

This report summarizes the process to make the car drive safely on Simulator Track 1, including training data collection, model design, training and test.

Firstly, the training data is collected to introduce desired driving behavior. The size of collected training images is 573.6MB and the size of driving_log.csv is 2.4MB. For clockwise and counter-clockwise directions, two laps of center lane driving and various recovery driving scenarios from sides are collected. The following four images are listed to show four different data collection scenarios: straight line driving, left turn driving, recovering from side and right turn driving.



Figure 1: straight line driving (center camera)



Figure 2: left turn driving (center camera)

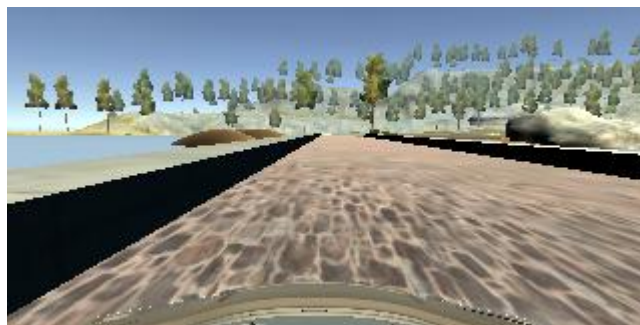


Figure 3: recover from side (center camera)



Figure 4: right turn driving (center camera)

In order to have more data to train the model, all three camera images are used. The value to add or subtract from the center steering angle for left and right images is set to 0.2. I apply the model architecture described in the paper “End to End Learning for Self-Driving Cars”. The model architecture is shown in Figure 5. The network consists of one normalization layer, five convolution layers and three fully connected layers. The convolution and fully connected layers serve the purpose of feature extraction and control.

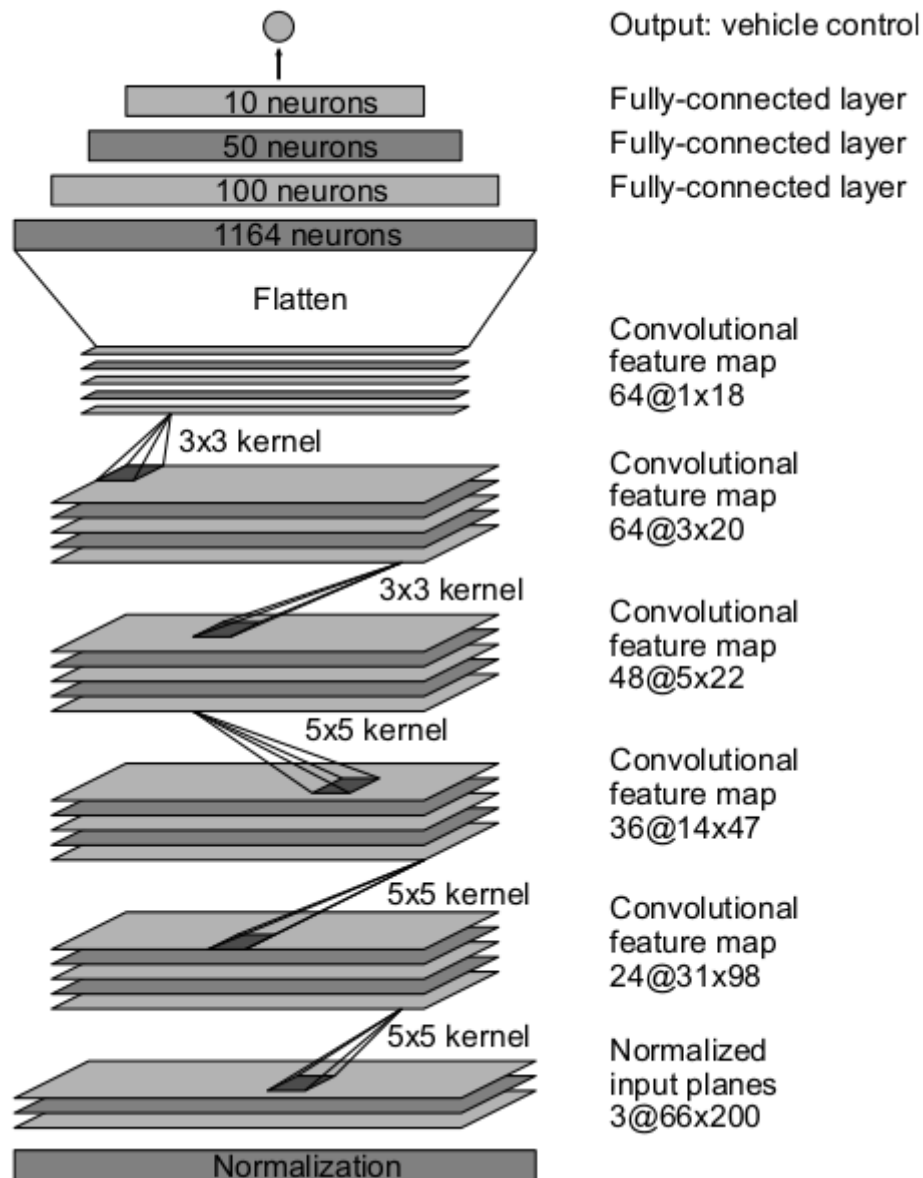


Figure 5: Network Architecture (Source: Paper End to End Learning for Self-Driving Cars)

The input of this model is an image and the output of the model is vehicle control (steering angle), thus this is a regression problem. I choose ‘mse’ as lose. For a fast convergence, ‘adam’ is selected as the optimizer. By following the tutorial provided in the class, the preprocess step for each image is normalization and cropping the interested region. A 80/20 split is used for training and validation. The training process is 10 epochs and converges to a loss around 0.04.

The model is only tested on track1. The car drives safely with its trajectory following the center lane well. The future work is to collect driving data of track2 to train the model, so this model will be more generalized.