

How Shall We Learn How to Learn How to Grasp

Benjamin Kuipers
University of Michigan

Abstract for the ICRA 2010 Workshop on
Representations for Object Grasping and Manipulation

Abstract

Decades of work by many brilliant researchers have gone into the problem of how to perceive an object and use a robot hand to grasp it effectively. Although we have seen many different kinds of progress, the problem has not been solved.

Perhaps, by observing the most powerful learning agent the world has ever known, we can obtain new insights into how a robot can learn the important skill of grasping from its own autonomous experience.

When investigating how humans and robots could build useful cognitive maps of large-scale space from autonomous exploration, we found that a hierarchy of different representations for space (which we call the Spatial Semantic Hierarchy) supports robust and flexible learning and effective navigation, even in the face of incomplete knowledge and limited perceptual and computational resources. We conjecture that similar semantic hierarchies can support learning about objects and actions, including the distinguished action of grasping.

Bio sketch

Benjamin Kuipers joined the University of Michigan in January 2009 as Professor of Computer Science and Engineering. Prior to that, he held an endowed Professorship in Computer Sciences at the University of Texas at Austin. He received his B.A. from Swarthmore College, and his Ph.D. from MIT. He investigates the representation of commonsense and expert knowledge, with particular emphasis on the effective use of incomplete knowledge. His research accomplishments include developing the TOUR model of spatial knowledge in the cognitive map, the QSIM algorithm for qualitative simulation, the Algernon system for knowledge representation, and the Spatial Semantic Hierarchy models of knowledge for robot exploration and mapping. He has served as Department Chair at UT Austin, and is a Fellow of AAI and IEEE.