QEA Module 3, Challenge 2: Mount Doom™

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1 Introduction

The purpose of this challenge was to explore optimization in the context of robotics. The challenge was to drive a NEATO as to find the local maximum of a surface using a gradient ascent algorithm. For reference, here is a video of the robot completing the challenge, and here is our github repo.

2 Methodology

2.1 Team structure

This project went pretty well for us. We mainly used the pair programming technique for most of it, partially because it is helpful, and partially because one of our computers wasn't working with Docker. This approach gave both people a good chance to actually write code, as well as debug code, and in the end, we both walked away with a lot of good, in depth knowledge.

3 Exercises

3.1 Exercise 1: Writing Pseudocode

Our approach was to use the gravity vector placed on the axes of the NEATO as the gradient vector. We take the gravity vector and project it into the x-y plane of the NEATO. This new vector is the direction that we want the NEATO to move. Next we find the angle between our current heading and the projected vector. We turn such that our heading is in line with the new projected vector. We then move forward a short distance, remeasure the gravity vector on the axes of the NEATO, and repeat this process until the projected vector is less than a threshold value.

Figure 1: Pictured above is a high quality, cinematic reenactment of our NEATO's ascent of Mount Doom. Leoneato Dicaprio plays our NEATO and Sir Iphone McKellen plays our phone.