Self-driving Car in Video Game using Deep Learning Approach

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Abstract

Developing self-driving cars in the real world is challenging due to the large environmental variations and the rarity of some critical situations for testing reliability. Moreover, it involves high costs and risks. The model can then perform image-based autonomous driving in the game. Additionally, to visualize the data, the project designs a GUI that allows the model to provide driving behavior analysis results for each frame rate. Finally, in Grand Theft Auto V, the vehicle can achieve an accuracy of over 70% when driving on Highway under sunny weather at noon.

Introduction

Training autonomous driving models in the real world is costly and time-consuming, due to the need for expensive hardware and the inherent safety concerns. [2] On the other hand, video games provide a simulated environment for model training and testing that is both cheaper and safer.

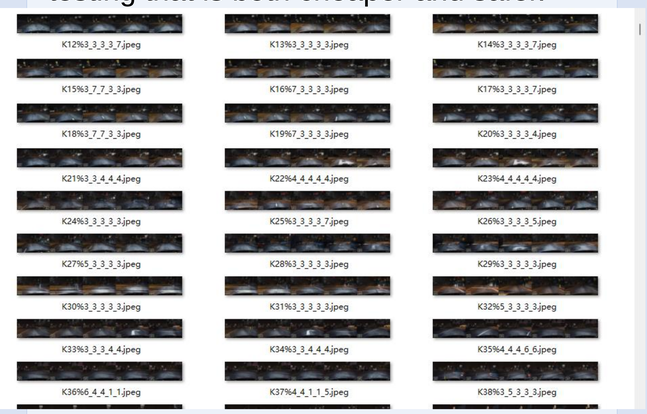

Figure 5: Dataset

Methodology

Game Tracking

The program records the user-specified window and captures real-time images and control data while the user drives the car.

Model Training

The modified Inception V3 model is used to train the model on the generated data.

Evaluation and Testing

The program can capture the game window content in real time and use the model to predict driving behaviors. However, due to hardware limitations, the model also provides a GUI that allows users to see more detailed results of each prediction step.

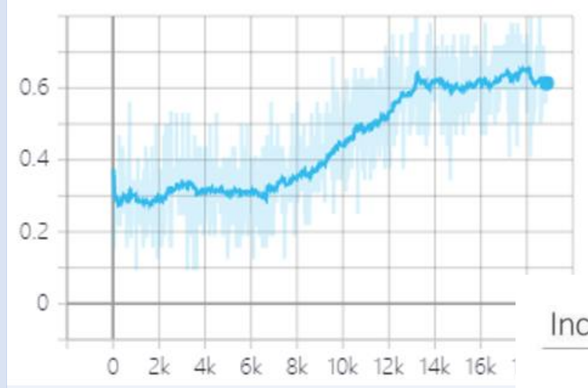

Figure 2: Accuracy in training

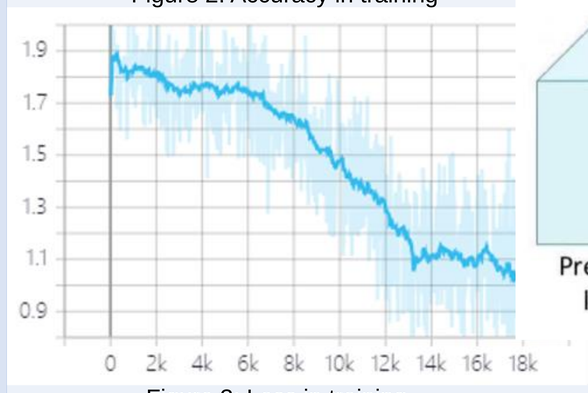

Figure 3: Loss in training

Result

The best way to discuss the result is showing!

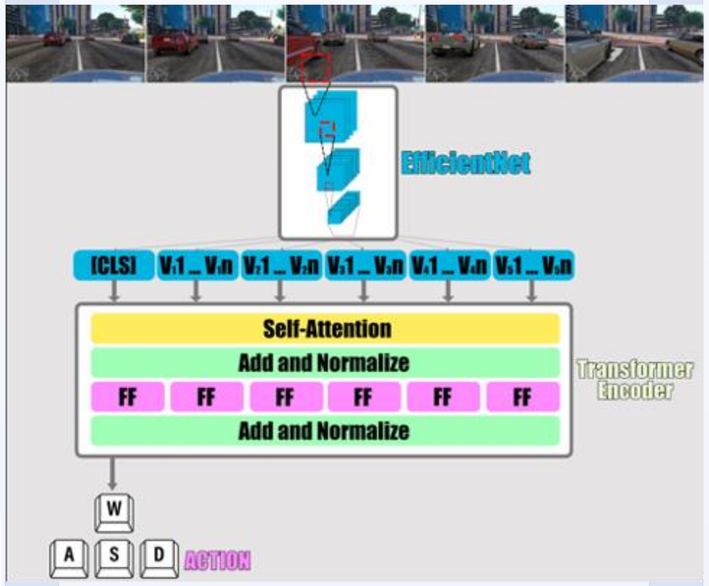

Figure 1: Project Structure

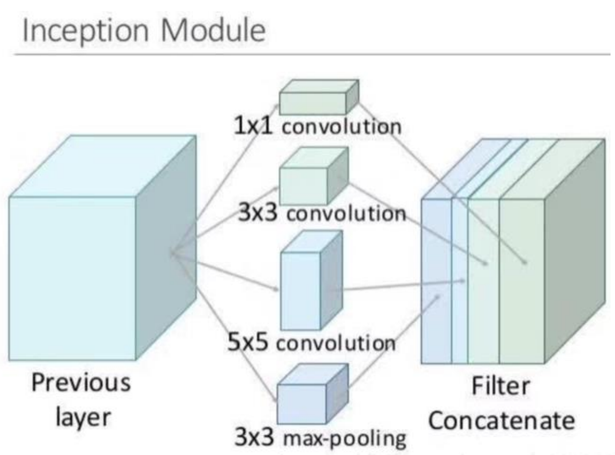

Figure 6: Inception V3

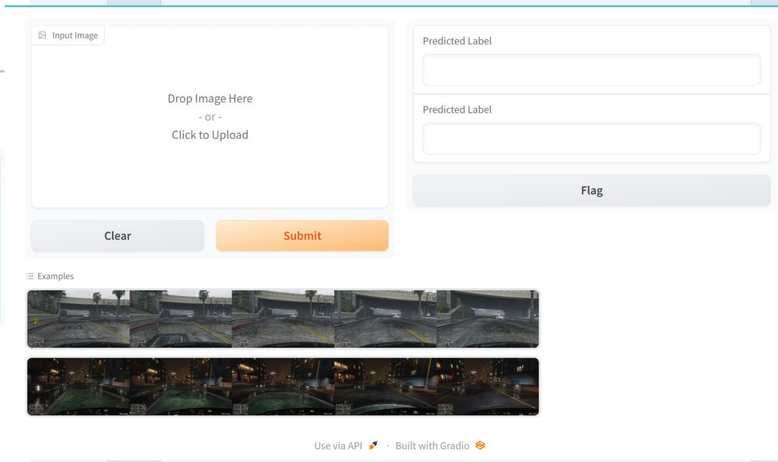

Figure 4: GUI

Discussion

In summary, the project achieved its main objectives with some minor deviations. However, due to insufficient memory and processing power of the hardware device, the project could not deliver optimal performance in terms of stability and accuracy. Consequently, in order to evaluate the driving behavior for each frame more precisely, a graphical user interface (GUI) was implemented as an alternative method.

Reference

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