

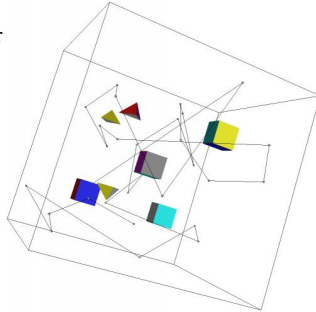
# Path Planning

## Chairs: Greg Chirikjian, Zvi Shiller

### Randomized Planning for Short Inspection Paths

T. Danner and L. Kavraki  
Rice University

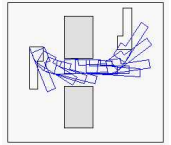
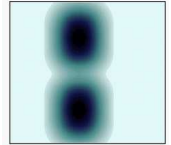
- Path planning for mobile observer robots
- Inspection paths for known environments
- Visibility constraints on range and incidence
- Implementation results in two and three dimensions



### A new potential field method for robot path planning

Yunfeng Wang and Gregory S. Chirikjian  
The Johns Hopkins University

- Path planning of non-spherical single body robots.
- Model the artificial potential field using heat transfer with variable thermal conductivity.
- Propose a path optimality method using the concept of heat resistance.
- Reduce a search on  $Rn \times SO(n)$  to one on  $Rn$  followed by a search on  $SO(n)$ .

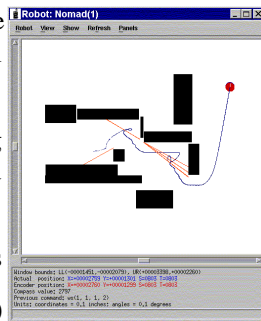


### Virtual Obstacle Concept for Local-Minimum Recovery in Potential-Field Based Navigation

Liu Chengqing<sup>1</sup>, Marcelo Ang Jr.<sup>1</sup>, Hariharan Krishnan<sup>1</sup> and Lim Ser Yong<sup>2</sup>

<sup>1</sup>National University of Singapore and <sup>2</sup>Gintic Institute of Manufacturing Technology

- Local minima problem in reactive motion planning using potential field
- Virtual obstacles created during encounters with concave-shaped obstacles
- Heuristics for getting out of traps
- Simulation results on Nomad 200



### Obstacle Traversal for Space Exploration

Zvi Shiller  
University of California, Los Angeles

- Traditional obstacle avoidance fails to climb over obstacles when necessary.
- A deterministic traversability measure is introduced that considers safe speeds along the terrain.
- The optimal path is found by a global optimization that considers robot dynamics and terrain topography.
- The optimal traversal path is generally safer than the shortest path.



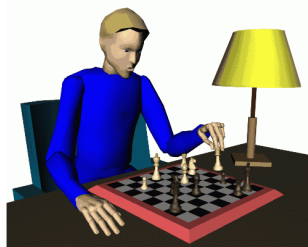
### RRT-Connect: An Efficient Approach to Single-Query Path Planning

J. J. Kuffner Jr.<sup>1</sup> and S. M. LaValle<sup>2</sup>

<sup>1</sup>Stanford University and <sup>2</sup>Iowa State University

- Practical search of high-dimensional C-spaces
- Randomized approach combining bidirectional RRTs & greedy heuristic
- Experiments include interactive task-level character animation
- Fast, general technique

### Human Arm (7 DOF)



### ERPP: An Experience-based Randomized Path Planner

S. Caselli and M. Reggiani  
Universit di Parma

- multiple planning tasks in the same environment often needed
- heuristic planner & random competition, exploit experience
- remarkable reduction in planning time and variance vs. RPP
- benefits of combining potential field and roadmap

