FORMULATION OF A RESEARCH PROBLEM

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Object Detection, Recognition, Tracking and Classification for Autonomous Driving

Statement of the Problem

The detection, classification and tracking of objects around an autonomous vehicle is essential to operate safely. For example, **Tesla**, best known for its electric cars have had several accidents in the past few years related to failure in recognizing the heavy vehicles when the autopilot was activated. It was evident that Tesla's Autopilot may have trouble recognizing the other heavy vehicles that were stationary and the ones crossing the roads.

Hence, in the first few weeks we plan on studying and exploring already existing algorithms to dissect what kind of different scenarios if considered, they could fail. Going ahead into the week, maybe we will eventually try to present our own algorithm to detect, classify, and track objects by utilizing the data collected along with using state of the art deep-learning network YOLO (You Only Look Once) and other deep learning methods.

Introduction

Traffic counts, speed and vehicle classification are fundamental data for a variety of transportation projects ranging from transportation planning to modern intelligent transportation systems. Still „Traffic Monitoring" and „Information Systems" related to classification of vehicles rely on sensors for estimating traffic parameters. Currently, magnetic loop detectors are often used to count vehicles passing over them. Vision-based video monitoring systems offer a number of advantages over earlier methods. In addition to vehicle counts, a much larger set of traffic parameters such as vehicle classifications, lane changes, parking areas etc., can be measured in such types of systems.

In large metropolitan areas, there is a need for data about vehicle classes that use a particular highway or a street. A classification and counting system like the one proposed here can provide important data for a particular decision making agency. Our

system uses a single camera mounted on a pole or other tall structure, looking down on the traffic scene. It can be used for detecting and classifying vehicles in multiple lanes and for any direction of traffic flow.

As we move forward with the implementation of the project, we will work on Visual Relationship detection between different objects in an image/video frame. Our aim is to make decisions while autonomous driving easier.

Project Timeline

This project will be implemented over the time period of 12 weeks. We plan to put in around 10-12 hours each week individually to work, collaborate and plan the project to obtain the desired results. A rough approximation of how we plan to approach the implementation can be seen below:

Week 1: Literature review - Read papers related to our problem and analyse the pros and cons of various approaches to similar problems for the first two weeks.

Week 3: Gathering Dataset - Gather Dataset from various sources, to train our model to differentiate between different kinds of vehicles.

Week 5: Experimental Implementation -Try to test our model on some input images, try different alternatives if one of our approaches fail.

Week 7: Visual Relationship - Learn more about it by reading articles, papers and books on image classification.

Will keep updating the timeline as weeks progress

Expected Results

Evaluating the algorithms of existing solutions and running various datasets on the software to extract information to identify any loopholes or weaknesses. Try to develop an algorithm of our own and test it using the datasets present to see the performance on detecting, tracking and classifying the objects along with position estimation.