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# Class: RBE 550

# Assignment: Transmission

**Task**

Our task was to create an RRT motion planner to remove the main shaft from a transmission case without causing collisions.

**Approach**

Our approach here was to use Matlab to build up the model as a serial robot with DH parameters. In working with the already made RRT planner, we wanted to introduce an RRT\* planner to see if we could get better functionality as well as lessen the occurrence of not finding a viable path.

**RRT\* vs. RRT**

After running a few iterations of the RRT planner, we wanted to try the RRT\* planner method in the hopes of cutting down the opportunity of not finding a viable path. While similar to RRT, RRT\* also grows a tree incrementally. However, it considers rewiring the tree by checking if a new path between nodes has a lower cost than the existing path. If so, it rewires the tree to use the lower-cost path. Now this does come at a cost in itself, as RRT generally has a lower computational complexity compared to RRT\* because it doesn't perform the additional step of rewiring the tree.

**Findings:**

Completeness and Optimality

* RRT\* (like RRT) is also probabilistically complete. It will find a solution if one exists in the search space. The re-wiring step enhances the exploration process, but it doesn't change the completeness property.
* RRT\* aims for optimality by considering the cost of paths in the re-wiring step. It actively seeks to improve the solution over time by rewiring the tree to use lower-cost paths. Therefore, RRT\* is more likely to find near-optimal solutions compared to RRT. If we run RRT\* we have seen completions of removing the shaft in 21 steps as opposed to the 35 steps we saw with RRT (see image below).

A screenshot of a computer program

Description automatically generated

-Figure 1: RRT –

A screenshot of a computer

Description automatically generated

-Figure 2: RRT\* -

A diagram of a mechanical model

Description automatically generated

-Figure 3: Generated Path-