

RBE 550 Motion Planning

Assignment 7 – Paper Summary

The paper, Dynamic Region-biased Rapidly-exploring Random Trees, explores a variation of the standard RRT sampling-based planner method.

This variation guides the RRT exploration by dynamically moving sampling regions along an embedded workspace topology. These sampling regions are in turn dynamically controlled via a greedily biased method sampling unexplored regions. Their approach uses a Reeb graph as the embedded topology which is precomputed as a retraction of the free workspace. This initial topology shrinks possible paths and points down to a 1-dimensional skeleton.

Once the query is set, the embedded topographical Reeb graph is further reduced to the directed subset graph. The paper itself refers to this subset as a Flow graph, which focuses on the shortest path towards nodes nearest the query goal.

The final step is the actual region-biased RRT algorithm, which takes the already calculated topography to traverse the regions. The RRT algorithm is lighter computationally speaker for this pre-generated topography, however, this seems likely to interfere with the beneficial nature of RRT as a method of planning that can handle dynamic environments. Unless the topography generation stage is faster than it appears, this method seems slow to respond to a changing environment or obstacle set.

However, despite the concerns for dynamic environments, the success of the variant appears generally much better than standard RRT and a number of other variants, and appears quite capable of handling nonholonomic problems.