1 Abstract

This is just the abstract, which explains what it is that this project is about.

2 Literature Review

2.1 Reinforcement Learning

2.1.1 Definitions

Agent Environment State Action Reward

2.1.2 Markov Decision Processes

2.1.3 The Bellman Equation

Equation that represents the value of being in a particular state, based on the reward given for being in that state and the value of the best possible adjacent state that can be reached by taking one action, usually multiplied by a discount factor. This results in a recursive equation, as the value of the state depends on the value of its surrounding states. Typically, one can start from the goal state and propagate the state values "backwards". .

2.1.4 Q Learning

Replace the state value function in the Bellman equation with the Q function. This can be interpreted as "action quality".

2.1.5 Q learning with neural networks

Instead of using a table to store the policy, the policy is "stored" in a neural network. This has consequences for stability.

3 Problem Formulation

The project has the following steps:

1. Perform a literature review on the topic of marine surface vessel modeling and control, as well as deep learning techniques used in tandem with control problems.
2. Set up a simulation environment for the surface vessel, incorporating difference levels of disturbances.
3. Set up a baseline using the established control algortihms
4. Apply machine learning (behavioural cloning or reinforcement learning) and compare them to the baseline

5. Analyse the performance of the machine learning controlelrs, compare the computation time (the expensiveness) between the two algrothms, and explore the stability consequences of using machine learning techniqes in control. machine learning