Neural Network Based Self Driving Car

This project “Neural Network Based Self Driving Car” is a raspberry pi project which uses python and with deep learning to recognise the path from camera and then controlling motors accordingly.

In this project I have used Opencv and tensorflow libraries which helps to capture and read camera output and process it. Here I have connected Raspberry pi to a webcam module and motor driver shield which is connected to motors.

In this project I have created different modules whose data are captured and then processed in a main code. The modules made are Webcam module, Motor module, Stop sign recognition module and Main driving module. By running Mian driving module all the linked modules get started and perform their function and send their output to the main driving module.

First of all, the webcam module is our input by capturing camera signals, it includes the opencv library to activate it. Module processes camera input by our pretrained model which includes steering angle which is calculated by cropping image to required path and then processing it to make a histogram image. If values of histogram image changed from 255 then steering angle will be the changed value. This model needs to be trained before using the main code. For training we have to capture nearly 2000-4000 pictures of the path from which valid images are chosen and processed by adding effects like increasing colours, zooming to path, etc. Then in the training section the computer learns to calculate steering angles by histogram image.

After getting pre pre-trained model and calculating the steering angle by webcam module, the value of steering angle is sent to the main driving module. I have also added a few extra commands like stop sign detection. Here I have used an xml file to recognise my stop sign from the camera's input, and then if the camera detects any stop sign then the values will be sent to the main driving module.

Then in the main driving Module, it processes the output value from different modules like steering angle and stop sign. After the process the output is displayed on screen and sent to the Motor module from performing actions. When a motor module receives required outputs’ commands four motors are functioned to run and stop accordingly.

For this project required hardware are-

1..Raspberry pi B+

2.. Webcam module/USB camera

3..Motors\*4

4..Motor driver

5..Batteries

6..RC car chassis

For this project required software are-

1..Python 3.x

2..Opencv 3.2.1==4.40

3..Tensorflow==1.14.0

4..Numpy==1.16.2

5..pandas == 1.2.3

6..matplotlib == 3.3.2

7..scikit-learn == 0.23.2

8..tensorflow == 2.3.1

9..imgaug == 0.4.0