

Building an Autonomous Vehicle Using Artificial Intelligence and Computer Vision

Status: Filled

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Sponsor(s):

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Project will focus on artificial intelligence and computer vision to achieve autonomous characteristics in a car. The car (Broon F8 3rd Generation), is an electric car, provided by Dr. Rad. An artificially created network can be trained to autonomously drive a vehicle, without any human intervention, creating a safer driving environment. The vehicle will be equipped with different hardware including stereo camera, and LiDAR, to collect the data in real-time. The goal of this project is to build a self-driving vehicle (prototype), using computer vision and deep neural networks, to navigate in experimental environments. The major topics discussed in this project range from manipulating the throttle and steering of the car in response to the signal received by the microcontroller. Algorithms are trained by collecting and feeding images of the

Figure 1 Modified Configuration

Figure 2 Alternative Configuration

Collect the data for indoor testing on 4th floor of SFU surrey
Collect the data for outdoor testing (camera + routed map) for end to end navigation and localization. [<https://arxiv.org/abs/1811.10119>]

4. Preprocess and train convolutional neural network (on GoogleColab, or another cloud computing platform, or on a powerful machine).

At this step we need to do some preprocessing such as image augmentation, and artificially expanding the dataset to generalize the performance of the trained network. The data can be trained on GoogleColab, or on any other cloud computing platform like AWS, or on any local computer. (Investigate how to enable GPU with Nvidia CUDA if using a local computer).

5. Using trained network and other algorithms such as lane detection, object detection to predict the steering, throttle, and brake.

Integrate additional algorithms for lane detection, object detection with trained CNN to have better prediction for the steering, throttle, and brake.

6. Autonomously drive (test) the vehicle.