

AUTOMATIC e-TRAFFIC FINER

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Abstract: The project presents Automatic Number Plate Recognition (ANPR) techniques and other image manipulation techniques for plate localization and character recognition which makes it faster and easier to identify the number plates. It also makes use of computer vision techniques to understand and label images. The objective is to design an efficient automatic identification system by using the vehicle image. The proposed model includes an automated system which uses a camera based on Raspberry Pi to capture the video. After recognizing the violation in traffic rules, vehicle number from number plate is extracted and a SMS based module is used to notify the Regional Transport Office (RTO) about their traffic rule violation.

1. INTRODUCTION:

Automation in day to day life has gained importance in recent years. Due to increase in number of vehicles on the road, the violation of the traffic rules has been increasing. The most common types of traffic violations include over-speeding, triple riding, parking vehicles in no parking areas, riding without helmet, riding without seatbelts and so on. To avoid such traffic violation, a traffic police has to be present to keep an eye on the traffic violators. Certain automated solutions were developed to eliminate the violations; however, each of them had certain limitations.

In this system we use an automatic number plate recognition technology which eliminates the need of an authority at the site of violation. The main problem these days is instead of catching the real culprit many innocent people are getting suffered. The main agenda of this project is to minimise the man power and reduce corruption due to less human interruption.

The number plate recognition application by using image processing technology will recognise the number plate using optical character recognition and the message of the offence will be sent to the concerned authority within a shorter span of time. The system uses a camera that has the capability to grab the image and to find the location of the number in the image. It then extracts the characters using character recognition tool. The details of which will be saved by the traffic authority.

2. SYSTEM REQUIREMENTS

➤ HARDWARE DETAILS

a) RASPBERRY PI 3 MODEL B+

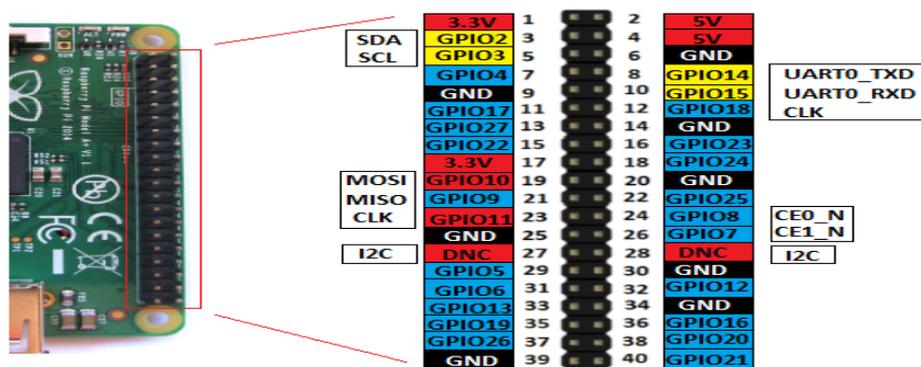
The Raspberry Pi 3 Model B+ has a wide range of features and improvements that will benefit the designers, developers and engineers who are looking forward to integrate Pi systems with their products. The Pi model has following features:

- Quad core 64-bit processor clocked at 1.4 GHz
- 1GB LPDDR2 SRAM
- Dual-band 2.4GHz and 5GHz wireless LAN
- Bluetooth 4.2/BLE
- Higher speed Ethernet up to 300Mbps
- Power-over-Ethernet capability (via a separate PoE HAT)



Fig No.1: Raspberry Pi 3 model B+

Pin diagram:



Raspberry Pi 3 B+ Pinout

Fig No.1.1: Physical features of B+ model

Pin diagram of B+ model

The external connection with the electronic device is made using 40 pin headers. It is the same as previous versions, making it compatible with all the devices where older versions can be used. Out of 40 pins, 26 are used as digital I/O pins, 9 are termed as dedicated I/O pins which indicate they don't come with alternate function.

Pin 3 and 5 comes with onboard pull up resistor which is 1.8 kΩ. Pin 27 and 28 are dedicate to ID EPROM. In B+ model the GPIO header is slightly repositioned to allow more space for the additional mounting hole. The devices that are compatible with B model may also work with B+ model; however, they may not sit identically in both versions.

Hardware Specifications.

1. CPU: The CPU is the brain of this tiny computer. It helps in carrying out a number of instructions based on the mathematical and logical formulas. It has a capacity of 64 bit.
2. Clock Speed and RAM: It comes with a clock speed of 1.4 GHz Broadcom BCM2837B0 that contains quad-core ARM Cortex-A53 and RAM memory is around 1GB (Identical to the previous version).
3. GPU: It stands for graphical processing unit, used for carrying out image calculation. Broadcom video core cable is added in the device that is mainly used for playing video games.
4. Micro USB Power Source Connector: this connector is used for providing 5V power to the board. It draws 170 to 200mA more power than B model.
5. HDMI and Composite Connection: Both audio output socket and video composite now reside in a single 4-pole 3.5mm socket which resides near HDMI. The power connector is also repositioned in new B+ model and lives next to HDMI socket. All power and audio video composite socket are now placed on the one side of the PCB, giving it a clean and precise look.
6. USB Hard Drive: The USB hard drive is available on the board that is used to boot the device. It is identical to the hard drive of regular computer where windows is used to boot the hard drive of the computer.
7. PoE: B+ model comes with a facility of Power over Ethernet (PoE): This is a new feature added in this device which allows the necessary electrical current using data cables
8. Other changes: The B+ model poses slightly different layout in terms of location of the components. The SD memory slot is replaced by a micro SD memory card slot. The status LEDs consists of red and green color and is relocated to the opposite end of the PCB.

b) CAMERA

The camera is used to take the images of the vehicle (front or rear side). A controlled lighting illumination that can bright up the plate and allow day and night operation is used. In most cases the illumination is Infra-Red (IR) which is invisible to the driver.

c) PC/LAPTOP

Normally a PC running Windows or Linux. It runs the LPR application which controls the system, reads the images, analyzes and identifies the plate, and interfaces with other applications and systems.

➤ SOFTWARE DETAILS

a) PYTHON

Python is a general purpose and high-level programming language. Python language is being used worldwide as a wide extent of use headway and system improvement programming language. Colossal brands and web searcher make use of Python programming to make their task more straightforward. It is flexible, strong and far reaching.

b) OpenCV

OpenCV supports a wide variety of programming languages such as C++, Python, Java, etc. It is available on different platforms including Windows, Linux, OS X, Android, and iOS. OpenCV-python is a library of Python bindings designed to solve computer vision problems. It is the Python API for OpenCV, combining the best qualities of OpenCV C++ API and the Python language. OpenCV is not an executable file that can be replicated. It consists of code, library files, and DLL documents that are unadulterated. It is these library records that we are linked to when we write our code to get to the capabilities of OpenCV.

c) NOOBS OS

NOOBS (New Out of Box Software) is an easy operating system installation manager for the Raspberry Pi. NOOBS is not an OS. It is an OS installer. NOOBS is a way to make setting up a Raspberry Pi for the first time much, much easier. It does not need network access or any special imaging software.

The latest version of NOOBS brings a compact user interface with functionalities easily visible on the first screen itself. We can access the following options while operating NOOBS:

- Install option lets us install the desired OS provided by NOOBS
- Edit config option edits or customise .config files of the OS installed in Raspberry Pi. Editing is done in the form of text editor interface.
- Wi-Fi networks option guides in terms of the connectivity status of Raspberry Pi to the internet.
- Online help option opens a browser to the official Raspberry Pi website Help page, for queries or tips.
- Language Selection option helps to change the display language based on the support available in the software.

3. SYSTEM ARCHITECTURE: System architecture is an applicable model that characterizes the framework's structure and behavior. This includes the frame pieces and the relationship explaining how they work together to modify the overall structure.

✓ **Set the camera brightness using trackbar value.**

- This is done to enable camera to use it even for night vision.

✓ **Convert the image to grayscale image.**

- Frames are read using the images captured.
- In case of No Parking and signal jumping detection, red colour area needs to be detected and displayed as red colour
- For this reason, lower and upper range of red colour is set. This detects the red colour area.
- Contours are used to draw the area of red colour region in rectangular shape.

✓ **Logic behind different violations.**

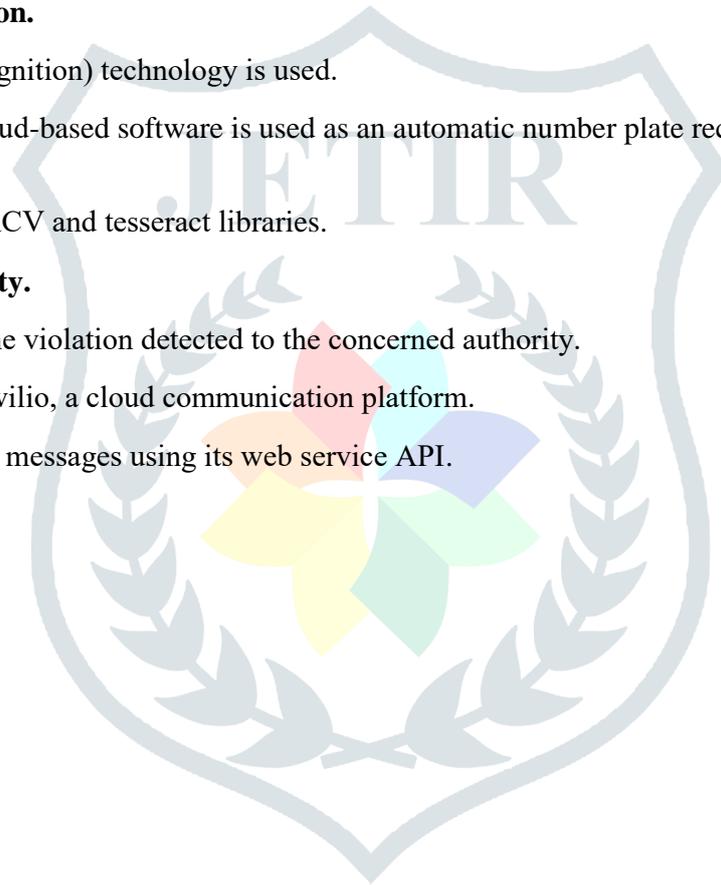
- In case where calculated area is greater than set minimum area and some red colour region is detected, this is found to be No Parking violation
- In case where the number of faces detected is greater than 2, it is found to be triple riding violation.

✓ **Number plate extraction.**

- OCR (Optical Character Recognition) technology is used.
- OpenALPR, a commercial cloud-based software is used as an automatic number plate recognition tool which is written in C++.
- OpenALPR make use of OpenCV and tesseract libraries.

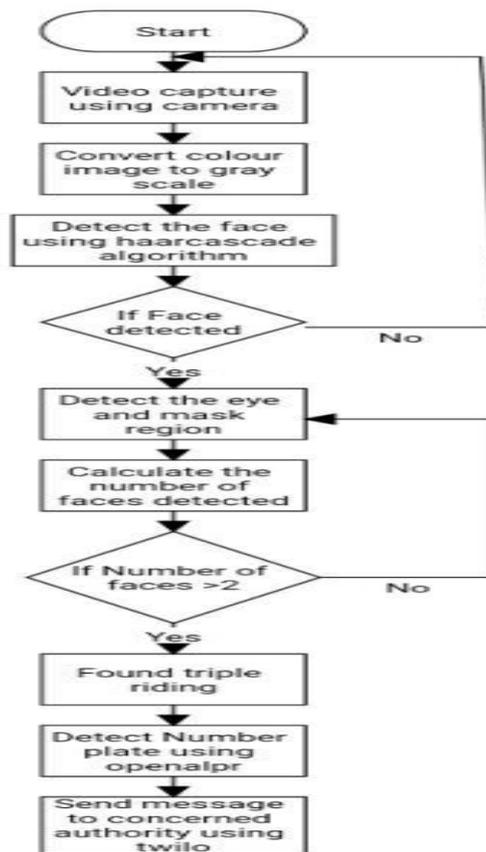
✓ **Intimating the authority.**

- A message is sent regarding the violation detected to the concerned authority.
- This is accomplished using Twilio, a cloud communication platform.
- Twilio sends and receives text messages using its web service API.



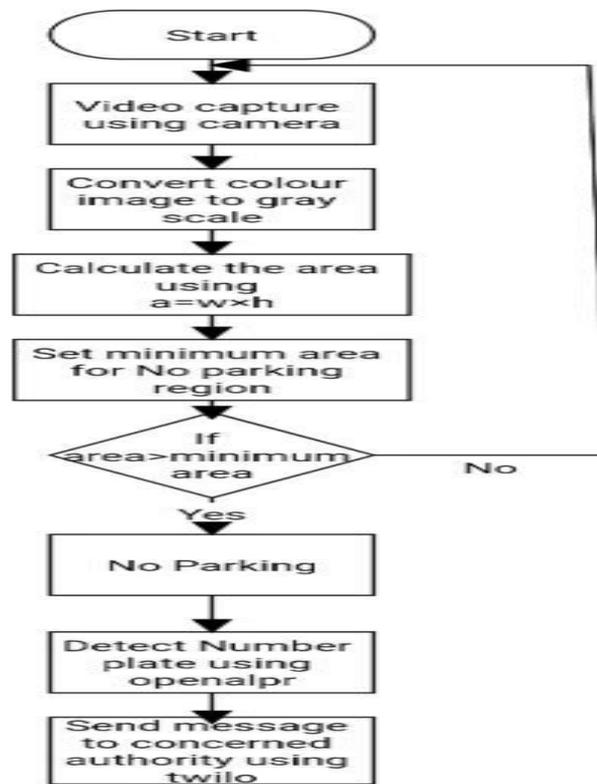
5. FLOW CHART:

5.1 For Triple Riding:



Initially, the camera captures the image while the video is being streamed. It then converts the colour image to the gray scale image. Haarcascade algorithm is used to detect the face, eye and mask region. If the face is detected, again the same algorithm is used to detect a greater number of faces using the loop. If and only if the number of faces is greater than two-It is found triple riding otherwise the loop continues. Once the violation is detected the number plate is extracted using OpenALPR (Automated License Plate Recognition) and a message regarding the violation is sent to the concerned authority.

5.2 For No Parking: Initially, the camera captures the image while the video is being streamed. It then converts the colour image to the gray scale image. A minimum area range is set for the no parking region and we calculate the area in the frame of image captured where the vehicle is parked. If the calculated area is greater than minimum area-The violation is found to be No parking. Once the violation is detected the number plate is extracted using OpenALPR (Automated License Plate Recognition) and a message regarding the violation is sent to the concerned authority.



6. CONCLUSION:

A program is being developed in this work to identify the motorcyclists who violate the laws such as No Parking and Triple riding. The program consists primarily of three parts—violation identification, license plate recognition of motorcyclists and intimating the authority regarding the violation and fine. The key criterion is to determine whether or not the picture captured has some violation detected. If the motorcyclist is marked with any violation, then the motorcyclist's license plate is recognized using OpenALPR software and tesseract OCR technology. Finally, an message is intimated to the authority about the violation and the corresponding fine.

7. REFERENCES:

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