



## TRAFFIC STOP LINE CROSSING DETECTION SYSTEM USING IMAGE PROCESSING

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**Abstract**— Using technology to detect traffic violators in many developing countries is challenging. And people in these countries really don't care about rules or doesn't know that rules exist. This gives inspiration for developing automated stop-line crossing detection system. This paper presents about cost effective system that uses Arduino-UNO and simple camera to detect people standing on zebra crossing when signal turns red. It also prevents the human intervention and detects stop-line violators swiftly. The system is autonomous and can detect more than one vehicle at a time and immediately send notification to violator. The system presents Automatic number plate recognition techniques and some other image manipulation techniques for number plate detection and character detection.

**Keywords**— Arduino, Mat lab, Stop-line violation detection, LED, ANPR.

### I. INTRODUCTION



Fig. 1. Violation of traffic rules

Traffic control system around the world is

becoming more and more technology oriented that they end up being automated systems. This 21<sup>st</sup> century witnessed more technological advancement than ever and it makes strong point to develop an automation models in traffic system which also witnessed development in years. Although technology is improving but many developing countries still rely on human intervention or traffic officials

for managing the traffic.

That being said, the duty of managing traffic every day by traffic police and concentrating on traffic violators can be difficult. It is to mention that people or vehicles in developing countries fail to follow traffic rules. India is no exception from this as majority of people in India has no basic knowledge about stop-line. They end up being on Zebra crossing as if it's not visible to them. It should also be mentioned that crossing roads randomly attract unwanted accidents and it may also lead to deaths.

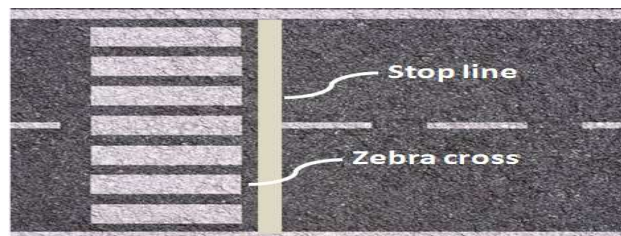


Fig 2. Representation of stop line and zebra cross on the road

So to tackle this problem this paper presents

simple and cost effective traffic management system. It's simple to implement and it requires cameras that are already installed on roads along with MATLAB software to perform operation like detecting violators and sending notification. It also uses Arduino-UNO which is a processor. The mat lab software is used to process the number plate of the violator captured by camera and send notification.

## II. BACKGROUND STUDY

Automation in the field of traffic management has been developing since the introduction of technology in traffic system. One of the work on automation was done in 2014 where the proposed model had the capability to detect vehicle which violate the traffic rules especially when signal turn red they are supposed to stop [1]. There were works done on disabled individual's i.e. blind people. The objective was to use automation in order to make roads safe for blind people to travel [2]. There was also work done on automation in zebra crossing where the system detects frequency of the people waiting to cross the road and based on those traffic lights switches automatically [7]. During 20<sup>th</sup> century image processing has become a booming topic and many researches were made on it. One such of it was to detect number plate and to measure distance of vehicle [16]. Again and again time shows that many technologies evolve from previous works. No one would have thought a single camera and a phone can provide history of violations done by vehicle drivers. This proves that technology is evolving. A simple system is made to detect traffic violators by using android application. The user or volunteer can capture image using his phone and can upload in app and the application automatically sends message to traffic police and they can take action on the driver [15].

Automation is not new to traffic management system, There were many review

papers on it. But, what inspired more is day to day accidents occurred due to negligence of commuters. In order to stop incidents and human intervention automation is simple answer, but yet no technology is perfect as there will always be room for improvements so is the automation which doesn't yield ideal results. This work and this technology always have room for improvement

## III. PROPOSED METHODOLOGY

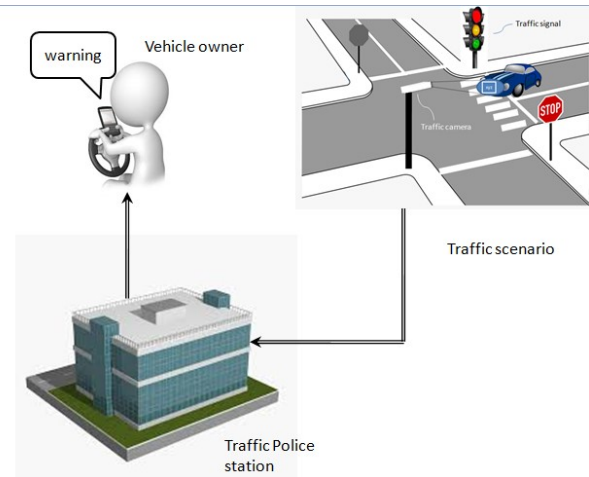


Fig.3. Overview of the system.

At first the proposed model has to be scaled prior to implementing in real world scenario. This gives a clear cut on how system works and can record the accuracy of the output. The above figure gives the over view of the system.

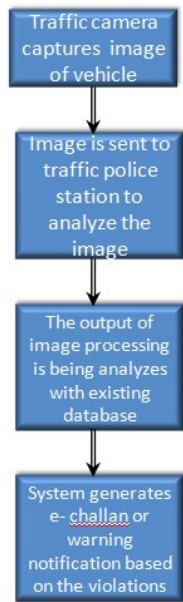


Fig.4. Overview of the system.

For model following are the devices and software used: Arduino, Jumper wires, Camera, LED lights, Car with number plate, standard bread board and Mat-lab software. Arduino is an open-source electronics platform.

Arduino is based on easy-to-use software and hardware. The boards are able to read input such as finger on a button and gives output such as activating a motor. We can tell what to do by sending set of instructions on microcontrollers on the board [9]. Camera is used to capture the image of the vehicle which violates the rule. Mat-lab is a programming platform which uses matrix based language called MATLAB [17]. The hardware consists of breadboard with jumper wires connecting Arduino and LED lights along with camera. A small size model is built to showcase the system.

Number plate detection uses many algorithms to detect the characters. The can be differentiate on the basis of edges, color and

texture. The edge based algorithm detects the edges and cuts the number plate from the background. The color based algorithm detects color of the number plate using the RGB concept of pixel. It detects the color are extracts the image in grey color. The texture based algorithm detects texture of number plate. The concept of image processing is used to detect the number plate from pictures captured by camera.

It can be done by using Harris algorithm since it is high in speed and accuracy with less complexity. The detection of number plate depends on external factors such as light and human intervention.

An extracted image from video should have good quality then only the characters can be read from plate. So in order to do that a good camera is used in this system. In real time the number plate consists of large characters, it's difficult to capture image with designs and unwanted names on plate. So to overcome this government should pass a law to prohibit using of names on number plate and every vehicle should follow a standard design of number plate.

The extracted image consists of vehicle number which is displayed on the monitor. The number is then matched from the database which consists of owner details and a particular violator gets notification/SMS. If the same person violates again then he will be slapped with fine.

When signal turns red the camera activates and continuously keeps track of vehicles. If the vehicle ends up on zebra crossing it will capture the number plate of vehicle. Now using the software and algorithm the number is extracted using image segmentation method. The extracted image is converted into grey image using image binarization method. In the image each character is segmented and recognized. The fully extracted vehicle number is compared with the database containing vehicle numbers along with owner number or email id. The owner receives notification about the violation.

#### IV. OBJECTIVE

In traffic, violating rules can cause increase in accidents especially with pedestrians. One of the major issues is not stopping vehicles behind the stop line which is exactly marked behind Zebra crossing. When the signal turns red it's a rule of traffic system that all vehicles should stop behind the stop line and therefore pedestrians should be allowed to cross the road i.e. by making use of Zebra Crossing. Hence our aim is to process the vehicles number plate using image processing, tracking the owner and imposing fine on the owner after breaking the rule for two times.

#### V. RESULT & DISCUSSION

When the vehicle ends up on zebra crossing during red signal the camera captures vehicle number plate and compares with vehicle numbers in database. The database consists of vehicle numbers along with their phone number and email id.



Fig.3 Camera captures number plate

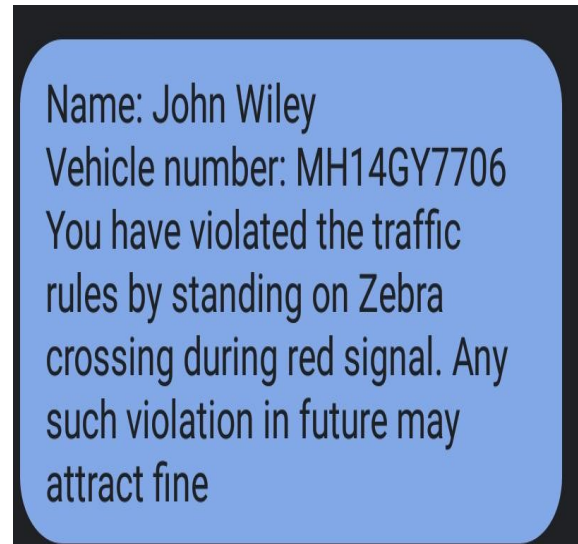


Fig. 4 Message received by vehicle owner

The vehicle owner will receive message like fig. 4. And if he violates again for more than two times he will get e-challan and have to pay fine to traffic police department. The message mentions name and vehicle number of the owner

#### VI. CONCLUSION & FUTURE SCOPE

Thousands of deaths occur every year related to road accidents especially in developing countries where people blindly cross the road. The proposed system helps to minimize the casualties and boost the confidence in people while crossing the road. This system is cost effective in terms of work load of traffic police and they can easily detect the violators without risking their life by standing whole day under the sun and in polluted roads. When comes to real life implementation it uses the existing traffic cameras to capture number plates and these days most people use phones so it is easy to send message about violation. In future the system can be collaborated with much more advanced technology to increase the efficiency such as using hologram. This combination can be effective to detect signal violators. The existing system can be used in future to detect

any damages in the stop line and alarm the road maintenance department of anything found. The system can also be used to improve visibility of stop line in nights. It uses extra illumination lights in night to capture the number plate of vehicle.

As told earlier no technology has end to it, in fact every technology has room to development. The same goes to the mentioned project and its difficult to obtain accurate results as capturing of images depends on light and color of the number plate. I hope this paper inspires others to come up with different methodology using the same technology.

## VII. Acknowledgment

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