Robust Task and Motion Planning Over Simple Boundary Interactions

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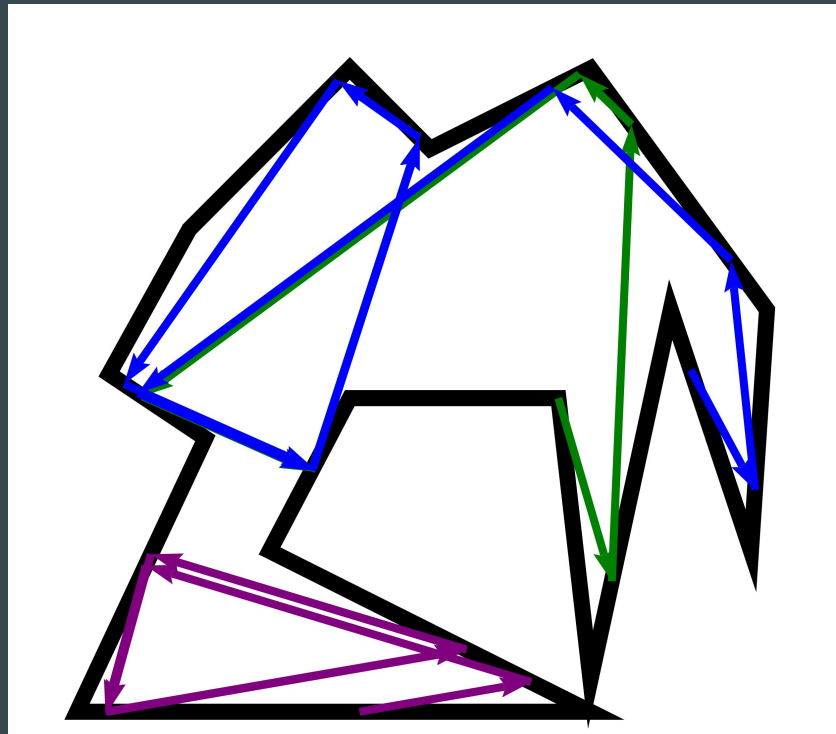
RSS Workshop: Robust Task and Motion Planning

Planning Over Boundary Interactions

Assume robot moves in straight lines.

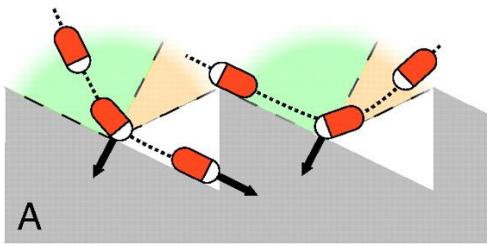
We can only control reorientation when it encounters a boundary.

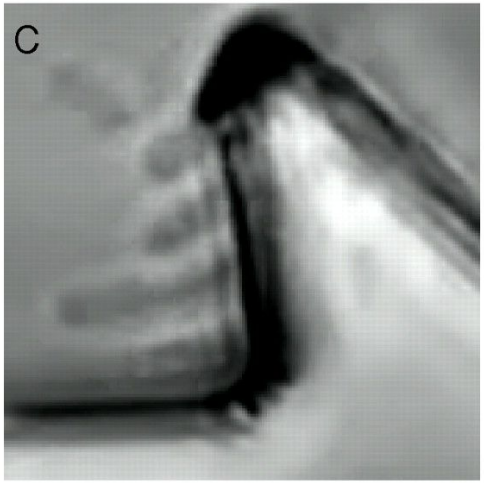


What Tasks Matter?

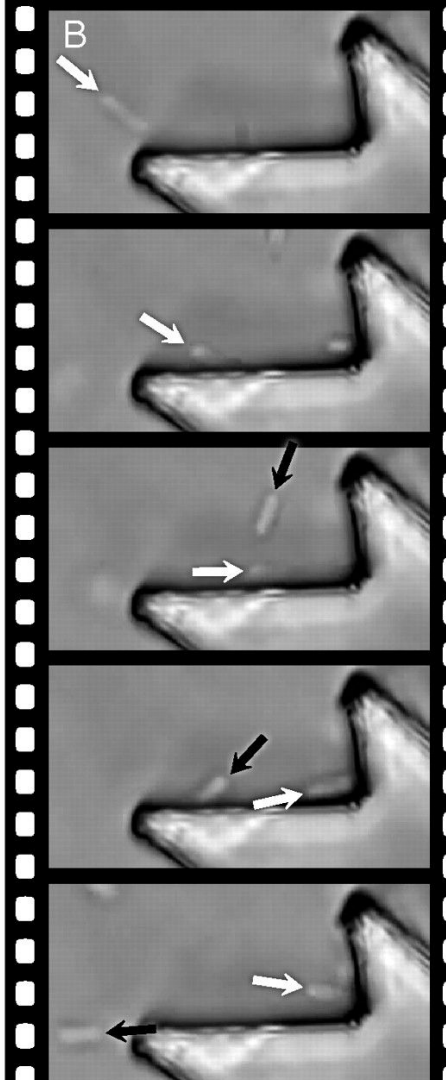
Flickr

China daily





Bacterial Ratchet Motors, Di Leonardo et. al, PNAS 2010



Our Contributions

- Use visibility / geometry to discretize space of trajectories
- Compute properties of dynamical system
  - uncertainty-reducing transitions, limit cycles
- Combine discrete / continuous reasoning in task specifications and planner

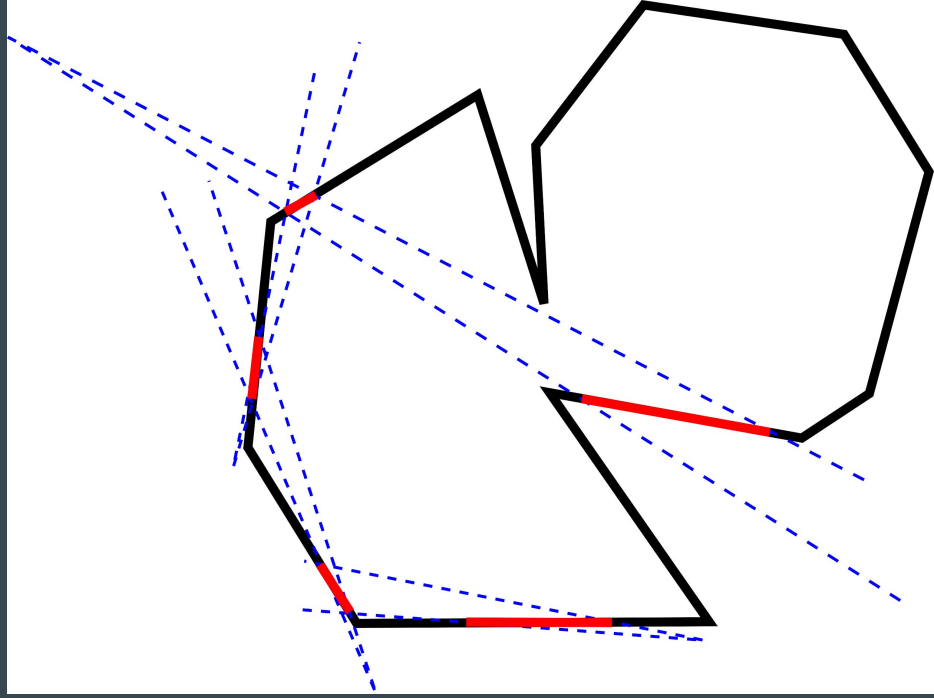
Specification Examples

“do X task (navigate, patrol, visit waypoints) with...”

- As simple a strategy as possible
- As robust a strategy as possible
- As few bounces as possible

Approach

- Discrete search
- Heuristics guide search
  - Ex: robustness
- Accumulate constraints
  - Ex: number of required bounce rules



Many open questions and low-hanging fruit!