CSCI545 Robotics Final Project Report
Robotic Motion Planning

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In a world gone mad, one project dared to impose its own brand of brutal justice on a world many thought too far gone to save.

I. Introduction

A. Background

Robots are no longer confined behind striped yellow lines with flashing lights to keep soft humans away from the moving parts. They are operate in busy hospital hallways, kitchens, and homes with pets, children, and clutter in a constant state of motion. As such, the ability to evaluate and interact with those dynamic environments is increasingly essential.

There are a number of possible approaches to this, many of which are strongly influenced by the risks of the environment, nature of the task, and the type of information to which the robot has access. If uncertain, should it simply stop and wait for instructions? Should it push through, trusting others to get out of its way? An industrial bot capable of ripping through a wall might have very different issues than a robotic vacuum which will at most scuff a floorboard.

B. Problem Description

Issues relating to navigation and motion run up and down the entire robotic stack. We chose to focus on the high-level planning aspects of the problem, particularly relating to issues involved in dynamic, noisy environments. Our primary approach was to explore, extend, and evaluate three broad categories of methods for navigating in a dynamic environment.

C. Robocode Environment

As our aim was to focus in on the planning and navigation algorithms, we chose an environment which allowed us to abstract and encapsulate many surrounding issues. The Robocode environment is a system designed for simulated robotic tank tournaments. It offers flexible sensor and control models and a relatively easily customizable environment.

Pieces: - sensor model - motion models (regular/advanced?) - environment (discretization?) - Bot coding issues - Threading for processing

Hm, how much to leave here versus individual sections?

D. Report Outline

In the following three sections, we discuss our efforts to explore this task using Potential Fields, Markov Decision Processes (MDPs) and reinforcement learning, specifically Q-learning.

II. Potential Fields

Discussion and plots...

III. Markov Decision Processes

Discussion and plots...

IV. Q-learning

V. Conclusion

To sum up...

A. Future work

VI. Acknowledgments

Our team would thank Franz Kafka, Alan Turing, and the Ghost of Christmas Past for their unwavering support during this project. We would also like to pour a drink for our homies in the ground.