

Project Proposal

ELEC4544- Artificial Intelligence and Machine Learning

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Introduction

In today's dynamic and rapidly evolving transportation landscape, ensuring road safety has become an ever-increasing paramount of importance. With the increasing number of vehicles and road users, the need for effective speed monitoring systems and enforcement is more crucial than ever. This project will propose the development of an Intelligent Automatic Speed Detection System using advanced computer vision and deep learning algorithms.

Speeding is a major contributing factor to inducing road accidents, posing real risks to both drivers and pedestrians. Traditional forms of speed detection involve manual intervention by authorities using specially designed equipment such as radar speed guns. The proposed Intelligent Automatic Speed Detection (IASD) system leverages the power of automated computer vision parallel with deep learning algorithms for object detection to automatically identify and track vehicles in real-time, allowing for the precise calculation of vehicular speeds, with minimal human intervention.

Project Plan

To initiate the project, we will establish a GitHub repository for code sharing. Subsequently, dedicate a couple of weeks to rigorous project planning and scheduling, alongside in-depth research to select the most suitable object detection models such as, You Only Look Once (YOLO), Single-Shot Detector (SSD), and Faster Regional-Convolutional Neural Network (R-CNN) in addition to tracking algorithms, video processing libraries and deep learning frameworks

Deliverables/Objectives

- **Real-time Speed Detection**, develop a robust system capable of accurately detecting and calculating the speed of vehicles in real-time using video feeds from traffic cameras, to simulate this we will use videos instead.
- **Object Identification and Tracking**, Implementing object detection and tracking algorithms from the aforementioned models to identify and monitor individual vehicles as they pass a monitored area.
- **Data Accuracy and Reliability**, ensure the system is robust (and not subject to false positives), and reliability of speed calculations under various environmental conditions, including lighting, weather, and traffic volume.
- **Integration and Alerts**, Implement optional features such as speed alerts and logging of speed data for monitoring, statistical analysis and enforcement purposes.

Extra Hardware and Software (Subject to addition/revision)

- **Python 3.12.0**, In addition to libraries required such as NumPy, OpenCV2, PyTorch, etc.
- **1080P HD Webcam or mobile phone camera**, implement mobile speed detection on small systems, (Subject to project deadline constraint)

References

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