Robot Learning
Organizers & Chairs: Chris Atkeson, Stefan Schaal

Real-Time Robot Learning With Locally Weighted Learning

S. Schaal[1], C. G. Atkeson[2] and S. Vijayakumar[3]
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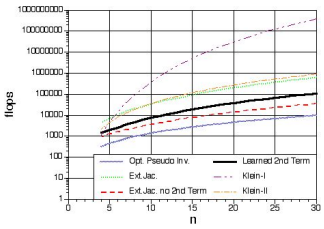
- How can we achieve real-time learning for high-dimensional robot systems?
- Spatially localized nonparametric neural networks offer a powerful approach to robot learning based on sound statistical principles, either as memory-based or non-memory-based algorithms
- Real-time learning was demonstrated for the task of devil-sticking, pole-balancing, and inverse dynamics learning with an anthropomorphic 7DOF robot arm
- Locally weighted learning offers one of the most powerful approaches to real-time robot learning

Inverse Kinematics for Humanoid Robots

G. Tevatia and S. Schaal
University of Southern California

- Existing Extended Jacobian Methods (EJM) computationally too expensive
- Most efficient version of EJM with comparable performance developed
- Compared with various algorithms for computational complexity
- Real time implementation on a 30 DOF humanoid robot feasible



Computational complexity of various algorithms

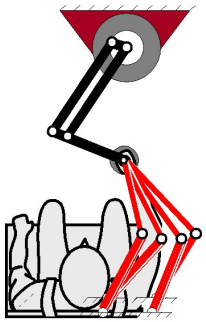
Q2: Memory-based active learning for optimizing noisycontinuous functions

Andrew W. Moore[1 2], Jeff G. Schneider[1 2], Justin A. Boyan[1] and Mary S. Lee[2]
[1]Carnegie Mellon University and [2]Schenley Park Research Inc.

Robots can teach people how to move their arm

F. A. Mussa-Ivaldi and J. L. Patton
Northwestern University

- Model: linear combination of arm-&-controller primitives
- Calculates a subject-specific,
- The subject grips a planar, 2-degree-of-freedom robot
- Implicitly learns motions after the force field is removed



Towards Programming Tools for Robots That Integrate Probabilistic Computation and Learning

S. Thrun
Carnegie Mellon University

- Making robot programming easier
- Integrating learning and probabilistic computation into C++
- Enormous savings when developing robot software
- Learning can drastically speed up robot programming