Leveraging Experience in Lazy Search

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Motion Planning on Roadmaps



Piano Movers' Problem



Shortest Path on a Roadmap

A* Search is Vertex Optimal

[Hart et al. 68]



But is this what we *really* want in motion planning?

Edge Evaluation Dominates Planning Time



(Schulman et al. '14)

Intersect swept volume with obstacles



Hauser, Kris., Lazy collision checking in asymptotically-optimal motion planning. 2015

Is there a search algorithm that minimizes the number of edge evaluations?

LazySP

[Dellin and Srinivasa, 2016]

First Provably Edge-Optimal A*-like Search Algorithm





















































Which edges do we evaluate?

Edges that eliminate a lot of paths



Check doors (Centrality)



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Prioritize narrow doors (Likelihood)



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Prioritize narrow *corridors* (Correlation)



Key Idea:

Leverage Experience by Imitating a Clairvoyant Oracle

Optimal set of edges to eliminate all shortest paths?











Learned v/s Uninformed Selectors



Learned v/s Uninformed Selectors



Posterior and Centrality are important features



Key Takeaway:

Experience is essential for making motion planners faster