TRAFFIC SIGNAL VIOLATION DETECTION SYSTEM

ABSTRACT

This paper describes the framework and components of an experimental platform for an advanced traffic signal violation detection system (TSVDS) aimed at providing traffic department to alleviate major mis-happenings. This system is able to detect traffic violations (like traffic signal violation) and record data (like number plate of the vehicle). This test-bed is mainly composed of two parts: a computer vision subsystem for detecting violations over the traffic at any time taken and GUI using "tkinter "which makes the system more user-friendly and easier to access for every person accessing it. There are few mechanisms to check vehicle parameters like (Vehicle registration number, dimensions and more). Number plate detection has been done through video processing and to process further image processing will be used through specific python libraries. when the video will be processed and the image has been acquired, number plate can be easily retrieved through python library (imageio) and the accused will be punished accordingly. The decision includes analyzing the videos from CCTV cameras and counts the number of vehicles in the junction and also import to the main system. we intend to present an improvement in existing manual traffic control system. It also discusses about using the timer for each phase and detecting vehicles through images instead of using electronic sensors embedded in the road. Finally, the traffic lights will be controlled according to the traffic conditions on road.

INTRODUCTION:

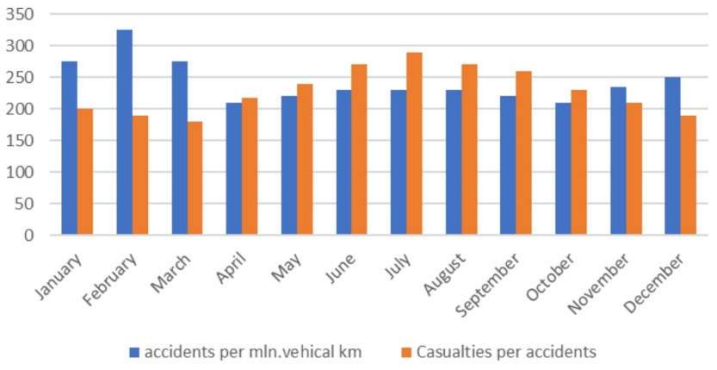
The increasing volume of vehicles in the cities over the globe causes high volume of traffic and due to the high volume of vehicles, traffic violations had been increased immensely all over the world. These violations cause in severe increment in number of accidents happening over the world endangering the life of people very much. Traffic violation is required the most to solve this alarming problem (violations) and to prevent tragedies to happen like fatalities and severe injuries. Traffic signal violation detection system enforces proper and maintained traffic regulations and to punish those who does not maintain the regulations. This system can easily detect traffic light violation in real time. A user-friendly graphical interface (GUI) is associated with the system to make it easier for the user to operate and deal with the system (like to monitor traffic and take action against violations). The greater part of the lethal mis happenings that happen due to over speeding and quicker

vehicles are more prone to mishappening as compared to slower or vehicles in speed limit and higher the speed more prominent the hazard is.

LITERATURE SURVEY:

Presented in [1] is the implementation of real-time traffic violation detection in a monitoring stream which is utilized in video streaming from given path locations. Another approach of implementing real-time/through video traffic violation detection was seen in [2], as they used video-based traffic detection through an improved background-updating algorithm and helped in extracting image better, thereafter track the moving vehicles by feature-based tracking method using python libraries. Intelligent control system is capable of tracking all vehicles, crisis management & control, traffic guidance and also recording driving offences along the highway. Each and every vehicle is equipped with RFID to hold the data like Car ID, position, etc. In this paper, vehicles are connected to computerized systems, intelligent light poles and other available hardware along the way. Intelligent control system is capable of tracking all vehicles, crisis management & control, traffic guidance and also recording driving offences along the highway. Traffic sign detection and recognition is observed by computer vision subsystem in both day and night time. The above-mentioned traffic Violations is recorded by Event data recorder (EDR). In manual controlling system we need more manpower to control traffic violation. In manual controlling system we need more manpower to control traffic violation. Vehicle detectors were using to collect the data to find the actual flow and to get signal timing according to the present rules and regulation of traffic Control. These vehicle detectors detect the vehicle on the basis of lane. This project is to report the drivers about some specific traffic violations like a no parking, no entry, speed limit, red signal and lane change. These Violations will be recorded in the local data-base and allow to visualization of the information of the traffic violations in the map using the standard Google tools.

This project is inspired by above project but it is implemented using a self-developed approach. Conventionally vehicle detection is referred as an object detection problem. To detect moving vehicle objects from the road, YOLOv3(YOU ONLY LOOK ONCE) model is used. After detecting vehicles, violation conditions are checked.



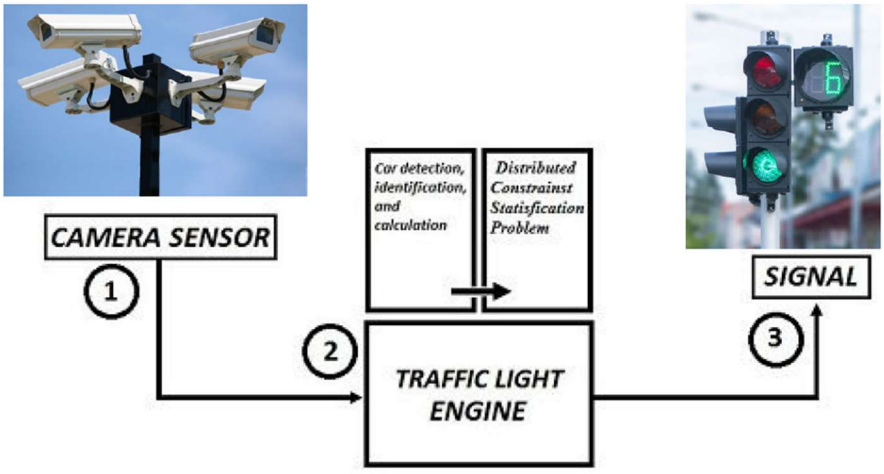
PROBLEM STATEMENT:

The purpose of this project is to develop a series of systems model for traffic passing through a 4-way intersection, controlled by traffic light. We will assume that arrangement of traffic lights and road lanes is fixed and that the lights switch from red to green to amber in a regular repetitive pattern. Moreover, we assume that driver behavior is constrained by the road rules (we keep this part really simple) and the desire to avoid vehicle collisions.

Economic and personal activities. At a general level, the Traffic problem is understood as a situation of mismatch Between supply (i.e., roads and their capacity) and demands (i.e., travel needs). Whenever this mismatch increases, the City administrators have tried to balance it by creating Infrastructures (e.g., new roads, expanding capacity) or Policy changes (e.g., banning traffic movement during major Games).

The problem statement brings out the two Stake holders of traffic management which can at times be at Odds – public resources and private resources. Traditionally, Traffic management has been funded only by city Governments and they had no framework to access citizen's Information related to travel. Both are changing. Given the Importance of traffic to citizen's daily lives, traffic Information is being provided as a value-added service by Businesses (e.g., radio stations, mobile phone operators) and Citizens are willing to pay directly or indirectly

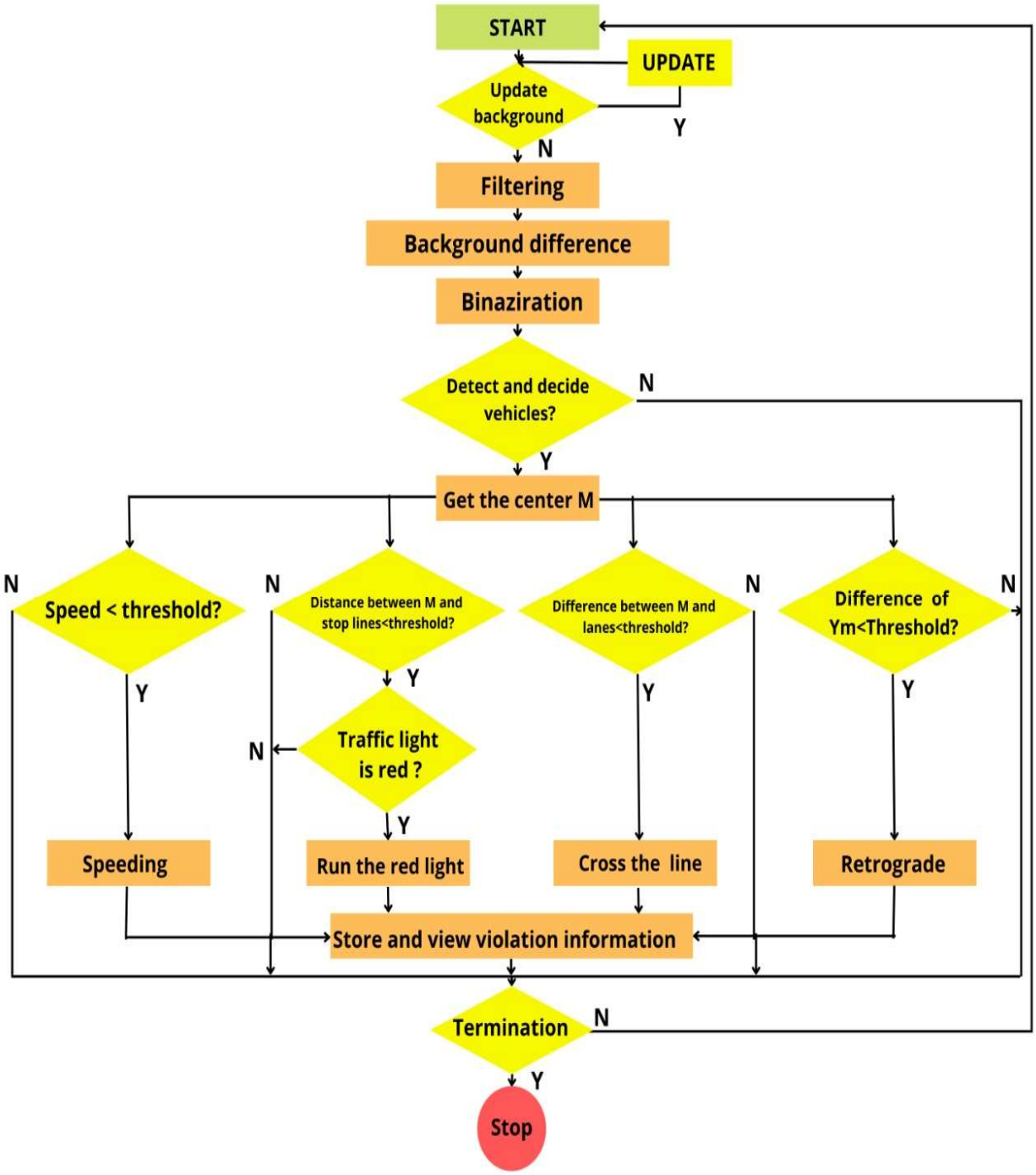
Architecture of Traffic Detection Violation System:



Developing a test-bed able to capture the vehicle surrounding and its internal state is not an easy task given the variety of available hardware and software choices. Besides being affordable, the different alternatives create a challenge for selecting the right equipment. Its embedded hardware consists of a Mini-ITX board as a host computer and a conventional PC as a slave computer for real-time image processing. Both of them are placed in a single rack located in the vehicle's boot. The Mini-ITX board integrates various readily available chipsets, such as a memory card adapter, a slot for connecting smart cards reader, a Bluetooth adaptor, etc. It also integrates some external devices, such as a GPS unit, a CAN interface, and a touchpad screen which permits access to system information as well as performing administrative tasks through an interactive GUI. All the electronic devices are powered by a dc/ac inverter, converting 12 Vdc from the vehicle battery to a Sensors 2014, 14 22116 200 Vac, 600 W. The hardware architecture, as shown in Figure 2, is designed with the purpose of making the managing the distributed components with easy reconfiguration.

The vision subsystem is equipped with two digital color cameras mounted on the vehicle's roof used to scan the road ahead looking for traffic signs. One camera is dedicated to daytime vision while the other is for night vision. Both cameras have a resolution of 1392 ×1040 and a focal length of 12 mm. This focal length has proven to be a good compromise between detection range (up to 80 m) and horizontal field of view (about 46°), retaining a good chance to pick close signs located at both sides of the vehicle. Using a 15 mm optic would obviously increase the detection range, but the narrower field of view could miss signs close to the vehicle in curves or roundabouts. On the other hand, using an 8 mm optic yields too short a detection distance for the system frame rate. As far as night vision is concerned, the test-bed is equipped with an active near-infrared (NIR) source of illumination obtained with a regular headlamp with an infrared pass filter. The camera devoted to nighttime is a conventional one, but with its infrared filter removed in order to maximize the NIR light into the camera sensor, allowing the use of very short integration times. This fact helps to avoid motion blur and saturation of reflecting signs, and to remove non-reflecting objects. Data Acquisition Subsystem Some of the vehicle's internal data, such as rpm, acceleration, speed, and so on, is accessed through the vehicle ODB-CAN interface. This interface is normally used with specific scan tools for diagnosis issues and the ODB data transfer protocol follows several standards, none of which are directly compatible with PCs. This situation is solved by using the ELM327 IC as a bridge between the ODB port and the standard RS-232 interface. With this device, the raw data from the vehicle's ECUs is translated into short messages that are transmitted to a PC via a standard RS-232 connection. From a programming point of view, the ELM327 device is viewed as a modem supporting AT commands. Thus, from a standalone application, the vehicle's data is accessed using techniques emulating a conventional terminal and by issuing corresponding AT commands to a serial port. Other data, not supplied by the vehicle's ECU, are obtained by external instrumentation.

Basically the above mentioned complications will determine the functionality of violation system, and thus aid in the compatibility.



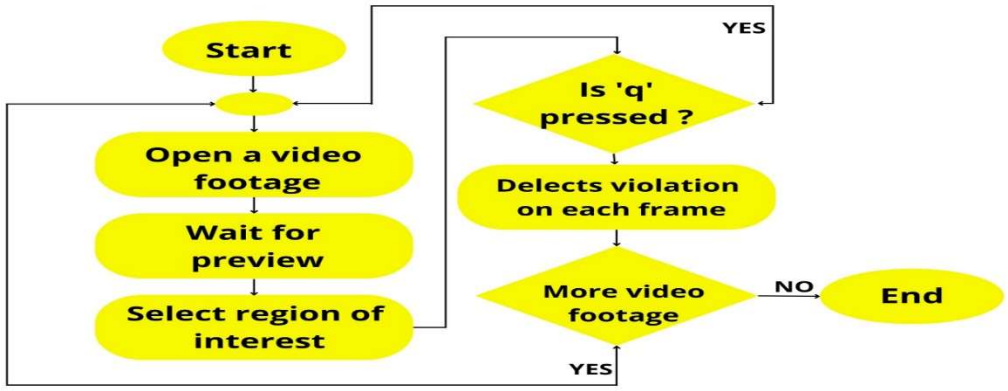
Implementation:

Computer Vision

OpenCV is an open-source computer vision and machine learning python library which is used in this project for image/video processing purpose. TensorFlow is used for implementing the vehicle classifier.

Graphical User Interface (GUI)

The graphical user interface has all the options needed for the software and has been done through “tkinter” library. The software serves administration and other debugging purposes. We don’t need to edit code for any kind of system in which it has to compile. For example, if we need to open any video footage, we can do it with the Open/video button.



Primarily, for the start of the project usage, the administrator needs to open a video footage using ‘video upload’ button that can be found under. The software can open any video footage from the storage files or from the path provided.

After opening the video footage from storage, the system will get a preview of the footage. The preview contains a frame from the given video footage. The preview is used to identify roads and draw a traffic line over the zebra crossing over the road. The traffic line drawn by software will act as a traffic signal line. To enable the line drawing feature, we need to select ‘Region of interest’ item from the ‘Analyze’ option. After that software will need to select two points to draw a line that specifies traffic signal.

Selecting the region of interest will start violation detection system. The coordinates of the line drawn will be shown on the new screen. The violation detection system will start immediately after the line is drawn. At first the weights will be loaded. Then the system will

detect objects and check for violations. The output will be shown frame by frame from the GUI.

The system will show output until the last frame of the footage. In background an output in mp4 format will be generated. The file will be in 'output' folder of 'Resources'. The process will be immediately terminated by clicking 'e'.
After processing a video footage, the administrator can add another video footage from the initial file manager. If the work is complete the administrator can quit using 'Exit' item from File option.

Modules used:

Libraries used for graphical user interface:

- Tkinter (GUI)
- Opencv
- Keras
- Imageio
- Struct

RESULT:

The designed algorithm was effectively able to detect the type of violation specified on this project which are denying traffic signal. The convergence of detection for the traffic violation mentioned is dissimilar, since it has a different threshold condition. The system provides detection for traffic signal violation. This system will help the traffic signal police to get the people who disobey the traffic rules and will reduce the workload on traffic police department. As when the signal is red the program will create an imaginary line at the starting of zebra crossing, as when any vehicle crosses that line the program will take the information of that vehicle like vehicle number and this will help the department to get that vehicle and punish the vehicle owner as per traffic rules.

CONCLUSION:

This traffic signal violation project we introduced in this project, we made the work of traffic signal department much easier than before, we tried to overcome all the difficulties that system earlier had, so we use some python libraries like Imageio, Tkinter, Keras, Pillow, Numpy, OpenCV, Struct. So, with the help of all these libraries we made the system much better than before. After implementing the program for general use on the traffic signal it will reduce the violation which in turn will reduce the accidents that happen due to the traffic signal violators. This will induce discipline in the society towards traffic management.

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