Novelty Description

The novelty requires the robot car moves onto a platform through a slope. In real life, autonomous cars may often need to navigate between places with different heights, such as driving onto a slope. However, the baseline algorithm cannot handle such situations effectively.

Since the sensor of the robot car is lower than the slope, even though the global planner can give a path at the beginning, the local planner will treat the slope as an obstacle when the sensor detects it, which makes the robot refuse to move onto the slope.

The problem is that the sensor can only detect objects at a certain level, so that the height and shape of each object are unknown. This makes it difficult to decide if an area is passable or not.

To solve the problem, it is ideal if we can get three-dimensional information from the environment. It may also help if we make the robot move closer to the obstacle when there is a path given by the global planner. The robot can then act accordingly if there are any changes on the local map.

In summary, the baseline algorithm has a decent performance when the path does not involve a variance in height, but it completely fails in tasks with such novelty introduced.

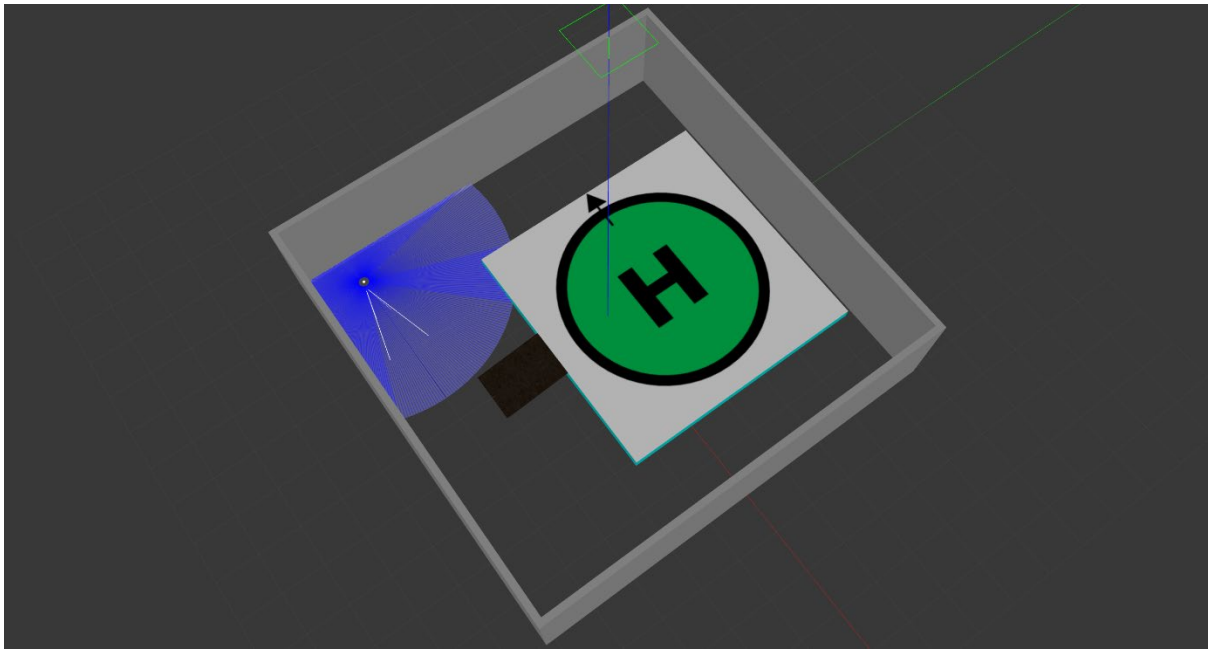

Image 1: Starting position

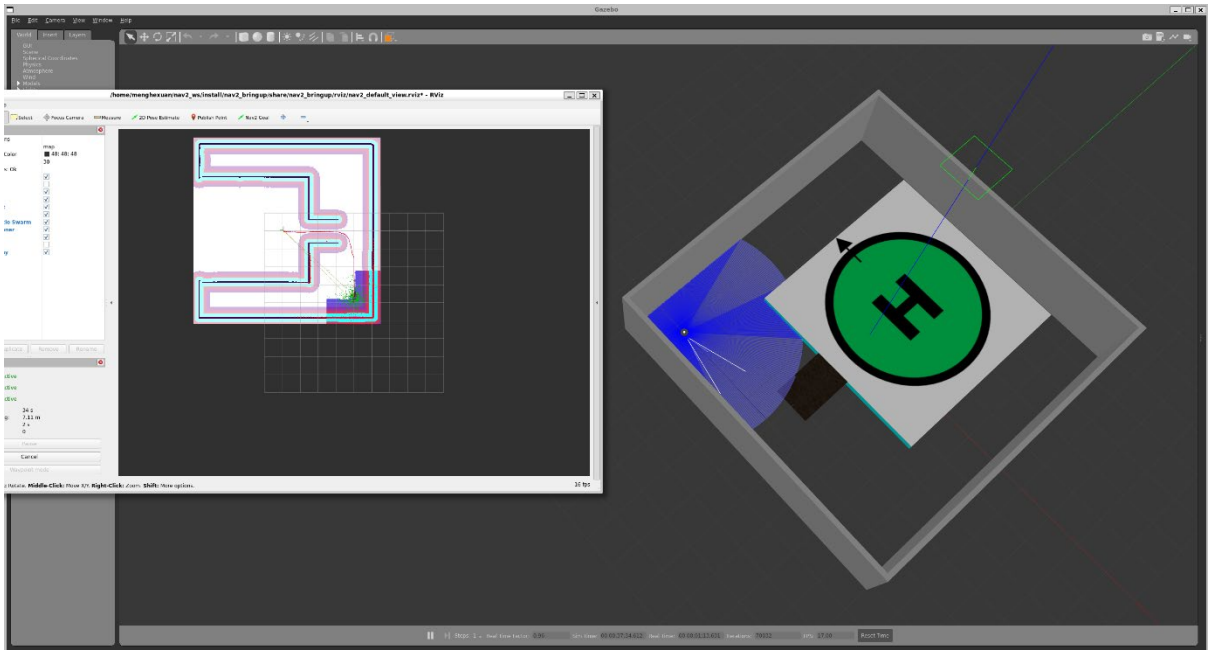

Image 2: A valid path exists at the beginning of navigation (red line)

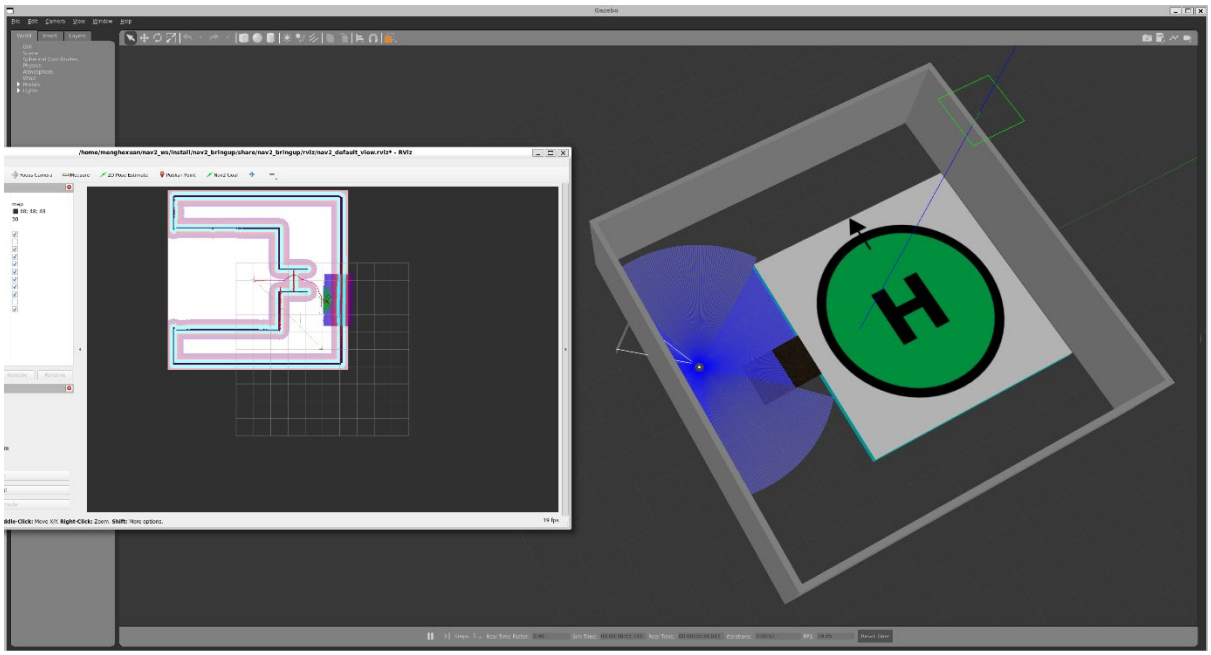

Image 3: Path blocked by newly detected obstacle (the slope)

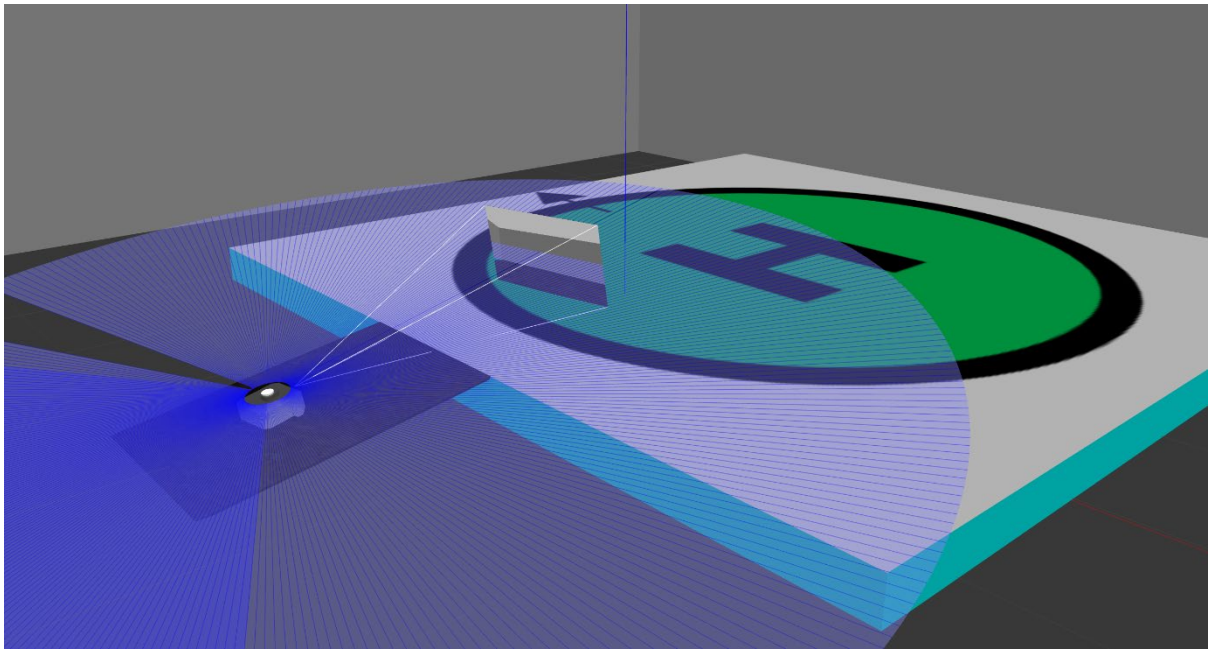

Image 4: Robot on the slope (using teleop_keyboard)

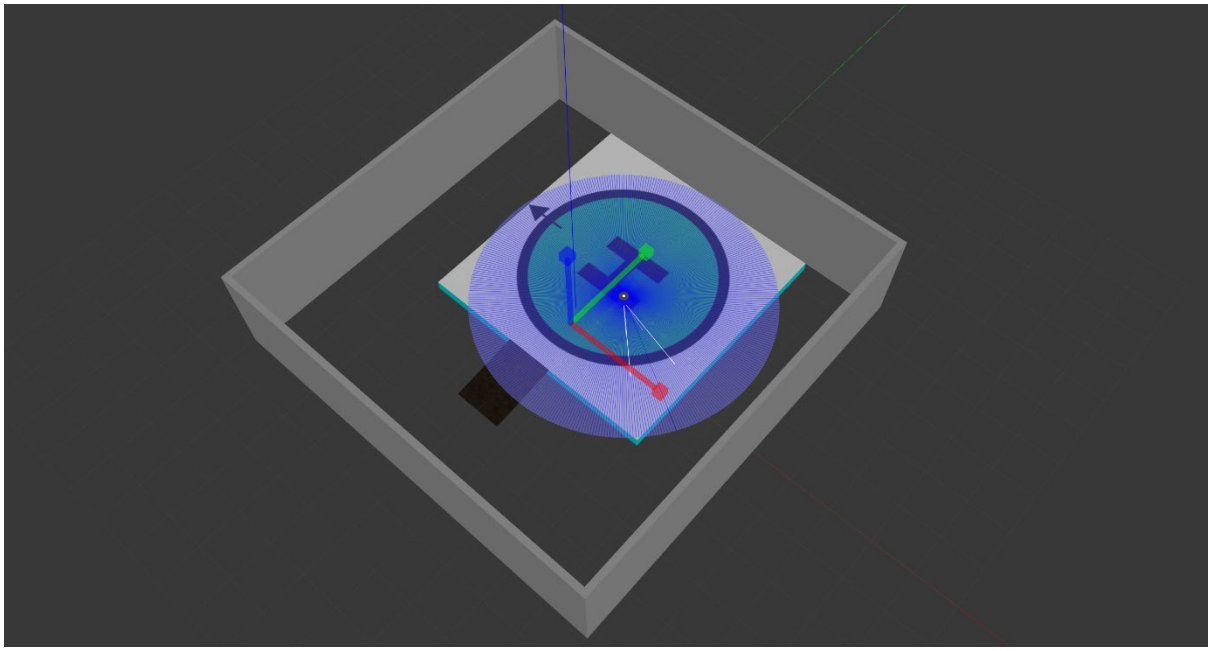

Image 5: Robot on the platform (using teleop_keyboard)