Design of A Data Transmission Unit for An Autonomous Vehicle

3.3.2020
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Abstract- **The vehicle equipped with autonomous driving capability detects the environment, locates its position, and operates appropriately to go to the specified destination safely without human input. For developing such autonomous vehicles many complex algorithms are used which involve various computer science fields such as Machine Learning, Artificial Intelligence, Neural Networks and Image Processing. The autonomous vehicle needs to provide accurate output in real time environment which in turn increases the computational power of the system. This paper proposes to build an end-to-end autonomous driving system based on most recently published system designs from academic research and industry practitioners. The proposed Data Transmission Unit comprises of a central wide angle camera mounted on the dashboard of a vehicle. The live video stream from the camera is fed to the Convolutional neural network (CNN) as input which in turn predicts the steering angle for every frame. The predicted steering angle is calibrated based on the designed steering and brake mechanism of the vehicle.**

Keywords— ***Autonomous vehicle, Deep learning, Convolutional neural network , Steering mechanism.***

I. INTRODUCTION

Autonomous Driving systems have attracted significant interest from many industry experts as well as in the field of research. Many automotive companies such as Google, Tesla, and Mobileye are investing heavily in research and development of autonomous driving systems. The amount of accidents occurring daily are in millions, which is due to reckless and careless driving. Use of efficient Self Driving cars will help in reducing the number of accidents occurring and improve the quality of road life. The concept of autonomous driving is also used in transportation with door step food delivery which is under development by many organizations such as Uber, Ola, etc. Constructing or building an autonomous vehicle is a tough job because the autonomous vehicles need to make critical decision in real life environment and if the results are not accurate the outcomes can be critical or sometimes even dangerous for human life.

II. RELATED WORK

The authors of [1] describe a CNN that is very different than the traditional pattern recognition. The CNN model is trained in such a way that it learns to compute steering angle by itself in different atmospheric conditions. The model is trained for hours from the dataset collected driving a vehicle in different atmospheric conditions. The vehicle used for collecting the dataset had three cameras mounted on the car and for every frame it is recording the steering angle. This dataset is then trained on the CNN model that consists of five convolutional layers, three fully connected layers and an output layer which is the predicted steering angle. Based on the simulation tests conducted in real environment, the trained model achieved an autonomy of 90%. This model is able to drive on roads having no lane markings or a proper path defined.

Shih-Chieh Lin, et al, discuss in [2] about the architectural implications faced in designing an autonomous vehicle. This paper discusses about the design constraints faced such as performance, processing and computational power, latency, decision making abilities and hardware design constraints. It is identified that for autonomous vehicle to react to a constantly changing traffic it is very critical for the system to make decisions with a processing latency less than 100ms. Object detection, tracking and localization are the three process that amount to 94% of the computational power. The proposed system consists of three major components namely scene recognition which is used to track nearby objects, path planning to define the path of the vehicle from source to destination. It is found out that the tail latency should be used to evaluate the performance of an autonomous vehicle rather than the mean latency. Based on the results obtained the

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27th June, 2020

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for presenting paper titled

Design of Data Transmission unit for an Autonomous Vehicle

in the Vidyavardhini's National conference 2020 **"Technical Advancements for Social upliftments"** organised by Vidyavardhinis College of Engineering and Technology, Vasai held on 27th June, 2020

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CERTIFICATE ID NZSALC-CE000466