

# TRAAP: TRAFFIC RULE ANALYSIS AND ALERT PLATFORM USING YOLO AND OCR ON RASPBERRY PI

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## **Abstract:**

Road traffic violations are a major cause of accidents, congestion, and loss of life in urban environments. Conventional traffic monitoring systems depend largely on fixed surveillance cameras and manual intervention, which limits coverage and operational efficiency. The Traffic Rule Analysis and Alert Platform TRAAP proposes a smart, portable, and real-time traffic enforcement solution using wearable technology for traffic police. In the proposed system, a camera mounted on a police cap and a pressable sensor placed on the wrist are used to capture images of violating vehicles. Upon sensor activation, the camera captures the image, and the vehicle number plate is detected using YOLO based object detection and Optical Character Recognition OCR. The extracted data is processed and securely stored in an SQL database using a Raspberry Pi platform. This system aims to reduce manual effort, improve enforcement accuracy, and enable faster violation processing, thereby enhancing overall traffic law enforcement efficiency.

## **1. INTRODUCTION**

Road traffic violations have become a significant concern due to rapid urbanization and the increasing number of vehicles. Violations such as signal jumping, overspeeding, riding without helmets, and improper parking disrupt traffic flow and contribute to serious accidents and loss of life. Effective traffic rule enforcement is essential to ensure road safety and discipline. Traditional traffic monitoring systems rely on fixed surveillance cameras and manual recording by traffic police.

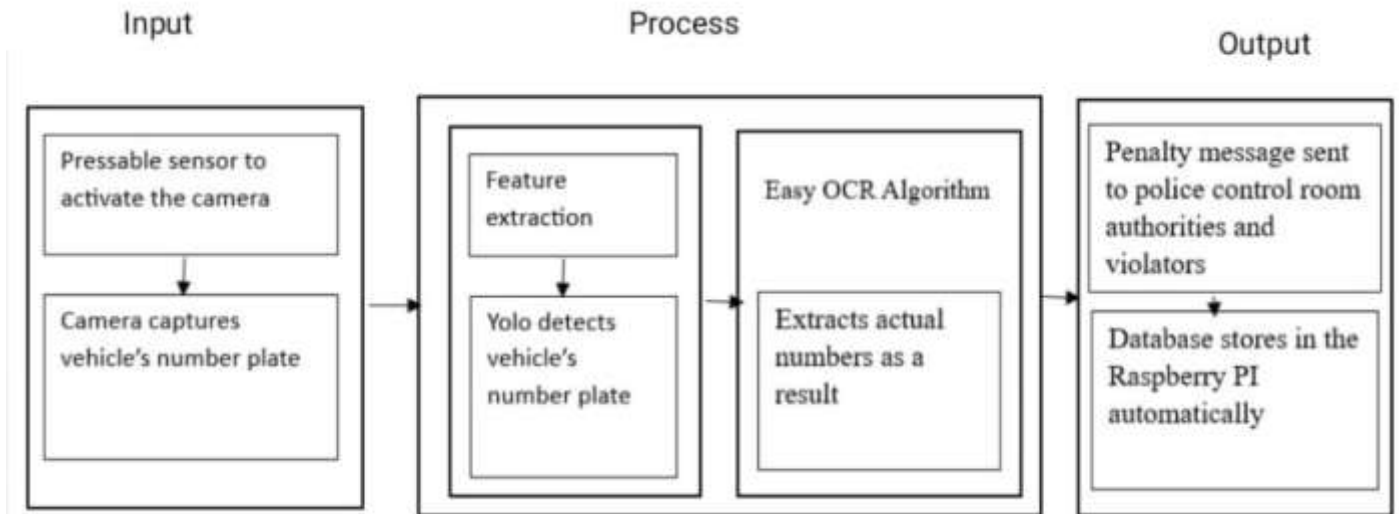
These approaches suffer from limited coverage, high infrastructure costs, blind spots, and human error. In congested or high-speed traffic conditions, manually recording vehicle numbers becomes highly challenging. Recent advancements in deep learning, computer vision, and Internet of Things (IoT) technologies have enabled intelligent traffic monitoring systems. YOLO provides real-time object detection, while OCR enables automatic extraction of text from images. Raspberry Pi allows these technologies to be deployed in compact and portable systems.

The TRAAP system introduces a wearable traffic enforcement solution in which a camera mounted on a police cap and a pressable wrist sensor capture images of violating vehicles. The captured data is processed and stored in a web-based platform for further analysis and record management.

## 2. METHODOLOGY

### 2.1 SYSTEM ARCHITECTURE

The system consists of input modules, processing unit Raspberry Pi, detection modules YOLO and OCR, and a web based interface. All components work together to detect violations and store data efficiently.



### 2.2 INPUT MODULE AND DATA ACQUISITION

A wearable camera mounted on a police cap captures images of vehicles. A pressable sensor acts as a trigger to capture images only when a violation is observed, reducing unnecessary data collection.

### 2.3 PROCESSING AND DETECTION

The captured image is sent to the Raspberry Pi. Image preprocessing such as resizing and noise reduction is applied. YOLOv4 detects the number plate region, and OCR extracts the alphanumeric text from the plate.

### 2.4 DATA STORAGE AND ALERT SYSTEM

The extracted vehicle number and violation details are stored in an SQL database. Alerts are sent to users via email, and the data is displayed on a web dashboard for monitoring.

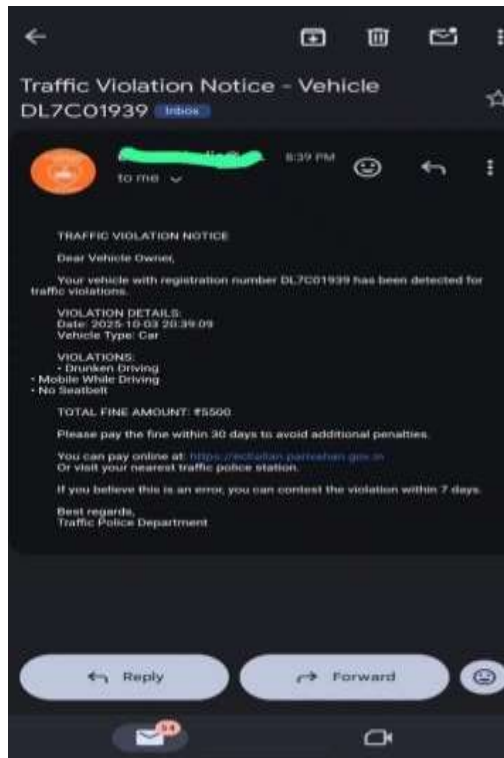
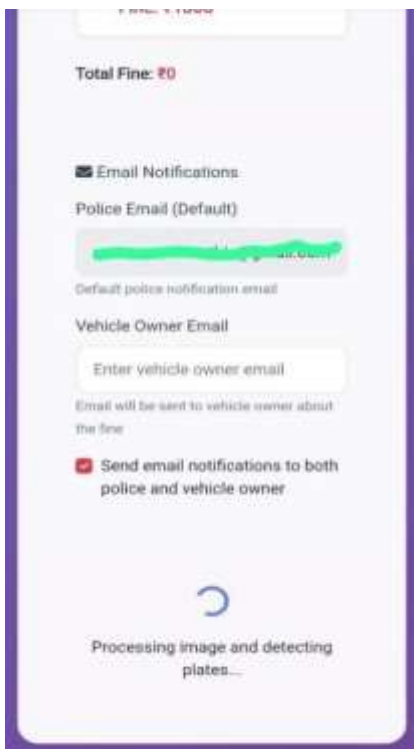
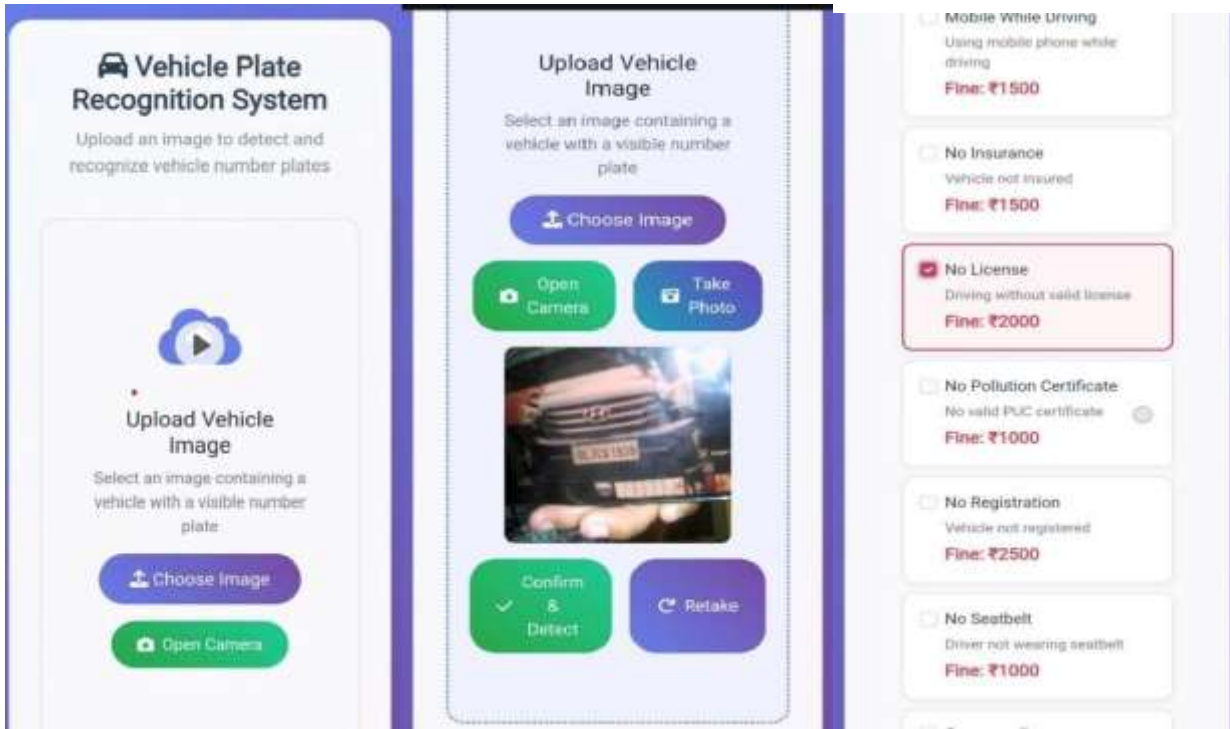
## 3. PROBLEM STATEMENT

Existing traffic monitoring systems rely heavily on fixed cameras and manual observation, which limits coverage and efficiency. There is a need for a portable, real time, and automated system to detect and record traffic violations accurately.

## 4. RESULTS AND DISCUSSION

The TRAAP system was tested under different traffic conditions. YOLO demonstrated high accuracy in detecting number plates in real time. OCR successfully extracted text from clear images.

The Raspberry Pi handled processing efficiently with minimal delay. The system reduced manual effort and improved accuracy in recording violations. The web interface enabled easy data management and retrieval.



## 5. CONCLUSION

The TRAAP system provides an effective and practical solution for modern traffic rule enforcement by integrating wearable technology, YOLO-based object detection, OCR, and Raspberry Pi. The system enables real-time detection of traffic violations through a portable setup, reducing dependency on fixed surveillance infrastructure.

By automating number plate detection and data processing, the system significantly improves accuracy and minimizes human errors. It also reduces manual workload for traffic authorities and ensures faster violation recording and response. The use of Raspberry Pi makes the system cost-effective, compact, and suitable for real-time applications.

Furthermore, the integration of a web-based platform allows efficient storage, retrieval, and management of violation data. Overall, the system is scalable, flexible, and suitable for implementation in smart city environments, contributing to improved road safety and efficient traffic management.

## 6. FUTURE ENHANCEMENTS

Future improvements of the TRAAP system include the integration of advanced deep learning models such as improved versions of YOLO to enhance detection accuracy and performance in complex traffic scenarios. The system can also be optimized for better performance under challenging conditions like low-light environments, rain, and motion blur by applying advanced image enhancement and preprocessing techniques.

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