Lecture on Manipulation and Motion

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Lula Robotics

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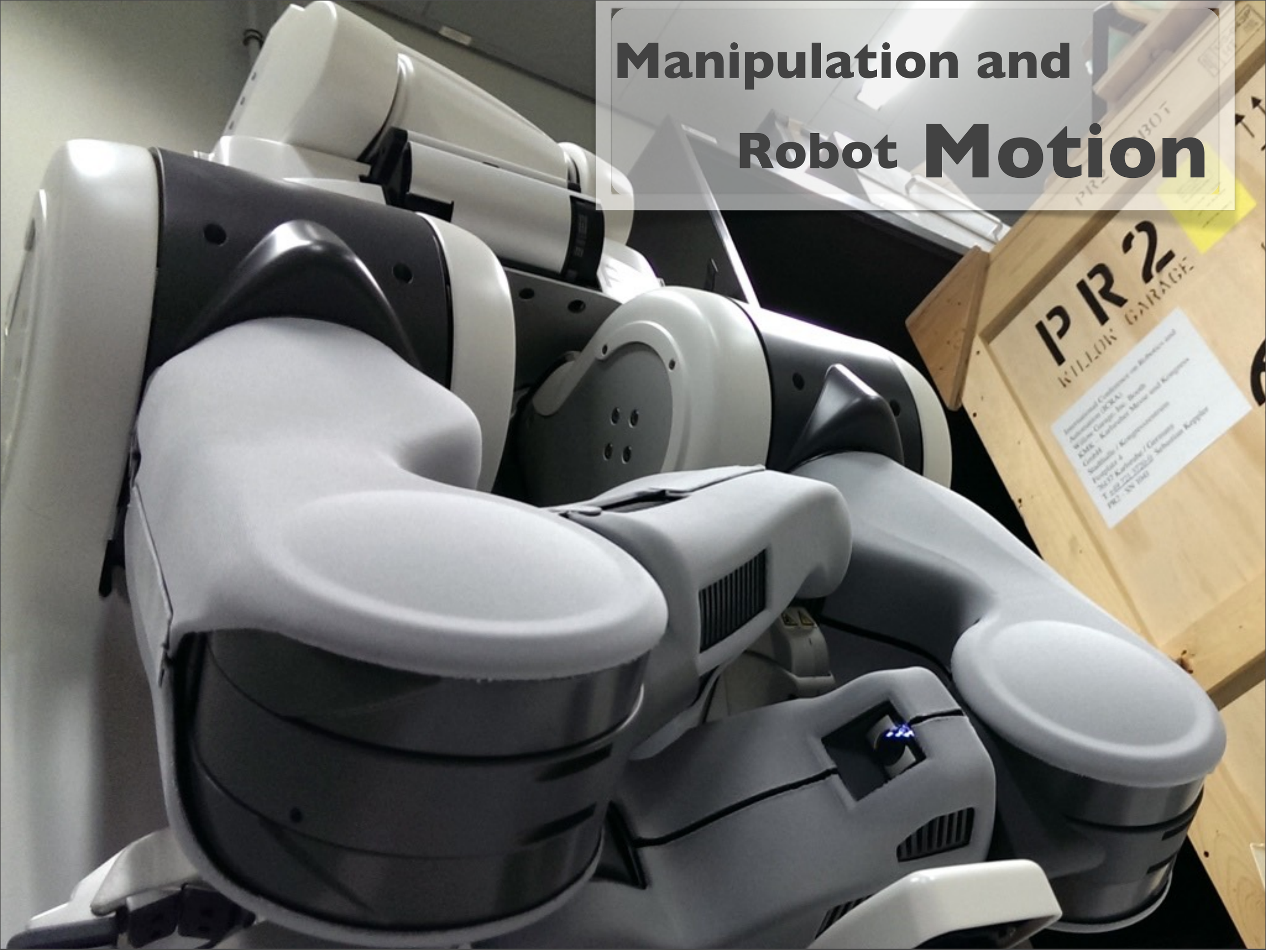
Manipulation and Robot Motion

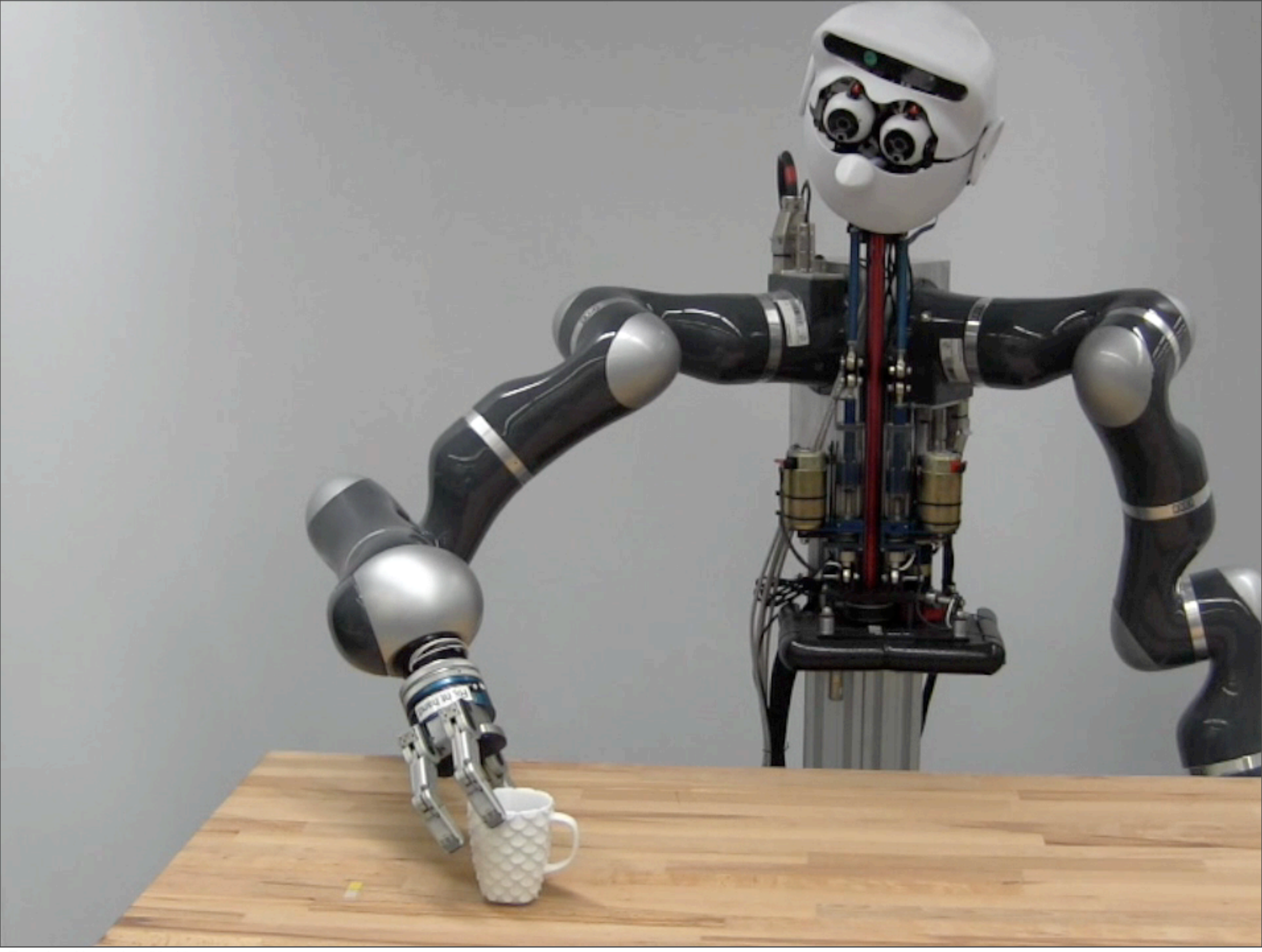


Outline

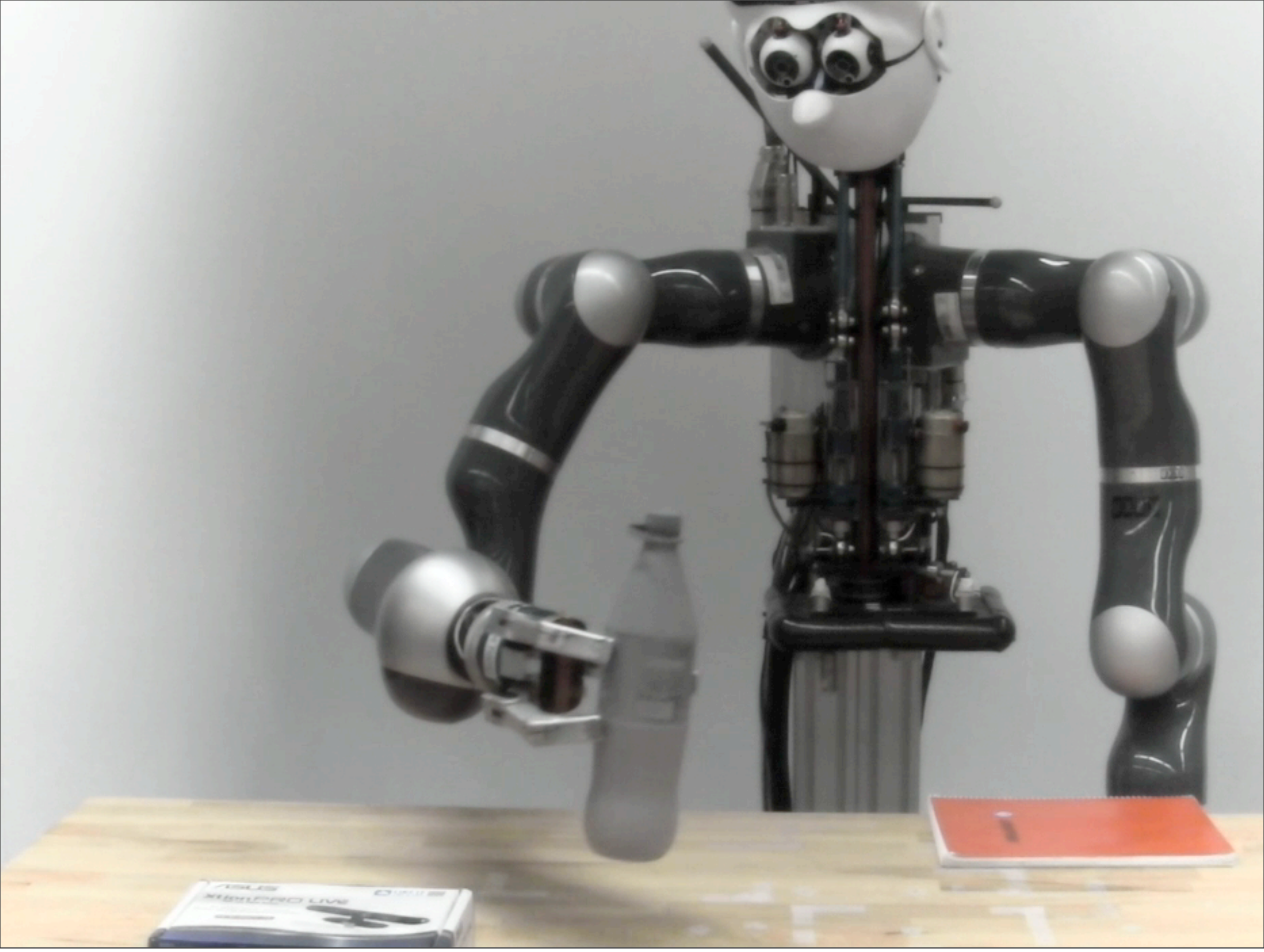
- Intro
- Core
  - Kinematics vs dynamics, planning vs control
  - Algorithmic consistency, some math, and an example
  - Anticipation: Motion optimization
- Videos!

Manipulation

Pastor et al. 2013




Statistical
Time Series
CONTROL SYSTEM DESIGN
CONTROL THEORY
ROBOT ETHICS
Probabilistic
ROBOTICS
ROBOT MODELING AND CONTROL
Siciliano · Sciavicco
Robotics
Hartley and
Zisserman
Multiple View Geometry
SECOND EDITION
Robotics, Vision and Control
THE ECOLOGICAL APPROACH
TO VISUAL PERCEPTION
STROGATZ
NONLINEAR DYNAMICS
AND CHAOS
Boyd and
Vandenberghe
Convex Optimization



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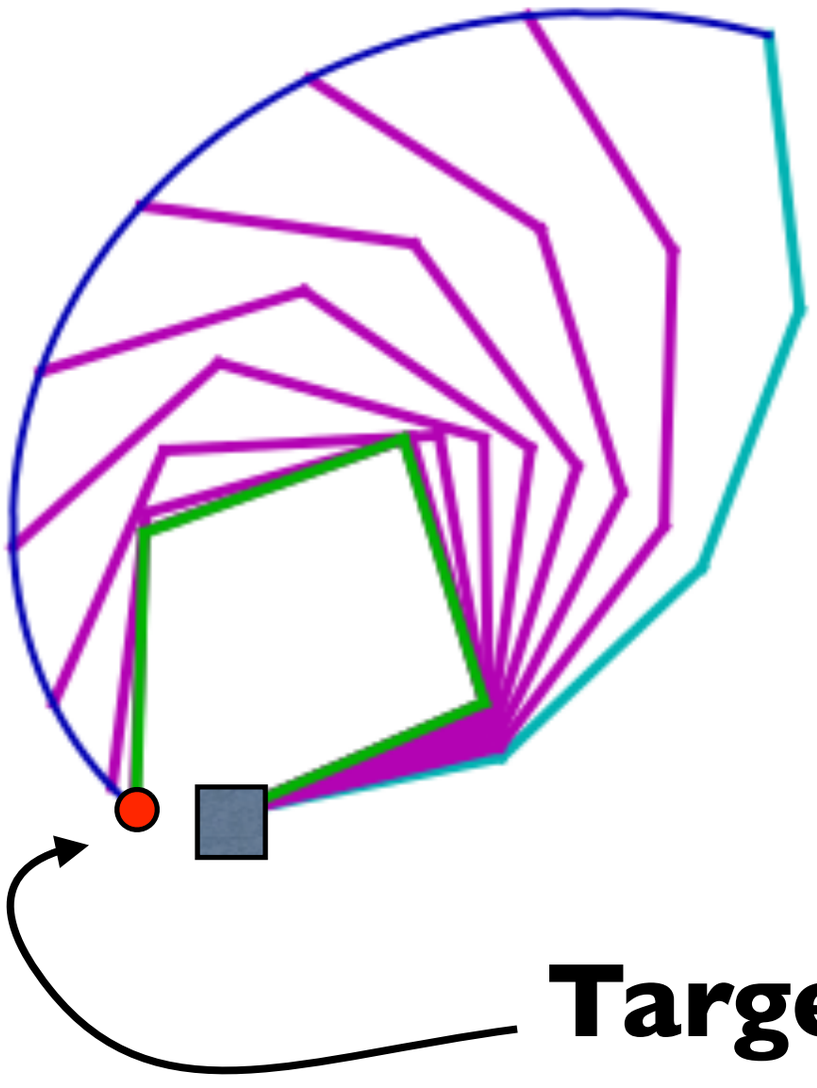
The role of the metric

Configuration space metric

"Jacobian transpose"



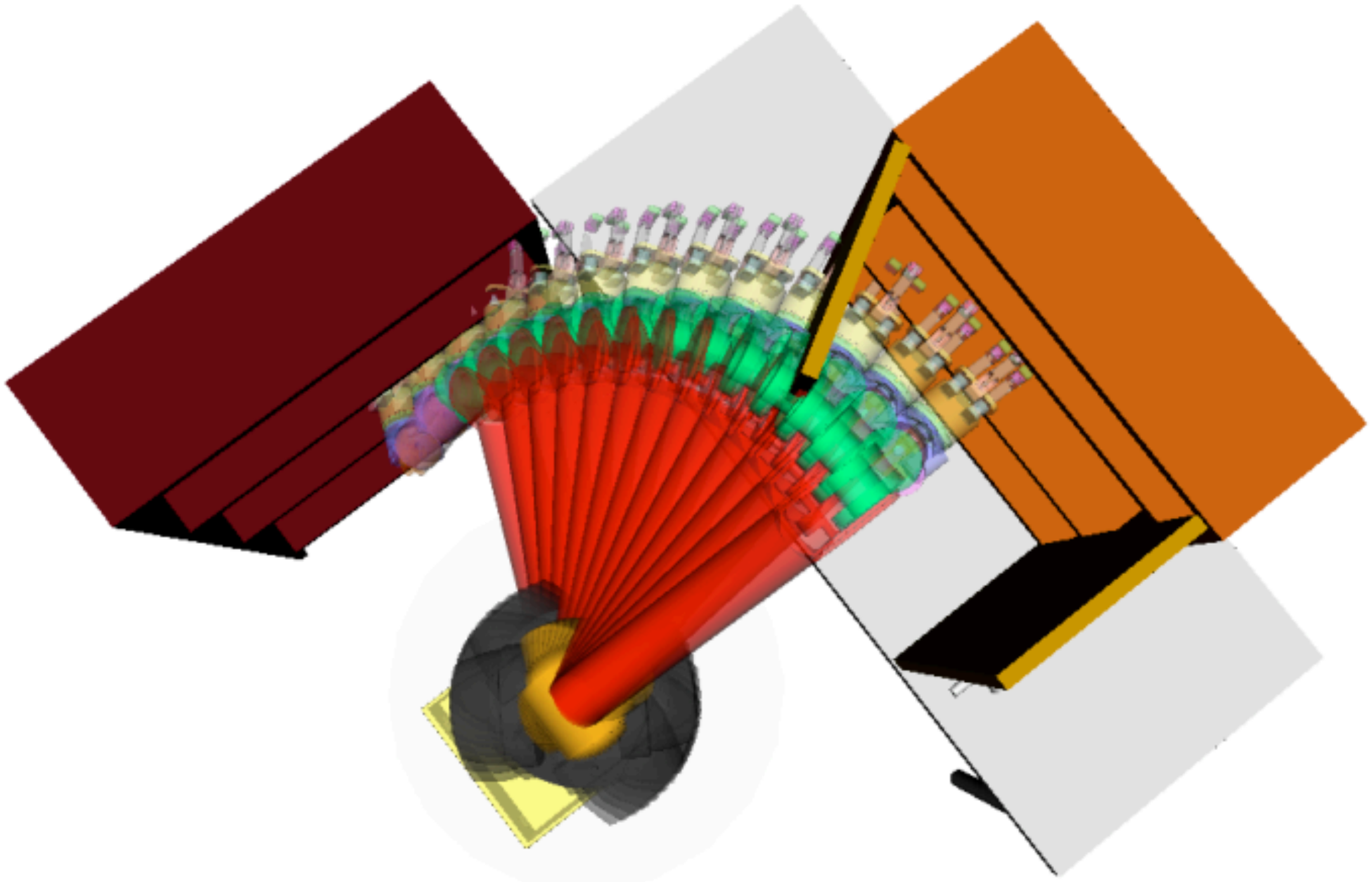
Euclidean workspace metric

"Jacobian pseudoinverse"

Target

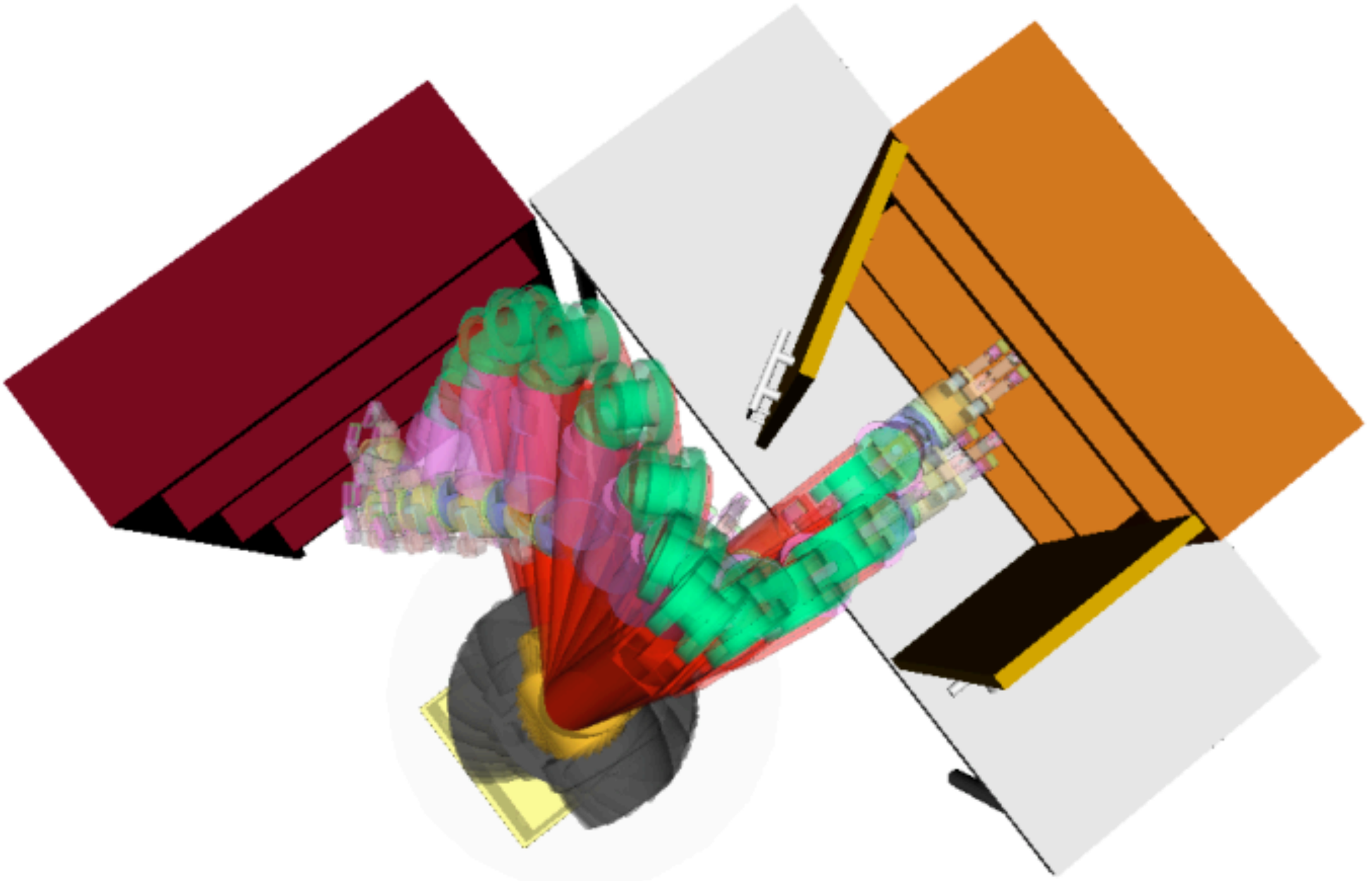
CHOMP

(Ratliff et al, 2009)

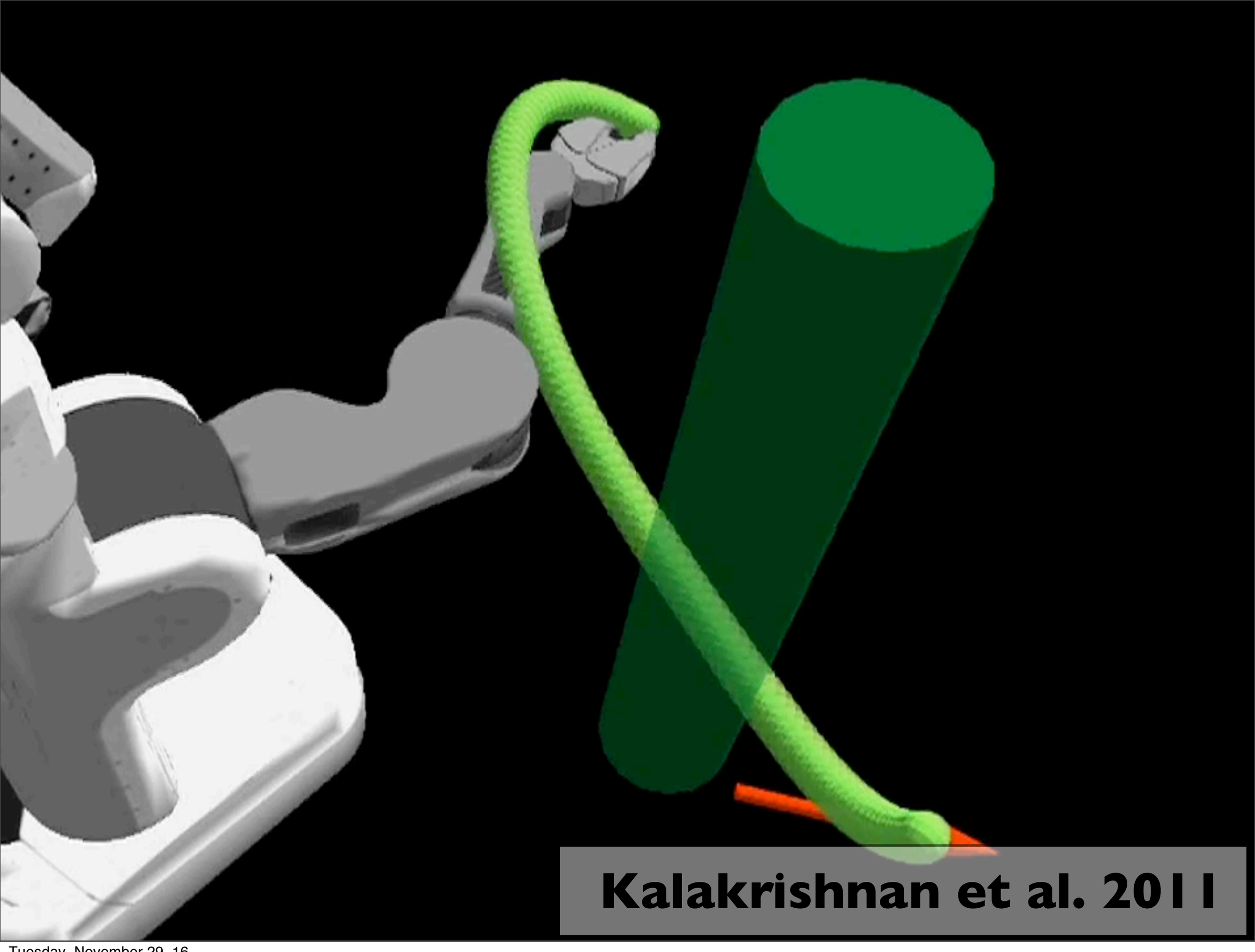


CHOMP

(Ratliff et al, 2009)

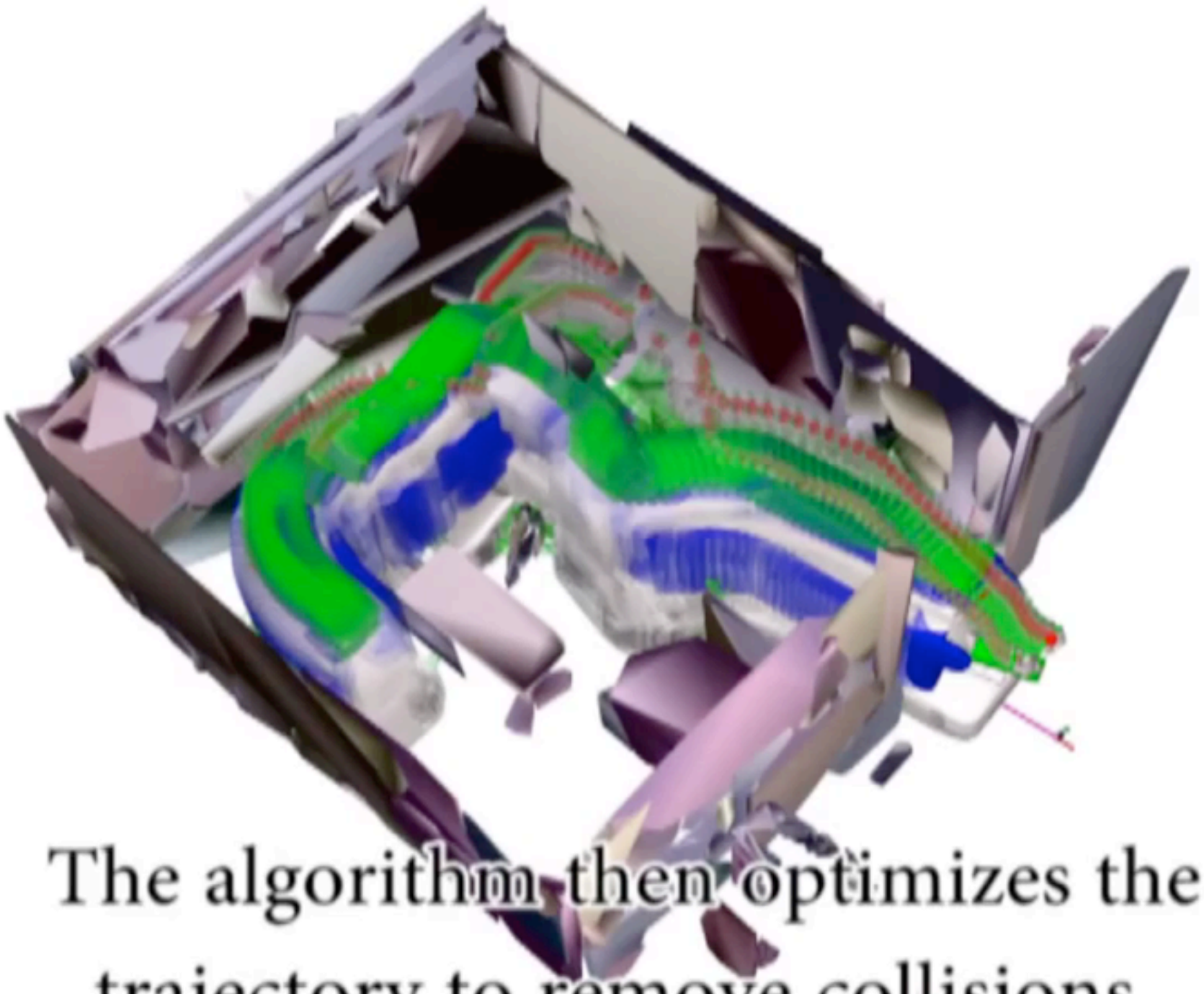


Tuesday, November 29, 16

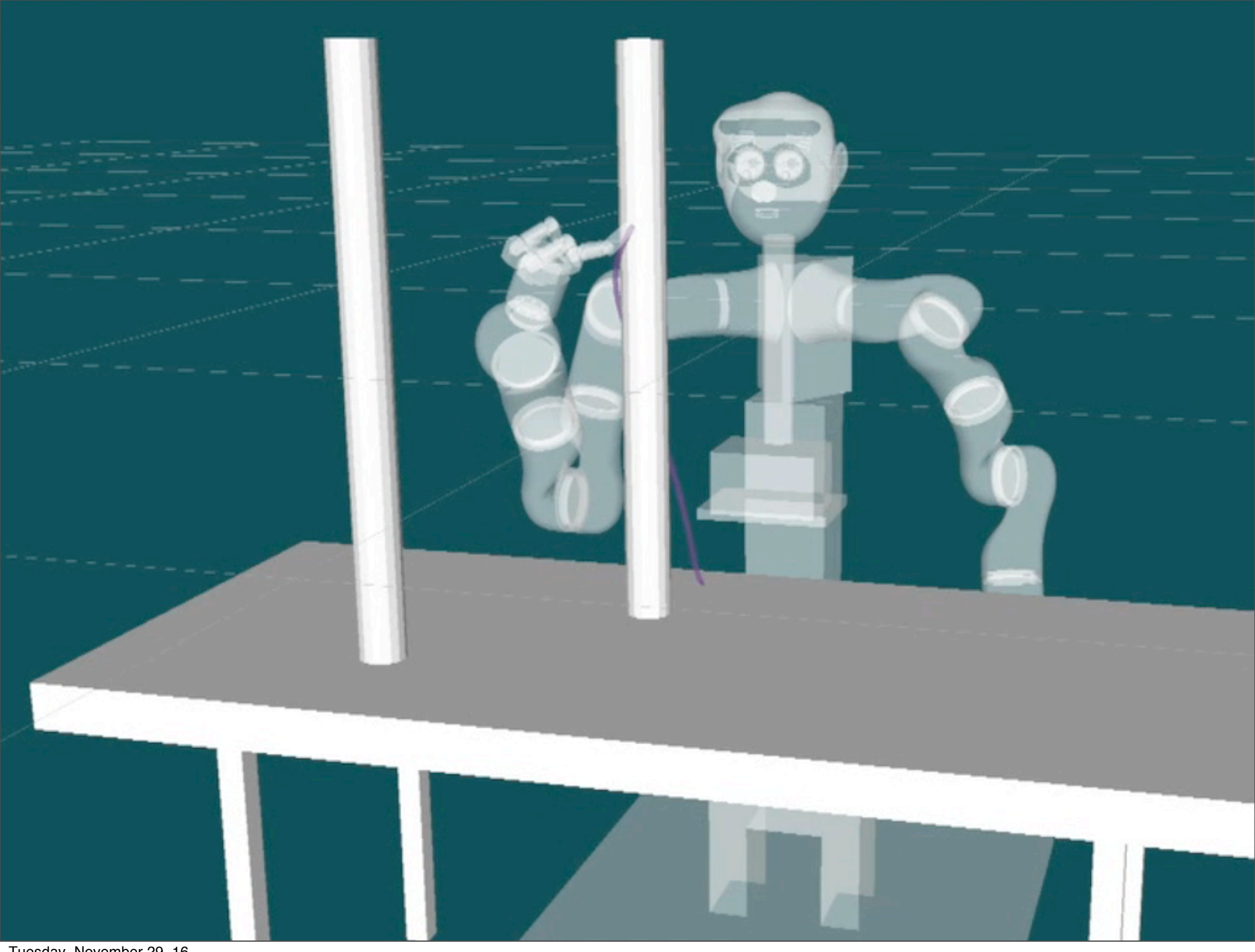

Kalakrishnan et al. 2011

Berkeley Trajopt 2010

Schulman et al.



The algorithm then optimizes the trajectory to remove collisions.

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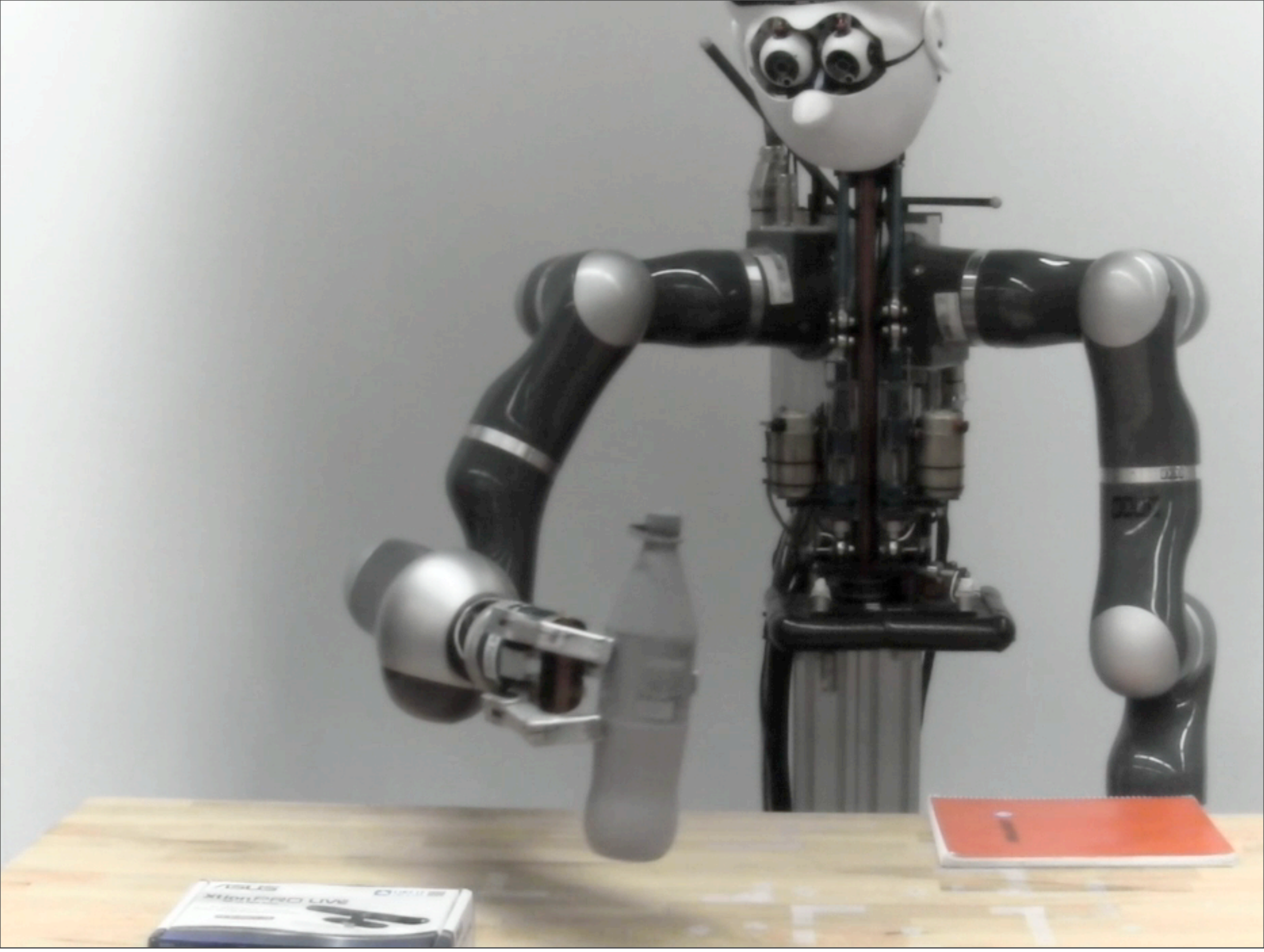

References

- Math for Intelligent Systems lectures:
  - http://www.nathanratliff.com/pedagogy/mathematics-for-intelligent-systems
  - Especially Multivariate Calculus II. Homework 6 of the U. Stuttgart lectures is a tutorial on the material.
- Advanced Robotics lectures:
  - http://www.nathanratliff.com/pedagogy/advanced-robotics
  - Especially Nonlinear Optimal Control: Reductions to Newton Optimization