

Analysis of Geopolitical factors over Global Supply Chain using RL

Assignment 2

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1 Let's test your Driving Skills

Concepts Required: MDP, PPO, Car driving basic physics, Other RL Algorithms

As you people know, RL is widely used for automation of tasks in the real world. This includes, robotics, trading, recommendations, and also driving. Your task in this assignment is to model a driving environment, which is as follows -

1. The track is annular with a defined inner and outer radius. You are free to choose these values.
2. The goal is to make the car follow the circular track in minimum time possible.
3. The car can accelerate, decelerate, or continue moving with same speed.
4. The steering of car can be turned at any angle, $\delta \in [-90^\circ, +90^\circ]$.

The first step to model any environment requires establishing the states, actions, rewards, and transitions(dynamics). We can discuss your choices for these parameters personally, so you don't wander later.

[**Note:** Make sure that the physics employed is correct]

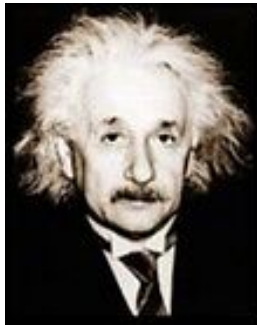
[**Hint:** Reward can be a function of the distance from the middle of the path and angle covered over the annulus]

The next step can be inheriting environment from OpenAI Gymnasium and modifying the standard functions, such as, *init()*, *step()*, *reset()* based on the use case. For more information, [you can look at this video](#).

The subsequent tasks for this assignment are -

- Figure out which RL models can be used for solving this problem. Try to be exhaustive by analysing model free, deep Q networks, off-policy, on-policy, Actor-Critic, etc. (This is not a Mutally Exclusive set but these are just for giving you thinking points).
Also, consider using *Proximal Policy Optimization(PPO)* for solving the problem because it has been used in the research paper implementation, so we will work over it in the future.
- Choose the best model out of these and state the reasons. Code it up, and try testing it on your environment. It's SUGGESTED that you take help of Youtube and articles as a resource, and not solve the problem by an LLM, because I reckon it's a cakewalk for ChatGPT or Claude.
- Rendering the driving might help you in debugging but you can also try simple graphics in python terminal for visualization.

[**Final Remarks:** This task is definitely not an easy one, so don't worry if you are not able to solve it completely by yourself. We can discuss the problems you are facing. I have left the physics modelling to you because it's our job as researchers to build a simple simulation of the real-world physics to begin with. So, move ahead one step at a time.]



IF WE KNEW WHAT IT WAS WE
WERE DOING, IT WOULD NOT BE
CALLED RESEARCH, WOULD IT?

- ALBERT EINSTEIN