

Smart Traffic Lights

Introduction

Traffic light control systems are widely used to monitor and control the flow of automobiles through the junction of many roads. They aim to realize smooth motion of cars in the transportation routes. However, the synchronization of multiple traffic light systems at adjacent intersections is a complicated problem given the various parameters involved. In addition, the mutual interference between adjacent traffic light systems, the disparity of cars flow with time, the accidents, the passage of emergency vehicles, and the pedestrian crossing are not implemented in the existing traffic system. This leads to traffic jam and congestion. We propose a system of smart traffic light based on artificial intelligence that evaluates the traffic density using camera and accomplishes dynamic timing slots with different levels. Moreover, it is designed to solve the problem of emergency vehicles stuck in the overcrowded roads.

Problem Identified

The problem identified is the current controlling system of traffic lights especially in India. In most of the cases (>75%), they are controlled manually. This is highly inefficient and leads to everyday congestion, increased travel time, high air and noise pollution because stop-start driving is inefficient and polluting.

Conventional systems developed do not handle variable flows approaching the junctions and is very costly. These methods based on magnetic coils are also very bulky and inefficient. Solution provided is light, costless, efficient and also prepared to handle increase in sudden traffic. It will reduce everyday congestion markedly, by smoothing traffic flows and prioritizing traffic in response to demand in real time.

Objectives

We have distributed our project into the following objectives:

1. To conduct a survey to explore traffic problems, travel behaviour and effectiveness of our solution.
2. Analysis of the conducted survey.
3. To obtain real time video from the camera into the computer program using python.
4. Implement Object Detection using Computer Vision and Image Processing.
5. Classification of detected objects(Cars, Motorbikes, Persons, etc.) using Machine Learning and Neural Network techniques.
6. To make an algorithm in the software for automatizing the on-off circuit of the traffic lights based on the traffic.
7. To implement the same circuit in the hardware using arduino(or microcontroller).
8. To connect the software in python to the hardware.
9. Experiment the model in a square or a T-point.
10. Analyze the experiment and improve the efficiency.

Industrial Relevance

- Supply chain management of industries using roadways for transportation will be faster, efficient and economical.
- Taxi rental companies will gain higher customer satisfaction and higher profit.
- It will highly profitize the public sector industries under Ministry of Road Transport and Highways and National Highway Authority of India as it eliminates manual intervention to manage regions with varying levels of traffic.
- Region specific studies to find peak hours to manage the traffic signals can be avoided by implementing the proposed system which is general.
- Cost of infrastructure can be minimised by employing the cameras already installed for detecting traffic rule violators

Approach

We will be conducting survey across different sets of people based on gender, age, locality, etc. to study their travel behaviour, causes of traffic and its effects on their lives and also to get feedback on our proposed solution.

We will use either a rotating camera or 4 different cameras to get the traffic input. We would process it using different techniques of image processing and computer vision to detect the objects. After that, we would train our model using different classification techniques like Faster R-CNN to classify whether the object is a part of the traffic on that particular road or not.

At last, we would have to make a hardware circuit using microcontroller like arduino and connect it with the computer program to make the traffic lights glow automatically. Circuit should be fast so that lights can be on-off immediately as required. Algorithms will be simple as it will make the red light glow when there is a minimum threshold value of traffic on the other road and it will be green when the traffic on the consecutive road is low.

Finally, we will try to implement our project at some real square like EC circle to test the efficiency and will then improve our components accordingly.

Impact on Society

If we successfully implement our solution then it would be real boon to our society. Some of the major benefits that our society will experience are saving of fuel, decrease in air and noise pollution level, preventing wastage of travel time and smoother traffic.

Future scope

- The different points can be connected to a network letting navigation features in vehicles to use the traffic data for effective route management.
- Model can be trained to detect accidents and alert the concerned authorities immediately.
- Effective surveillance system of the city.
- Prediction of peak times of traffic and hence improving the algorithm in advance for smoother flow.