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ADVANCED TRAFFIC VIOLATION PENALTY SYSTEM USING IOT AND IMAGE PROCESSING TECHNIQUES

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***Abstract*— Nowadays road traffic has become a real problem. Most traffic crashes are caused by human factors, within which traffic violations are one of the most typical and common causes. India is now moving towards automated solutions to curb traffic violations. This project aims to develop a penalty system for traffic violations using IoT and image processing techniques to facilitate the traffic police to manage the penalties for traffic violations. This system aims to reduce the paperwork, and manual process. In recent years' work, both technologies have been used separately and have their advantages and disadvantages. Hence in this work, the advantages of both the technologies are utilized. In the image processing, part PYTHON will be used which is efficient and reliable for license plate recognition. The used PYTHON code works on the K-Nearest Neighbor Algorithm for image processing. In this system, direct messages will be sent to the owner which creates a very quick and efficient where people will have obligation to follow the traffic rules.**

***Index Terms*— Image processing, Ultrasonic sensor, Database**

I. INTRODUCTION

The social situation in India is fundamentally extraordinary because of issues, for example, neediness, and joblessness just as extensively lower in regard to rules. This makes it unfeasible to go for a programmed tollbooth. The business requires a programmed vehicle grouping framework in India not to decrease or wipe out human intercession or work, yet to guarantee that human mediation doesn't bring about any budgetary acts of neglect. The business requires a framework that runs out of sight and simply keeps a cross-beware of the manual. The conventional OCR-based methodology for number plate acknowledgment doesn't work for the varieties in the painting style of the number plates. In the proposed strategy an advanced camera is utilized to catch the pictures and concentrate highlights of the vehicle number plate. These highlights are coordinated against a predefined set of the same vehicle number plate pictures in the database. The character pictures are coordinated in a proficient way to make it a continuous arrangement.

As for vehicle wellbeing, India meets just two out of the seven-vehicle security guidelines by the World Health Organization (WHO). Bikes represent 25% of all-out street crash passing. About 75%motorcycle riders engaged in mishaps kept on wearing head protectors, crash records appear. It is very difficult for the authorities to check whether there is a traffic violation, which leads to miserable situations where it becomes dangerous not only for the drivers but also for pedestrians. From recent research, it is that due to this in India the number of road accidents per 1000 vehicles is 35[1].

II. RELATED WORK

Many types of research have been done in the past and now about controlling the traffic violations through different sensors and image processing techniques. About 90% of traffic crashes are caused by human factors, within which traffic violations are one of the most typical and common causes. Traffic violations are the most typical and harmful unsafe driving behaviors therefore investigating the relationship between the traffic violations and crashes are of both theoretical significance and engineering value. Intelligent transportation systems (ITS) for traffic monitoring are critical in reducing traffic congestion increasing safety and productivity.

III. METHOD

This project deals with providing instantaneous penalty messages to the violator about their violation. The camera is to identify the violators and for license plate recognition. The messages are sent to the respective vehicle owners through the online platform Twilio.

Step 1: The camera is used to capture the image when a violation is detected.

Step 2: The first stage of the system is the image acquisition stage. After the image has been obtained, various methods of processing can be applied to the image to extract the number plate details.

Step 3: The string which is extracted will be compared with details already stored in the SQLite database and obtain the vehicle owner's mobile number.

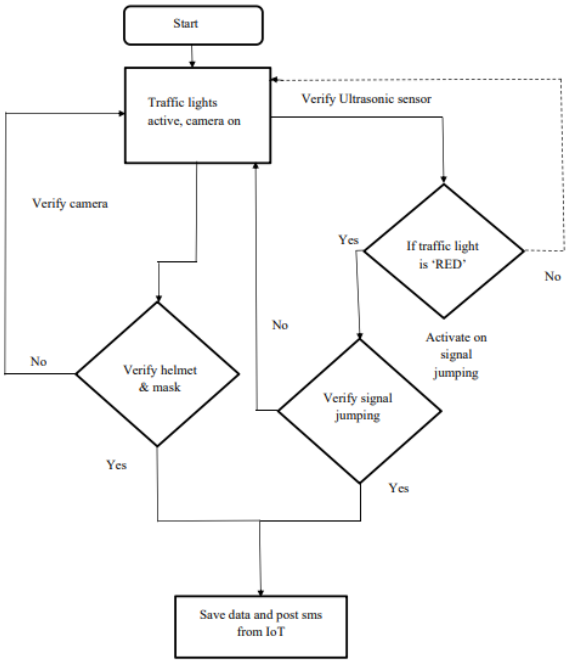

Fig 1: Flow chart for Methodology

Step 4: To send the penalty message to the respective vehicle owner we used "Twilio messaging" an online platform to send the messages.
The implementation of this project has the following sequence of steps

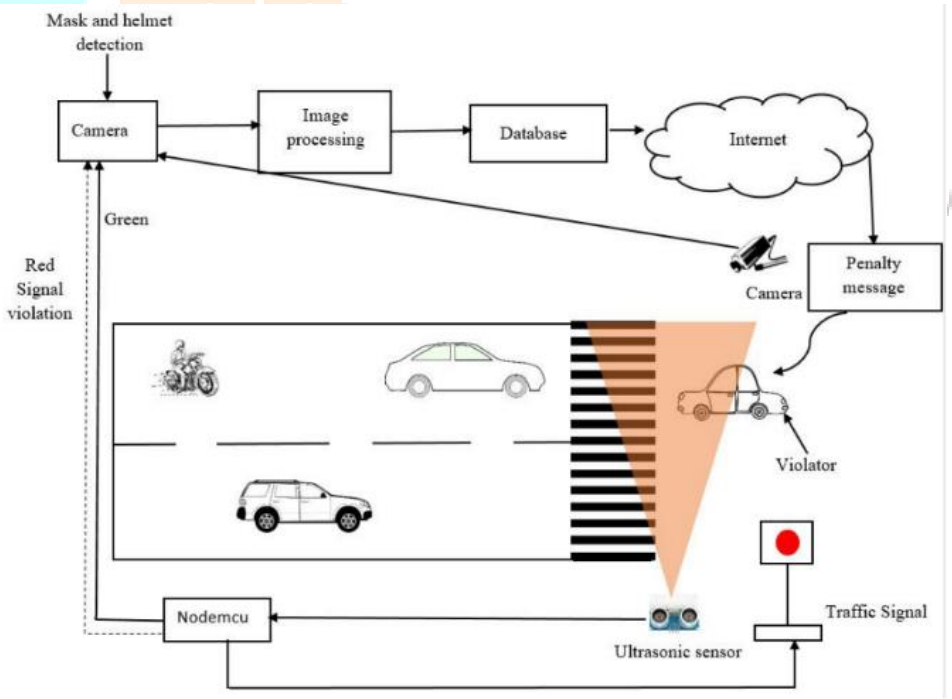

Fig 2: Traffic Violation Control System

The functional block of the advanced traffic violation penalty system is shown in figure 2. Here Nodemcu is used to control the Traffic signal lights and ultrasonic sensor. The total system is divided into three parameters such as helmet detection and mask detection and red signal violation.

IV. EXPERIMENT AND SIMULATION

To validate our proposed system experimental analysis is performed. The hardware setup is as shown below.

The hardware setup is connected as follows:

1. D1 of Node MCU is connected to the Echo pin of the ultrasonic sensor.
2. D2 of Node MCU is connected to the Trigger pin of the Ultrasonic sensor.
3. GND pin of Node MCU is connected to the GND pin of the Ultrasonic sensor.
4. VU pin of Node MCU is connected to Vcc pin of the Ultrasonic sensor.
5. D3 pin of Node MCU is connected to Din pin of the NeoPixel led.

6. VU pin of Node MCU is connected to +5V of NeoPixel led.
7. GND pin of Node MCU is connected to the GND pin of the NeoPixel led.

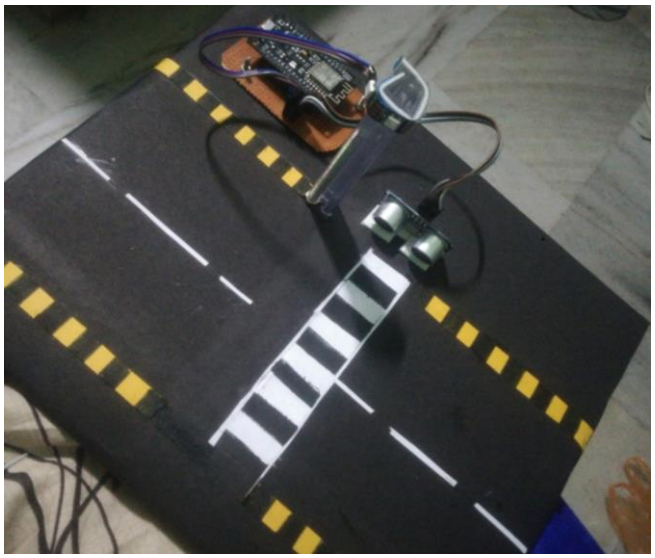

Fig 3: Hardware setup

The programming of Node MCU is performed on Arduino IDE which is used for signal violation detection. And for helmet violation detection we will be using PYTHON programming using the YOLOv3 algorithm. Similarly, in these uncertain times, human civilization needs to quickly adapt to the threat at hand. While wearing a mask is not the ultimate solution, it still reduces the rate of transmission of the virus, so for face mask detection SSD algorithm is used.

For the license plate recognition, we used the KNN algorithm and Python-tesseract, an OCR tool for python to obtain the alpha-numeric characters. Initially, the details of the vehicle are stored in the SQLite database. The camera detects the violation of either helmet or signal violation and facemask violation then captures the image.

The license plate number will be extracted and compared with the stored vehicle number plates in the database and obtained the vehicle owner details and with the help of the Twilio online messaging platform, the penalty message will be sent to the violator.

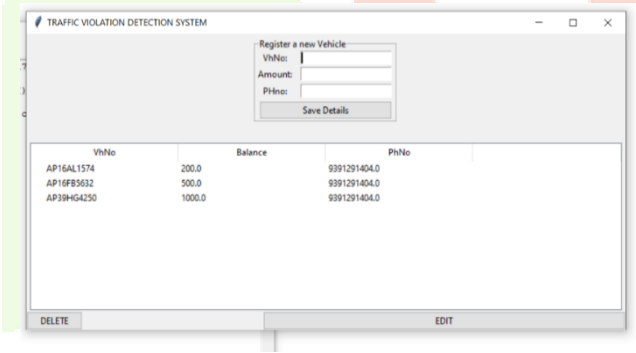

Fig 3: SQLite Database

V. Results

The license plate is extracted by using knn and pytessaract tools and an alphanumeric string is obtained after image processing. This string is compared to the details already stored in the database and the penalty message is sent to the respective vehicle owner with the help of the Twilio messaging online platform.

The outcomes of our work are as depicted:

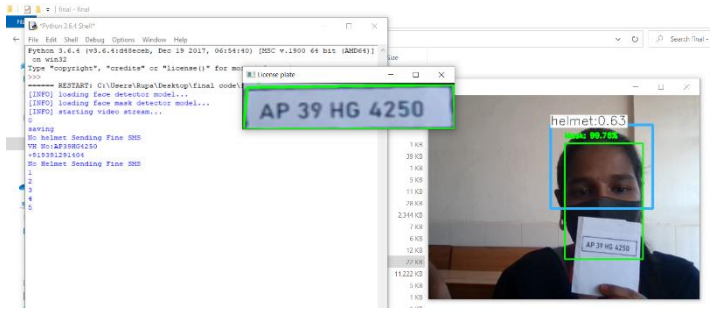

Figure 4. Output for No Helmet.

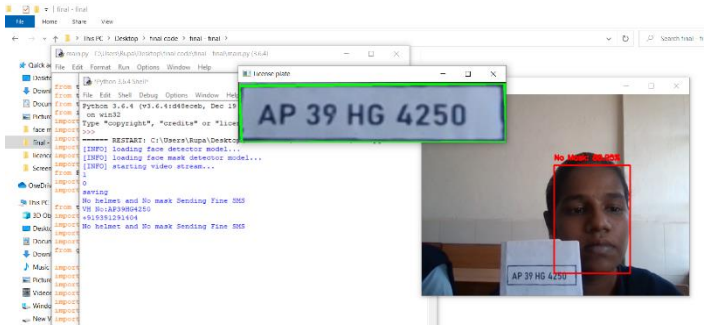

Figure 5. Output for no mask no helmet.

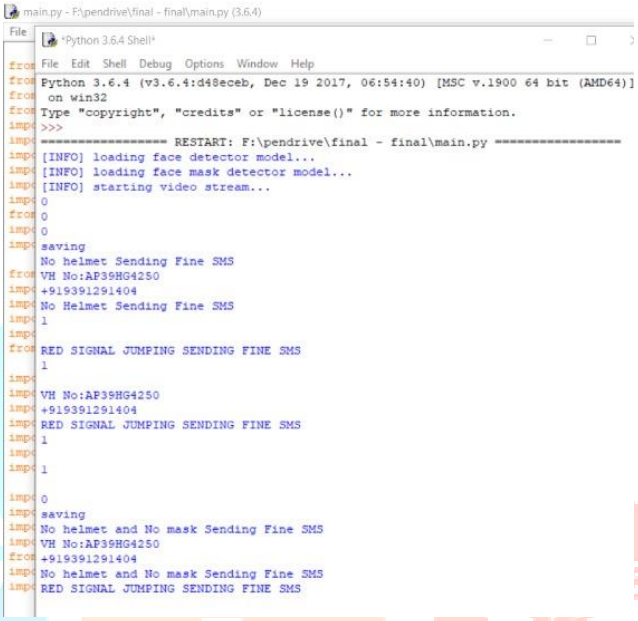

Figure 6. Output for signal jumping.

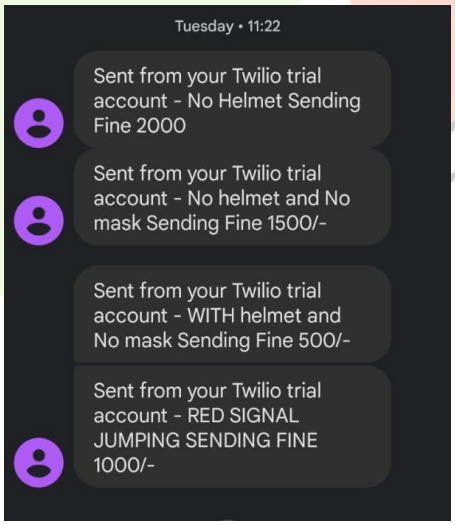

Figure 7. The messages are received by violator

VI. CONCLUSION AND FUTURE SCOPE

After experimentation and simulation, it is concluded that the purposed method can be implemented in the existing system and provide reliable results. The purposed method shows clear scope to reduce theprobability of error in traffic violation control. However, this work can be improved further by usingmore advanced image processing techniques and adding new features.

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