Gauntlet Challenge

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1   Introduction

The goal of this challenge was to have our NEATO autonomously traverse across an obstacle course by using LIDAR data to create a gradient plot of that course (where every obstacle was a source and the destination, the Barrel of Benevolence or BoB, was a sink).

In order to complete this challenge, we first scanned the obstacle course from the origin, and used a RANSAC algorithm to determine where the BoB was located. Once successfully locating the BoB and getting an estimate on its radius and location, we removed those points from the dataset of scanned points, and used a different RANSAC algorithm to locate the endpoints of all the obstacles which, luckily for us, could be represented by linear lines.
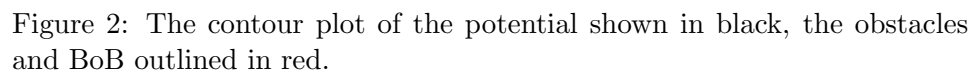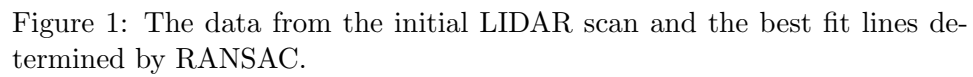
After successfully extrapolating the data points into functions, we found the potential and gradient grids of the gauntlet, and used the gradient information to guide our NEATO through the obstacle course. The strategy we used to move our neato was almost identical to the one we used in the flatland challenge: first, the NEATO would move forward for a short distance, then calculate the gradient at the point it is located, then turn to face the direction of the gradient, before moving forward again. This process would repeat until the magnitude of the gradient exceeded a certain number, indicating that the NEATO had reached the lowest point of the potential field, which in this case is where the BoB is located.

2   Data

The total amount of time it took for the NEATO to reach the Barrel of Benevolence was one minute. Our plots are on the following pages.

3   Video and Code

Click here!

Figure 1: The data from the initial LIDAR scan and the best fit lines determined by RANSAC.

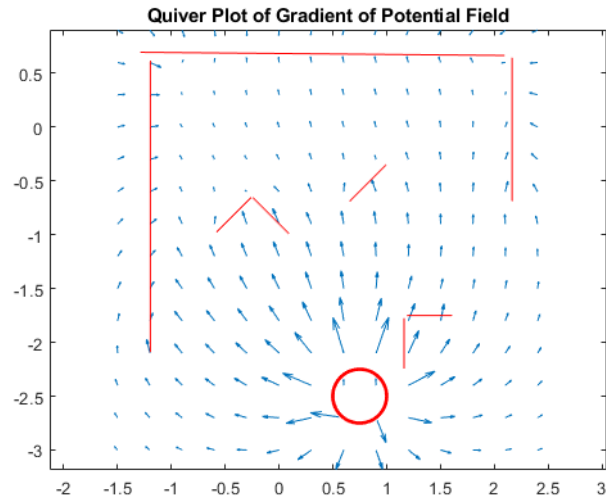Figure 2: The contour plot of the potential shown in black, the obstacles and BoB outlined in red.

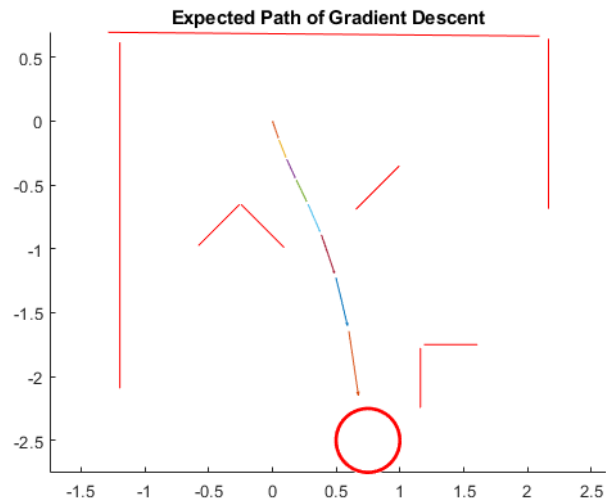Figure 3: A vector field showing the sinks and sources of the potential field.

Figure 4: The expected path of the NEATO.

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