

Training a simulated drone with deep reinforcement learning

Student



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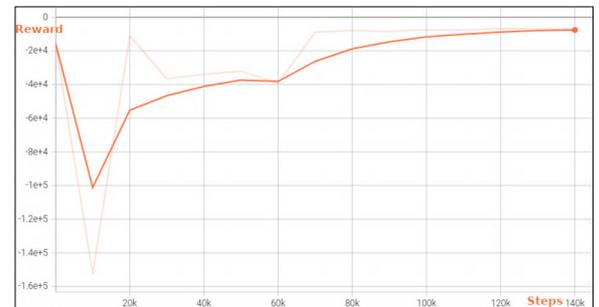
Definition of Task: This project aims to address the challenge of controlling a first-person view drone (FPV drone) using deep reinforcement learning. Current research in this area requires specialized hardware and complex algorithms, often conducted by specialized research teams. The project is designed to solve relatively simple tasks and explore the possibilities of deep reinforcement learning using commodity hardware and standard software. The main task involves training a simulated drone to start, land, and fly to a predefined location. The project emphasizes simplifying the "Learning to Fly" task by exploring options to scale down the problem and make it more manageable.

Approach / Technology: The project employs a comprehensive approach and utilizes various technologies to develop an autonomous drone delivery system. The primary focus is on applying Soft Actor-Critic (SAC), an off-policy reinforcement learning algorithm, to enable the drone to autonomously perform the tasks. The use of Unreal Engine 5 in combination with AirSim/Colosseum provides a simulated environment for training and testing the drone's behavior. As reinforcement learning framework, TensorFlow Agents is employed. The development environment is structured around Visual Studio Code, Git, and a self-hosted GitLab instance, emphasizing open-source tools. The project follows agile methodologies, specifically Scrum, enabling to react quickly to unexpected events.

Result: Key results include the successful implementation of Soft Actor-Critic (SAC) for training the drone to perform the required tasks takeoff, landing and navigating autonomously. The setup guide provided in the report helps other

students and interested parties to quickly get started with the Unreal environment. Furthermore, a detailed and easy-to-understand explanation of the soft actor-critic algorithm is included.

Learning curve of the start policy
Own presentation



Flying drone in an Unreal Engine 5 environment
Own presentation



Advisor
Prof. Dr. Marco
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Subject Area
Miscellaneous