Auto Skyrim

In this project, we use Reinforcement Learning to train planes to fly in an environment.

Objective:
This project aims to teach the RL Agent to find a way and travel towards the goal in 3D space while avoiding obstacles. The Agent will have five actions – Left, Right, Up, Down, and Throttle (continuous), and the final objective is to go through the checkpoints and reach the landing pad. Similar trained agents can be used for automating RC Planes used for various purposes like farming.

Related Work:

Similar work has been done by Immersive Limit[3], featured on the Unity3D ML Agents page[2]. Here the Agent flies freely in space while going through the checkpoint rings. In addition, we attempt to make the Agent completely Autonomous by also learning to take off and land on the target landing pad.

Technical Outline:
The Environment is a single Agent Environment where the Agent travels in 3D space to reach the goal and land safely. The Agent will have the location of the landing pad and will use raycast to determine nearby obstacles. We will use DQN and double DQN techniques to train the Agent.

We will scale the reward between -1 and +1. We will be providing positive rewards when the Agent moves closer to the goal and when it goes through checkpoints. Similarly, we will provide negative rewards when the plane hits an obstacle and crashes.

The Environment will be made in Unity3d and controlled using ML-Agents[2] Python-API[1]. We will be using PyTorch as the deep learning framework and tensorboard for visualization.
We will try to go in phases to make the learning and debugging process easier in case of issues. For the first phase, the start point and landing pad will be in a straight line with checkpoint rings and no obstacles. Later we will add obstacles and increase difficulty in subsequent phases.

Reference:
[1] Python-API [https://github.com/Unity-Technologies/ml-agents/blob/main/docs/Python-API.md]
[2] Unity ML-Agents [https://github.com/Unity-Technologies/ml-agents]
[3] Related Work [https ://www.youtube.com/watch?v=vkFhp30XzGk]