AUTOMATED TRAFFIC LIGHT CONTROL AND VIOLATION DETECTION SYSTEM

Team members – Mahesh H A, Ch Abhishek, Advaith K Vasisht, Revanth Y **Supervisor** – Raghu B.A

Department of Computer Science and Engineering, PES University

PROBLEM STATEMENT

The density of vehicles on roads is rapidly increasing which has given rise to problems like accidents, traffic, and bottlenecks. As we all know, traffic lights can only be controlled by advanced technologies as it requires a lot of surveillance and monitoring to control the traffic. Due to the large number of these traffic signals it is impossible to monitor all of them. Hence, we need to make an automated traffic light system that enables the flow of traffic as and when required by it. Road safety is a major concern by traffic as many rides fail to maintain all the traffic rules and they continue to violate them. Due to this the policeman is facing various problems as they cannot monitor every single violation.

BACKGROUND

The existing systems are first compared and analyzed for their drawbacks and advantages in the implementation of that system. A documented list of existing methods to control and manage the road transport sector is made. The problems in the current systems are identified and are noted down as modules. We then analyses the given component in road traffic management and try to optimize it. In this paper, the analysis is performed and a possible solution to a few of those modules are explored and implemented. The exploration takes place in road traffic light and signal management and the solution follows along the lines of calculating density of vehicles to control the light signal. The whole point of this project is to optimize so the necessity being that we reduce workload on human resources and increase efficiency.

DATASET AND PRODUCT FEATURES

CCTV Video Footage of real-time traffic in Bangalore is being used as dataset in this system. We have also recorded videos manually during the traffic in real-time and used it as dataset

The main features of the system are the following,

- To automate and control the traffic-lights system by setting a timer.
- To allocate time for each signal based on density.
- To follow a specific scheduling order for traffic lights.
- Detection of helmet when violation occurs.
- To detect the vehicles whenever they cross the line.
- To detect the number plate of the vehicle when a potential violation is incurred.

DESIGN APPROACH

a) **Design Approach of Automated Traffic Light Control:**
Reading in a video into python using OpenCV. Splitting into frames and then grids and extract the ROI. Extracting features from the ROI and load those features into a machine learning model. Obtaining the prediction and density and control the light based on the density.
Traffic Line Violation: The vehicles are detected using YOLOv3 model. After detecting the vehicles, violation cases are checked. A traffic line is drawn over the road in the preview of the given video footage by the user. The line specifies that the traffic light is red. Violation happens if any vehicle crosses the traffic line in red state.
Helmet Detection: We have built an iterator that takes input as images feed and sending it to the network and then runs forward pass to get the output by calling post process function we remove the bounding boxes with low confidence and then retain the bounding boxes with high confidence. Results of this will be classified as people wearing and not wearing helmets.
License Plate Recognition: Reading an image into python using OpenCV. Applying filtering and edge detection use contour search to find plates. Extracting number plate text using OCR with EasyOCR.

Constraints: Camera Quality, Availability of hardware processors
Assumptions: Cameras at every junction and with enough lighting. Proper connections between the surveillance center and the cameras. Visually identifiable violations.
Dependencies: Adequate Lighting. Electricity, Regular Maintenance of cameras.

RESULTS AND DISCUSSION

All the results in traffic automation have met all the expectations and the results were taken after the grid split and after the model has classified the grid. The red colored grids are supposed to be grids containing traffic vehicles and the green colored grids are ones that do not contain. For each frame, the density is stored and then forecasted. And after each time interval, the predicted density and green light time is displayed. For line violation A straight line called the traffic violation line is drawn on the road near the signal in the CCTV footage or the camera footage from the junction. The crossing of this line during red traffic lights is treated as a violation. Riders who are not wearing helmets are violating the rule and these violated vehicles captured images are stored under a detected images folder. And these images are sent as an input to the License Plate Detection Model.

CONCLUSION AND FUTURE WORK

In order to overcome the problems faced by the traffic police and the public regarding the traffic control system, we have come up with a better solution that uses image processing techniques, scheduling algorithms which is possibly optimal and better than many other existing systems. We have built a system that detects the potential traffic violations and automates the traffic light signal controller. By using all the actual real time images as an input, this method is consistent in its own ways of vehicle detection and much better than already existed systems.

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TEAM MEMBERS

MAHESH H A

CH ABHISHEK

ADVAITH K V

REVANTH Y

GUIDE:

RAGHU B A