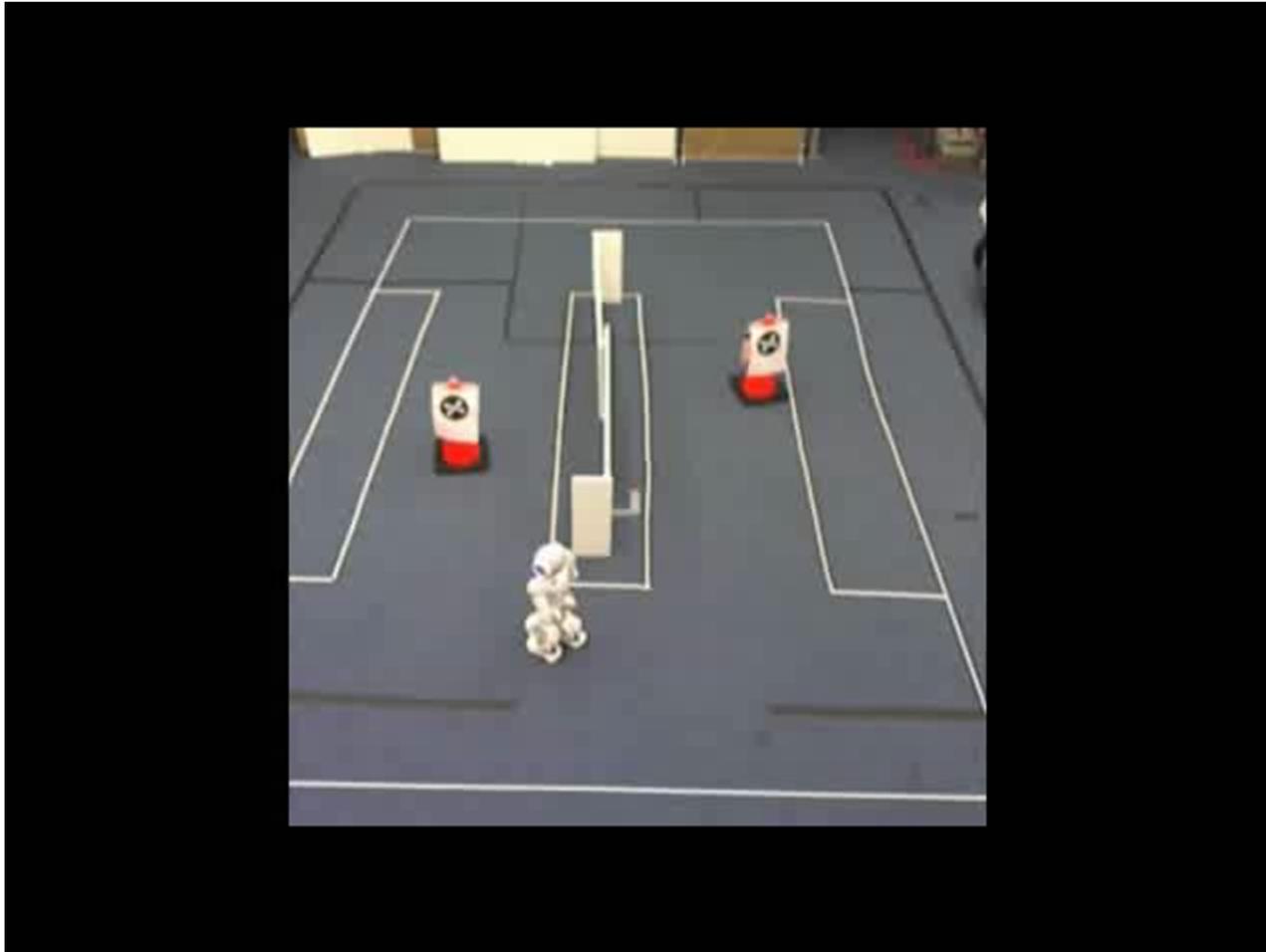
not or next always eventually until

Approach in a nutshell

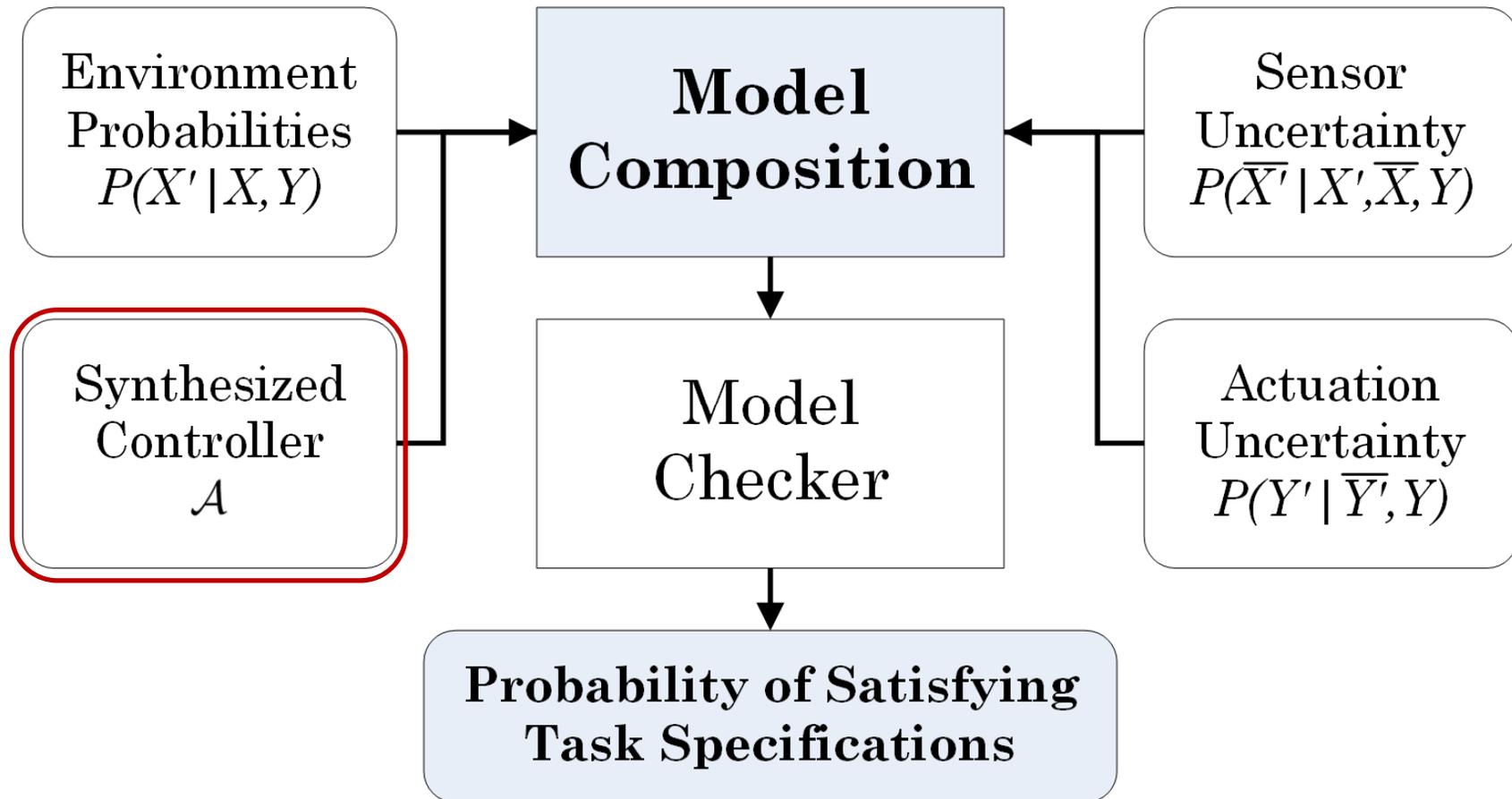
- **Abstract** the continuous problem (sensing, actuation) into a discrete one
- Solve* for a **provably-correct** discrete controller (finite state machine)

Approach in a nutshell

- **Abstract** the continuous problem (sensing, actuation) into a discrete one
- Solve* for a **provably-correct** discrete controller (finite state machine)
- **Continuously implement** the discrete controller



CPS: Tightly Integrated Perception and Planning in Intelligent Robotics (completed)



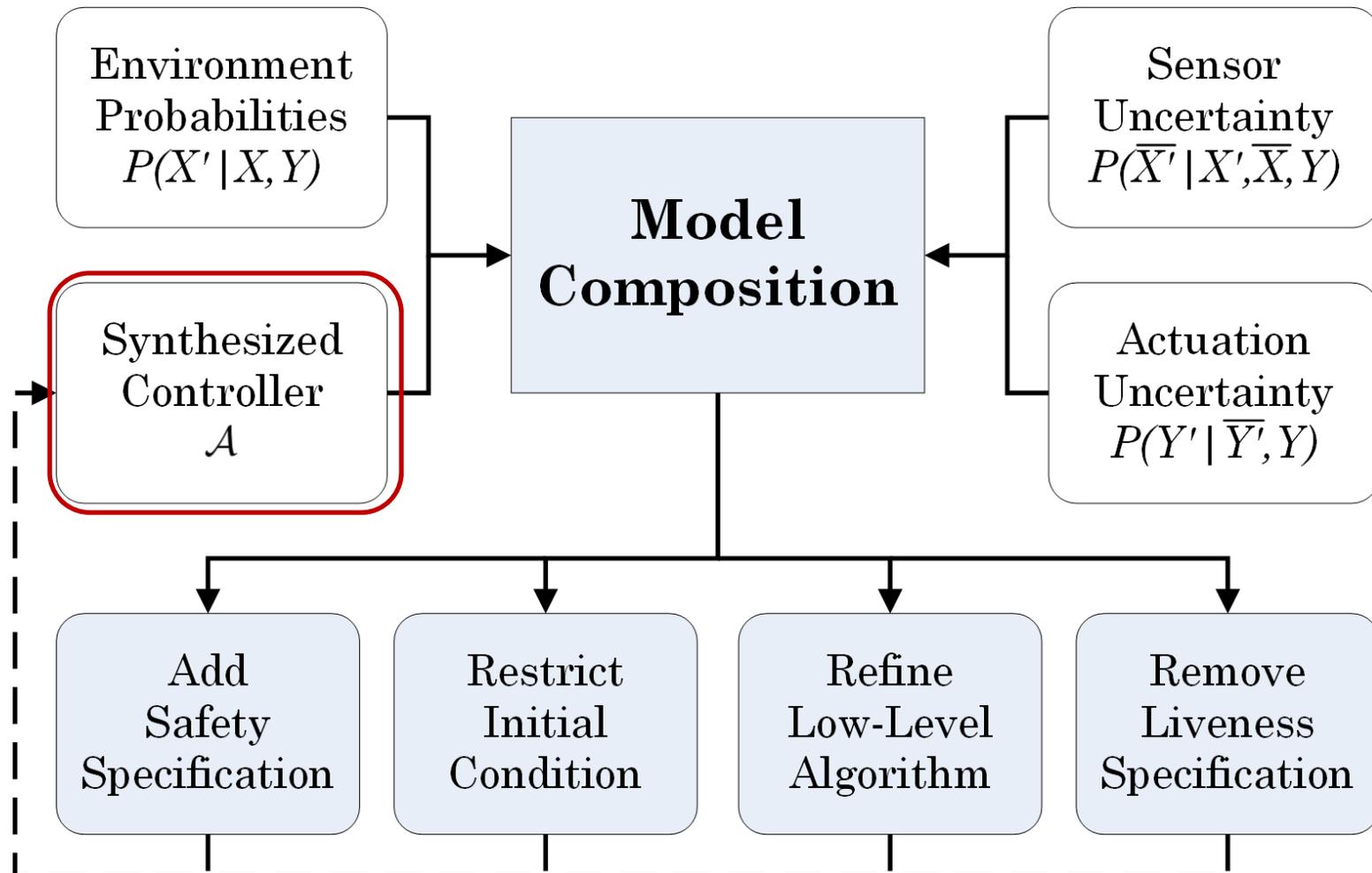
Johnson and KG, RSS 2011, Advanced Robotics 2012, ICRA 2013, IJRR under review

VERIFIABLE
ROBOTICS
RESEARCHGROUP

Johnson, Havlak, Campbell and KG, ICRA 2012

February 18, 2014

CPS: Tightly Integrated Perception and Planning in Intelligent Robotics (completed)

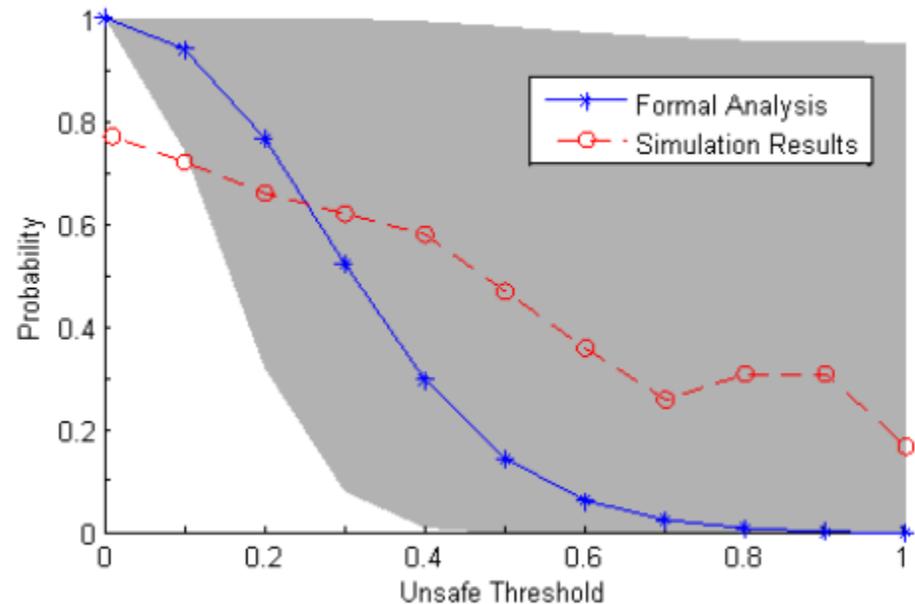
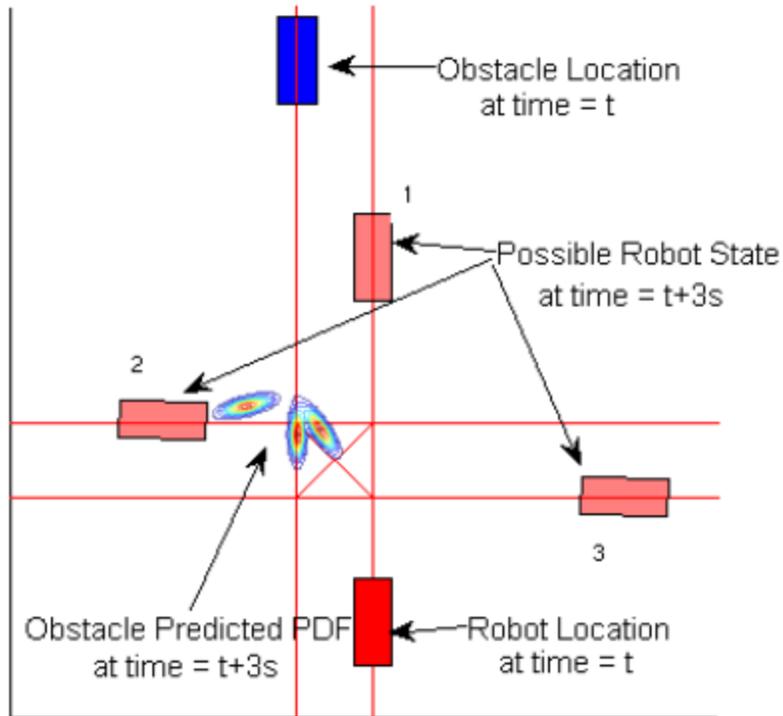


Johnson and KG, RSS 2011, Advanced Robotics 2012, ICRA 2013, IJRR under review

Johnson, Havlak, Campbell and KG, ICRA 2012

February 18, 2014

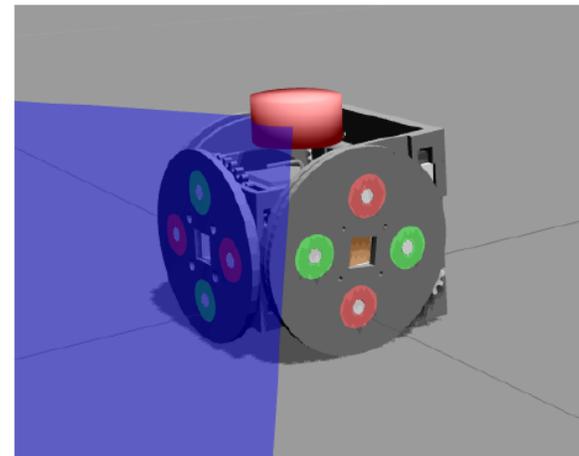
CPS: Tightly Integrated Perception and Planning in Intelligent Robotics (completed)



CPS: High-Level Perception and Control for Autonomous Reconfigurable Modular Robots (started October '13)



Modlab – Upenn



High-Level Verifiable **Robotics**

Hadas Kress-Gazit

**Sibley School of Mechanical and Aerospace Engineering
Cornell University**

**hadaskg@cornell.edu
verifiablerobotics.com**

