**CPSC 8810: Motion Planning - Final Project Report**

**Project Title:** Nonholonomic Motion Planning for a Car in 2D Off-road Environments using RRT\*.

**Overview of the Project:**

The objective is to plan the motion of a car in 2D environment that is not confined to the roads,i.e an off road environment. The car is considered to be a Dubins Car which is subject to non-holonomic constraints where RRT\* algorithm is implemented for path planning, which can effectively generate paths to navigate through the 2D environment.

**Description of your implementation:**

**Status of Code:**

The RRT\* algorithm is created and integrated to run with the 2D environment. The code performance is compared with the other available path planning algorithms to find out the which is the optimized algorithm for Dubin’s Path planning.

The RRT\* algorithm runs the code and delivers an optimized path which the vehicle should be taken into consideration.

**Usage of Third-Party Library:**

For the baseline version of the project, we have considered the environment and utility function code from this below Git path -[**https://github.com/jhan15/dubins\_path\_planning**](https://github.com/jhan15/dubins_path_planning)

The other algorithms in the existing directory of the Git folder will be used for comparison purpose.

**Results:**

**Future Work:**

1. **Multi-Objective optimization –** RRT\* implementation should have multiple optimization constraints – such as Time to reach the goal, distance traveled and the execution time for algorithm.
2. **Dynamic Obstacle Avoidance -** To make the algorithm capable enough to handle dynamic obstacles into the environment as RRT\* is capable for adapting to changing environments.
3. **Non-Holonomic Variants Experiment -** We have planned to implement the similar algorithm in the Reed Shreep Car to understand how the Reverse direction have a positive impact on the final Trajectory generation.
4. **Extend to 3D environments –** Update the code to include the 3D space for the environment and expand the tree accordingly.