F1 Intelligent Racing

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1 Project Description

2 Project Design

Project design: general architecture, components, existing components, APIs. This can also be the submitted design with updated changes.

The core simulation environment is implemented in Python by Tomas Brezina, whose repo provides a track generation as well as a evolutionary algorithm that mutates agents based on a neural network. The `core.py` file provides classes for managing the track, cars, checkpoints, and collision detections. The `Simulation` class orchestrates the behavior of cars, updates their positions, and handles the checkpoint tracking.

The reinforcement learning agent is contained in the `rl_agent.py` file and contains the `RLAgent` class, which is used to train the agent and feed the evolutionary algorithm with the best agents. The agent objects are stored and rendered based on the configuration given in the entry point of our project in the `__main__.py` file.

There are several existing components that we have utilized in our project. We used `pyglet, NumPy, PyTorch, and Matplotlib`. Pyglet was used for rendering the simulation environment so the graphics and also handling the user input events.

3 Implementation

3.1 Reinforcement Learning: Deep Q-Learning

4 Testing

5 Analysis

6 Github Repository

F1 Racing Optimal Path:
Link: https://github.com/Krishnanshu-Gupta/F1-Racing-Optimal-Path