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Summary

The Path Planning code was developed based on OMPL (Open Motion Planning Library) [2]. This would be optimized continuously and applied to the ROS.

What FarmVroong completed this week:

- Build Path Planning code.

OMPL is a library containing various motion planning algorithms. Our Path Planning is a method that considers off-road environments based on a sampling-based method, BIT*. Therefore, the BIT* paper [1] and OMPL library were referenced to develop our code. The following topics describe the characteristics of our code.

- ◆ Set the configuration space.

In the process of SLAM, the environment around the vehicle is recognized using an RGB-D camera and a GPS. A three-dimensional map created in this process is created. To plan the optimal trajectory, the map is reduced to two dimensions. The two-dimension map is stored as .ppm file because the format allows very little information about the image besides basic color. When sampling the state in the map, the state is matched to a pixel in the file. The point classifies the state with the RGB data of the pixel. White, gray, and black represent free space, unknown space, and obstacle space, respectively.

- ◆ Apply stable paths.

The data of stable path is collected during the SLAM process with GPS coordination. The points are mapped to a ppm file that represents a map. The points are marked yellow color. Therefore, when load a ppm file, the planner recognizes stable path.

- ◆ Optimize path planning.

The basic path planning algorithm determines the shortest distance as the optimal path. However, this path planner considers driving stability and sufficient distance from obstacles. Therefore, the cost to determine the optimal path is calculated by considering three requirements.

- ◆ Export result.

The path planning result is stored in the tree graph data structure. The data is exported to the two-dimensional matrix representing coordinates of configuration space. Moreover, the result could be marked in red on the ppm file.

Things to do by next week

- Make joystick to control the car
- Make jetson board GUI for the package

- Develop the path planner

References

- [1] J. Gammell, S. Srinivasa, and T. Barfoot, “Batch Informed Trees (BIT*): Sampling-based Optimal Planning via the Heuristically Guided Search of Implicit Random Geometric Graphs.”, 2015.
- [2] M. Moll, “The Open Motion Planning Library,” Kavrakilab.org, 2013. <https://ompl.kavrakilab.org> (accessed July 8, 2022).