A Combination of Feedback Control and Vision-Based Deep Learning Mechanism for Guiding Self-Driving Cars

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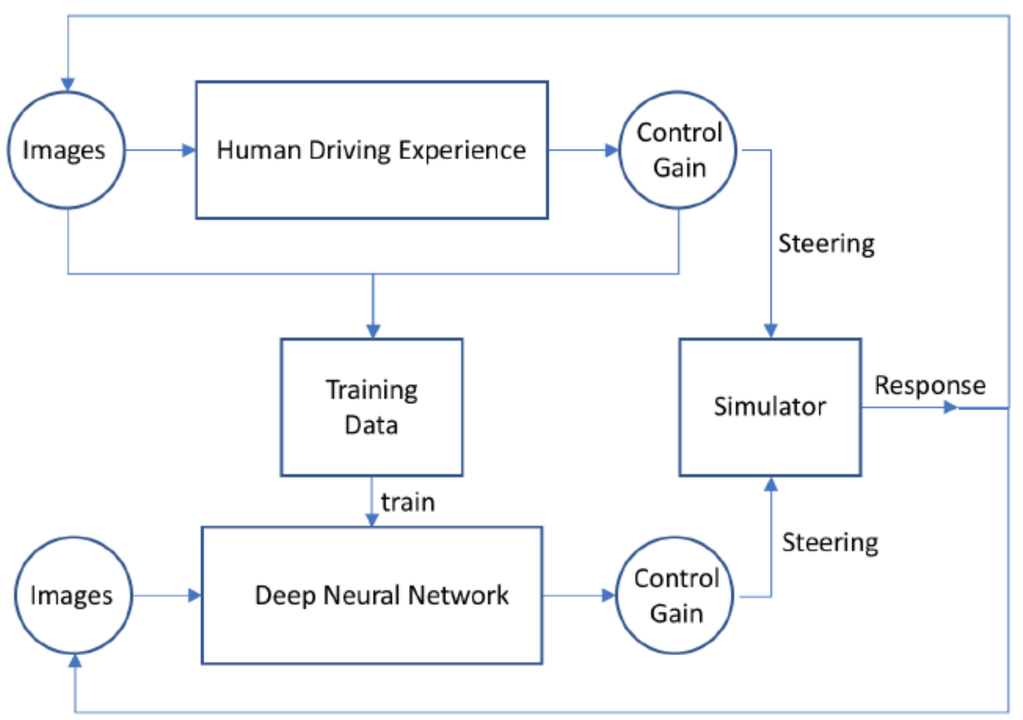
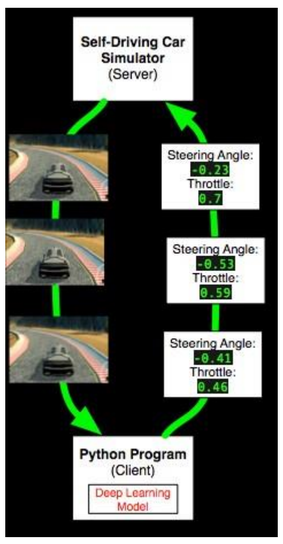
Udacity self driving car simulator
https://github.com/udacity/self-driving-car-sim



The proposed system architecture



Simulator (Server) <->
Model (Client)

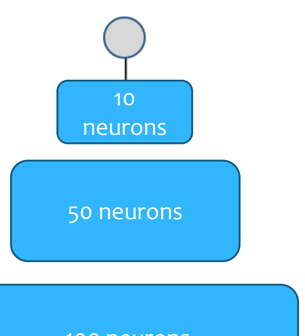
UI of Car driver

(a) Center

(b) Left

(c) Right

The proposed system architecture



Fully connected layer

Fully connected layer

Fully connected layer

Fully connected layer

The input of Neural Network

Demo video on YouTube

VI. CONCLUSIONS

We have developed an agent that can imitate the behavior of humans driving a car. We implemented a self-driving car which can drive itself on the track of a simulator. The self-driving car uses deep neural network as a computational framework to "learn" what is the position of the car related to the road. While the car understands the position of itself related to the track, it can use the information as a basis for feedback control. The simulation result showed the proposed agent can drive the car within the track; however, the dynamics of car is somewhat high.

In the future, we will study how to let the driving agent understand the speed of the car only use vision-based sensors (cameras). Then, a PD-type or a PID-type controller could be implemented.