Self-Driving Remote Control Car

SE 101 Project Proposal

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What is it?

A self driving remote control car that incorporates a Raspberry Pi board used to collect input data that will be fed to the data processing component (computer) over Wifi.

Major Software Components

The software/data-processing will be coded in Python (or C++).

Camera - a small recording camera must be attached to the car to input environment data.

OpenCV - library used for decoding the image feed into a numpy array/matrix. Haar Feature Classifiers used to detect stop signs, road obstacles, and any other important features that are taken into consideration while driving.

Convolutional neural network - The array/matrix will contain the gray-scaled values of every pixel in the image feed. This matrix will be fed into the network (of dimensions pixels high by pixels wide), and map to one of 4 outputs: drive straight, turn left, turn right, and stop. The degree of turning must be considered and that will be a challenge of this project.

Hardware

Raspberry Pi board - attached to the remote control car, will need to figure out how to translate the output data into actual movement.

Remote Control Toy Car - will either build or purchase one. Will need to figure out how the remote control communicates with the car, and hence get the computer to communicate with the chip, and translate that into movements.

Arduino Chip - may be used to connect to the remote control, which will receive data from the processing unit and translate into controlling the movement of the car.

Anticipated Challenges

Training - there are different approaches to training the weights of the networks. Right now, we are contemplating between reinforcement approaches vs supervised approaches. Supervised training methods will be utilized for object detection and such, but as for actually moving the car, we will have to do some experimenting.

Communicating with the chip and translating that into movements - we will need to learn how to transform the output vector into actual movements. An Arduino may be used to connect with the chip pins on the remote control, and hence send signals to the chip from the processing unit which will control the movement of the car.

Distance Measurement (from car to lanes, signs, etc.) - an algorithm will have to be developed to figure out how to translate the data from the images into concrete distances to the object in the feed.