Reinforcement Learning in Video Games with Computer Vision

Short Summary

With this project, we intend to utilize various techniques from reinforcement learning and computer vision to train an agent to achieve the capability of playing a video game autonomously without human intervention. We will explore multiple video game titles across different genres on platforms such as desktop and mobile. We will select a single game as the basis for training the agent based on feasibility, time constraints, and other factors.

Objective

With our agent, we aim to achieve real-time decision-making capabilities and high in-game performance by relying on gathered visual data.

Methodology and Evaluation

To approach this task, we plan to use a combination of techniques from reinforcement learning and computer vision such as Deep Q Networks, epsilon-greedy, and replay buffer for agent training, Convolutional Neural Networks, and bounding box techniques to obtain the necessary visual data. We will also modify or tune the reward structure and hyperparameters in order to optimize the effectiveness of our agent throughout the duration of the project.

Evaluation

We will be designing a robust reward system and use the cumulative reward as a point of measure for the effectiveness of the agent. The reward system will encourage the agent to perform desired actions and discourage undesired actions. Examples rewards may be positive rewards for a good score, and negative rewards for a mistake in judgement.

Environment

We will most likely use the game environment itself represented by visual data provided by computer vision techniques as the environment for the agent. This data may be represented in data structures such as matrices.

References

- https://d2l.ai/chapter_computer-vision/bounding-box.html
- https://roboflow.com/
- PyTorch documentations
- Numpy documentations
- Any future additional literature/resources we may need to complete the project