FINAL YEAR PROJECT AS AN ENGINEERING PROBLEM

Auto-Parking of vehicle by using Supervised Learning Approach

Supervisor:

Dr. Muwahida Liaquat

Group Members:

Mustaqeem Ashraf

Mazahir Hussain

Shamsa Kanwal

Tooba Anwar

College of Electrical and Mechanical Engineering (CEME)
National University of Sciences and Technology (NUST)

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Preamble:

Convolutional neural networks (CNNs) are machine learning models accomplishing state of the art results in a variety of computer vision tasks, decision making and visual recognition. For a long time, traditional computer vision-based algorithms have been the primary method for analyzing camera footage, used for assisting safety functions, where decision making have been a product of manually constructed behaviors. During the last few years deep learning has showed its extraordinary capabilities for both visual recognition and decision making in end-to-end systems.

In this project we will use a Supervised Learning Approach to park an autonomous vehicle. A CNN has been trained to map raw pixels from a single front-facing camera directly to steering commands. The objective was to build a simple and reliable algorithm for a self-driving car and to implement a system that allow autonomous driving.

Range of conflicting requirements:

The issue under consideration has not been addressed before. We've done a detailed study and analysis on the work that has been done on this, read multiple research papers and safe to say that a lot of work is done in field of autonomous vehicle but there is not sufficient work done for parking of autonomous vehicle. All the work that is relevant to this is based on digital image processing and computer vision. There's no data set available for parking of a vehicle.

The most important requirement is the data set availability to train a CNN model. Thus, the data set must be formed by our own effort by using Carla simulator. Different techniques will be applied to achieve maximum efficiency and accuracy for it to work.

Depth of Analysis required:

At the minute, there's no such work done for the parking of autonomous vehicle by using CNN model. Some work has done for parking by using LiDAR. But camera sensor plays a key role in autonomous vehicle. Also, CNN is best technique for features extraction or to detect objects like other cars.

Depth of Knowledge required:

Knowledge of Image processing is required for preprocessing of the Data. Know-how of different techniques to be applied for resize of image and histogram normalization. And knowledge of CNN models is required for model training. Multiple frameworks and libraries including OpenCV, NumPy, TensorFlow and Sklearn are used in model training. Knowledge of Python and knowledge of, how to use different sensor in Carla simulator is also required.

Familiarity of issues:

Since there is no Data set of cameras available for the parking of autonomous vehicles. Everything must be done starting from data sets formation by using Carla simulator, forming multiple labels, till the programming, training of CNN model and then testing of model in virtual environment.

Extent of applicable codes:

This project is being done keeping in mind the engineering code of ethics stating that “the work of engineers shall Hold paramount the safety of the public”. As we know the autonomous vehicle can reduce the 90% rates of road accident.

Extent of stakeholder involvements and level of conflicting:

Stakeholders for the project include engineers, electric vehicle companies e.g.: Tesla or Waymo as well as autonomous vehicle industry because these companies are doing a lot of research in field of autonomous vehicle industry.

Conflicting requirements for this include the high processing power of that model, availability of data and the confusion regarding the use of models and application.

Consequences:

- Time saving
- Space saving in parking
- Environment friendly
- Reduction in accidents
- Stress free parking

Interdependence:

Our data set will be based on the requirement of our CNN model and what label we will use in that model e.g.: steering angle, break or speed and what should be the dimensions of our data set. To proceed to model training, we first need to make the CNN model based on architecture design for our vehicle. And then train that model on the data we have generated from Carla simulator.

After training of CNN model, we will control the speed and steering angle by doing back propagation of that model.