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DETECTION OF ILLEGAL ON-STREET PARKING

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Abstract -The increase of automobiles in this generation is very high compared to the olden days. Due to the increase of such automobile, there is also a gradual increase in terms of traffic in the countries. We wait for a long time based on the traffic in the cities. The main cause for some traffic to occur is due illegal parking on roads and other areas. In order to beat this drawback, we tend to propose a way to avoid traffic that is by detecting illegal on-street parked vehicles by the use of their number plates by image processing. On-street parking refers to practice of parking vehicle on the side of public road or street. The on-street parking is common method of parking in urban and suburban areas where parking lots or dedicated off-street parking space may be limited. Due to illegal on-street parking there will be traffic congestion and also accidents may occur. "Detection of Illegal On-Street Parking" provides data of the illegally parked vehicle by capturing the image of number plate and that image is converted to greyscale, segmented and masked in the pre-processing stage. Then using Computer Vision technique, bounding boxes are formed around characters and characters are also printed with the use of CV library. The proposed also generates the chalan or invoice of penalty stating the duration of time parked in.

***Key Words*:** on-street parking, area of interest, Raspberry Pi, image processing, Resnet, Yolo v3 model, OCR.

1. INTRODUCTION

In these days the illegal parking has been the major problem in some part of the country. Due to this illegal parking, there are numerous amounts of problems. Some of the main problems are traffic congestion, safety hazards, obstructed access for the emergency vehicle like ambulance, reduced parking facilities for the legitimate users. Our project aims to address this issue by automatically identifying and reporting illegally parked vehicles. The project aims to develop an automated system for the detection of on-road illegal parking, addressing the persistent issue of vehicular obstructions that impede traffic flow and pedestrian safety in urban environments. The primary problem this project seeks to tackle is the prevalent lack of efficient and timely identification of illegally parked vehicles, leading to traffic congestion, safety hazards, and inconvenience for commuters and pedestrians. By leveraging computer vision, image processing algorithms, Internet of Things (IoT) and sensor technologies, the project aims to create a robust solution capable of accurately detecting and alerting authorities or relevant stakeholders about instances of on-road illegal parking. Also this system identifies and extracts the vehicles registration number thereby it will be easy to generate the E-Challans for the particular vehicle for the illegal parking. This system intends to streamline enforcement efforts, enhance urban mobility, and contribute to creating more organized and safer roadways. The system aims at monitoring and controlling traffic in urban areas and it is also aims at avoiding backend collisions caused by illegally parked vehicles by strictly monitoring illegally parked vehicles.

2. RELATED WORKS

The industrial revolution 4.0 has given rise to the number of IoT devices. The access too internet has become easy and there is a significant increase in the number of people using internet. Based on the above topic there are many related works are done so far. But they are implemented using very high technology and are expensive. Moreover they are designed according to the American and European standards which are very difficult to be implemented in India. The major drawback in all the proposed systems are they are implemented keeping in the mind that vehicle if left hand driven but in India the vehicles are right hand driven. This paper proposes an IotT based technology suitable for Indian conditions that helps in detection of on-street illegally parked vehicles.

3. METHODOLLOGY

There are mainly 6 steps:

- Identification of the object using camera
- Recognition of the stationary objects in the captured video.
- Classification of objects of the different types.
- Detection and extraction of the vehicle registration number.
- Generation of the notification or alert for the owner of the vehicle and the concerned authorities.
- Generation of the E-Challans based on the time duration of illegally parked vehicles

4. PROPOSED SYTEM

The system works on the basic principle of image processing and Yolo V3 algorithm. The processing of captured data will be done by Raspberry Pi processor. A camera is connected to Raspberry Pi which captures the image. The algorithm for lane detection with the help of MATLAB package present in Open CV helps in plotting of lanes in the captured image or video and a lane on the road is detected. A deep convoluted neural network is used to process and detect the object in image with the help of Yolo v3 model and object is detected. The next step is extraction of number from number plate of vehicle and produces the challan and sends to the vehicle owner based on the duration of vehicle parked.

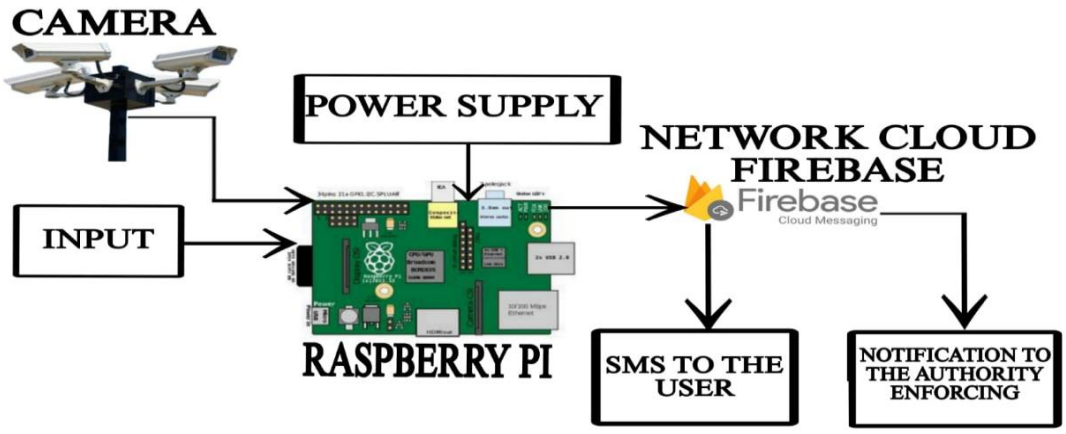

FIG 4.1 SYSTEM ARCHITECTURE

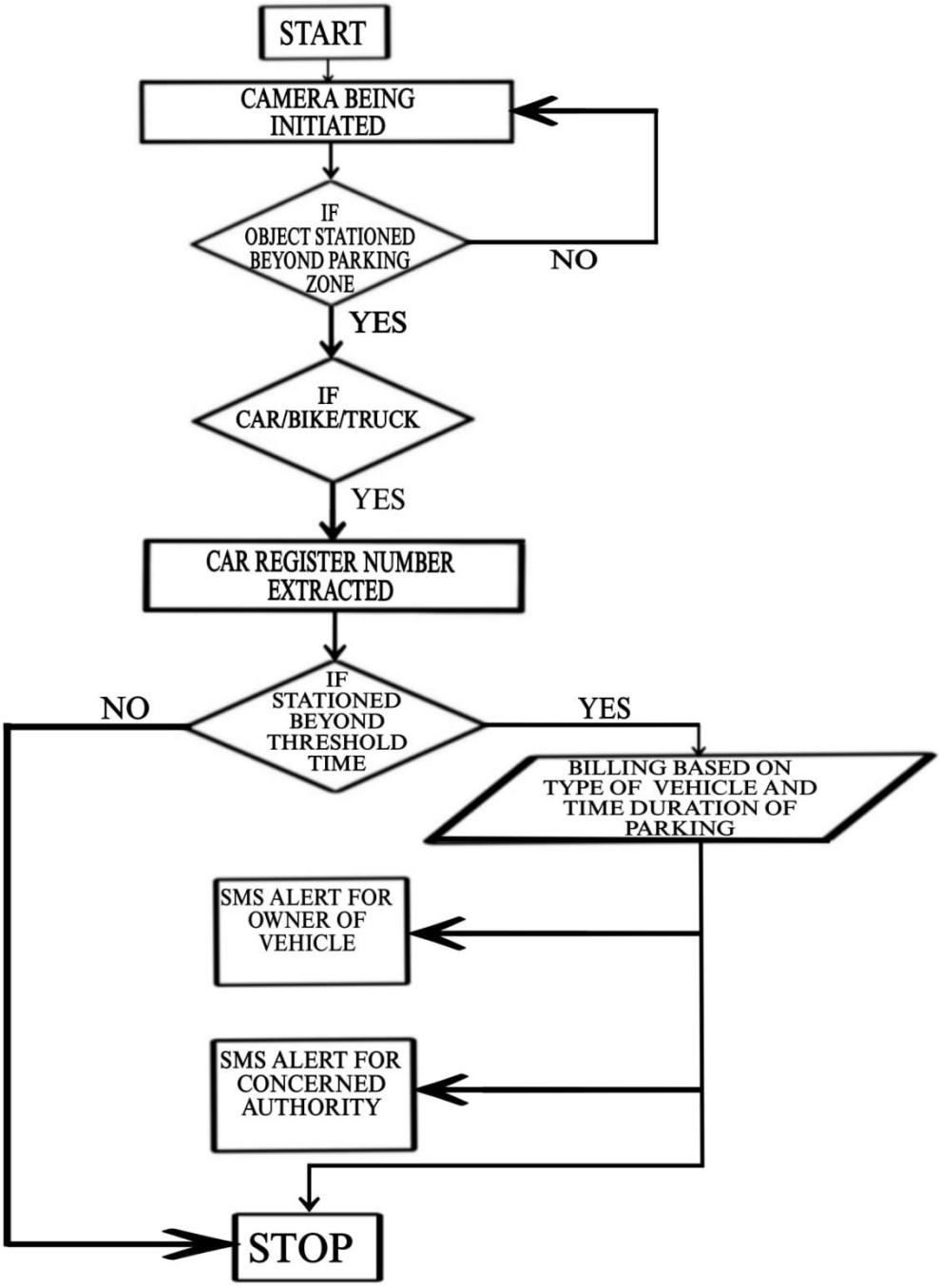

FIG 4.2 PROPOSED SYSTEM

5. HARDWARE COMPONENTS

A. RASPBERRY PI

The proposed system uses Raspberry Pi 4B model. It is a microprocessor that runs Linux, but it also provides a set of GPIO (general purpose input/output) pins, allowing you to control electronic components for physical computing and explore the Internet of Things (IoT). The Raspberry Pi operates in the open source ecosystem: it runs Linux (a variety of distributions), and its main supported operating system, Pi OS, is open source and runs a suite of open source software. The Raspberry Pi Foundation contributes to the Linux kernel and various other open source projects as well as releasing much of its own software as open source.

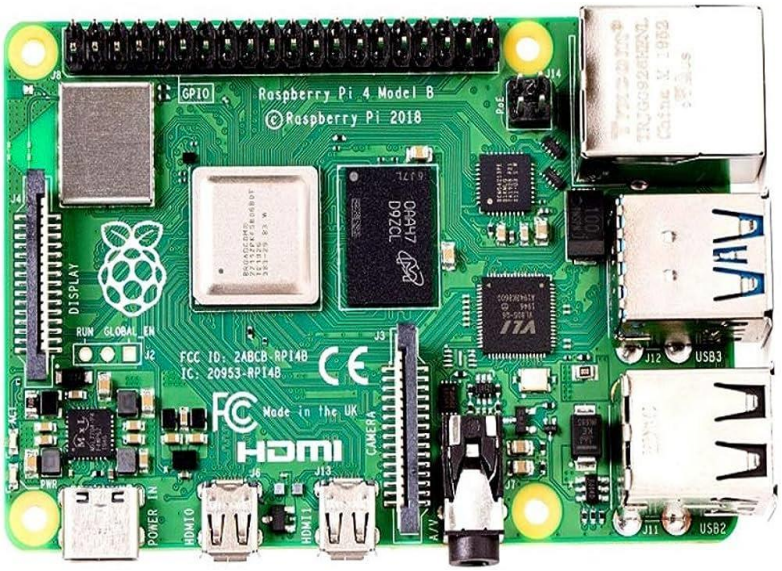

FIG 5.1 RASPBERRY PI 4B MODEL

6. ALGORITHMS USED

A. LANE DETECTION USING OPEN CV

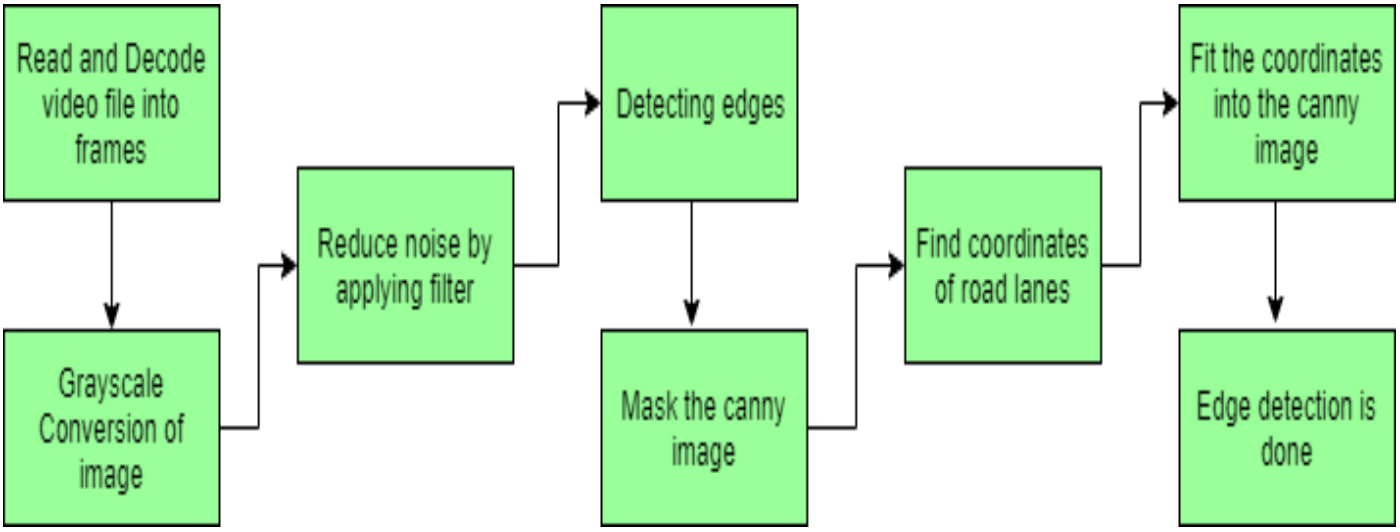

FIG 6.1 FLOWCHART OF LANE DETECTION

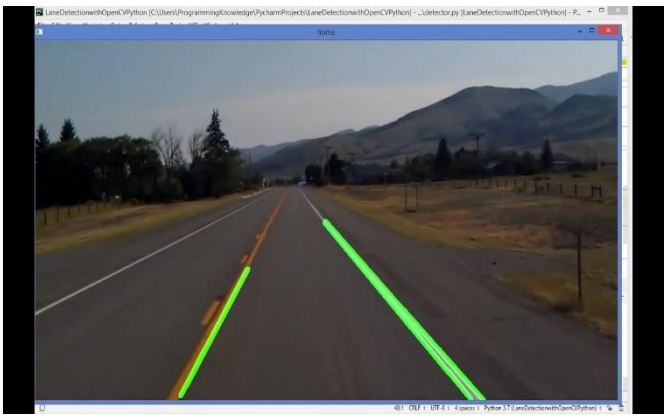

FIG 6.2 LANE DETCTION

The figure 6.2 shows the output of lane detection

B. HOUGH TRANSFORMATION IN LANE DETECTION

In image processing, the Hough transformation is a feature extraction method used to find basic geometric objects like lines and circles. By converting the picture space into a parameter space, it makes it possible to identify shapes by accumulating voting points. We'll use the probabilistic Hough Line Transform in our algorithm. The Hough transformation has been extended to address the computational complexity with the probabilistic Hough transformation. In order to speed up processing while preserving accuracy in shape detection, it randomly chooses a selection of picture points and applies the Hough transformation solely to those points.

C. YOLO v3

YOLOv3 is the version three of the YOLO system. The neural network model architecture is stored in the yolov3.cfg file, and the pre-trained weights of the neural network are stored in yolov3.weights. There is a file called coco names that has the list of 80 object class that the model will be able to detect. Common Objects in Context (**COCO**) Common Objects in Context (**COCO**) is a database that aims to enable future research for object detection, instance segmentation, image captioning, and person key points localization. COCO is a large-scale object detection, segmentation, and captioning dataset. The model has been trained only on these 80 object classes. It uses convoluted neural network to detect the object.

Work flow of Yolo v3:

- Reading of input video
- Loading YOLO v3 Network
- Reading frames in the loop
- Getting blob from the frame
- Implementing Forward Pass
- Getting Bounding Boxes
- Non-maximum Suppression
- Drawing Bounding Boxes with Labels
- Writing processed frames

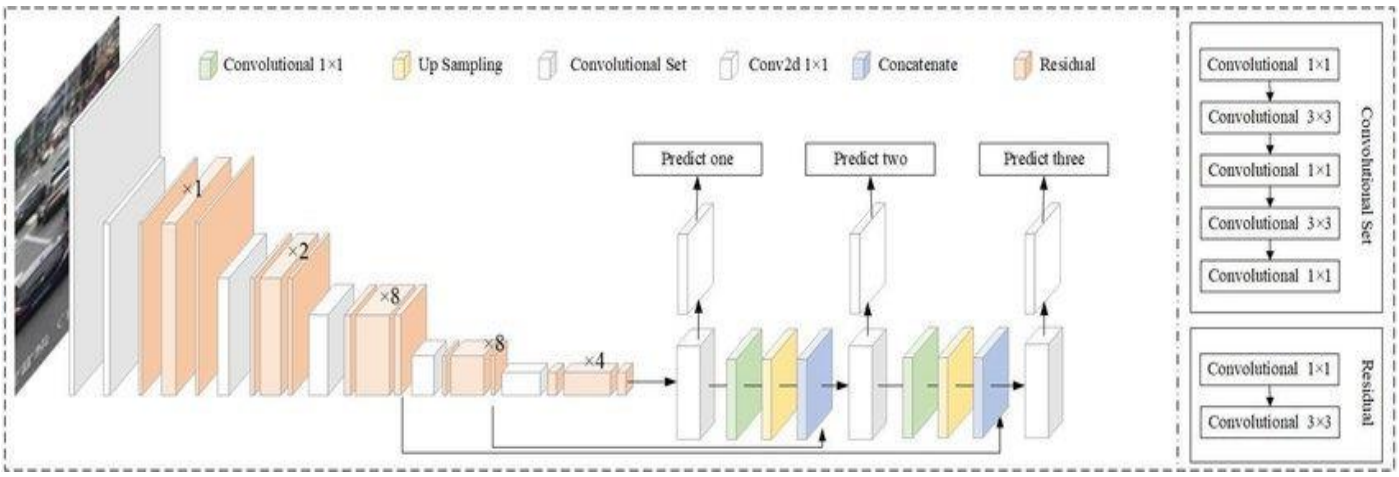

FIG 6.3 YOLO v3 ARCHITECTURE

The fig 6.3 shows the architecture of YOLO v3

7. OUTPUT

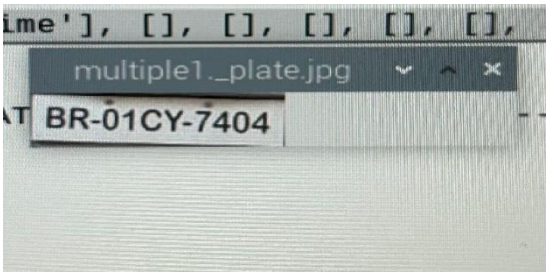

FIG. 7.1 Cropped Image of Number Plate

The figure 7.1 shows the cropped image of the number plate from the vehicle after Optical Character recognition(OCR)

FIG. 7.2 Output of YOLO v3

The above figure is the output of YOLO algorithm and it detects the object.

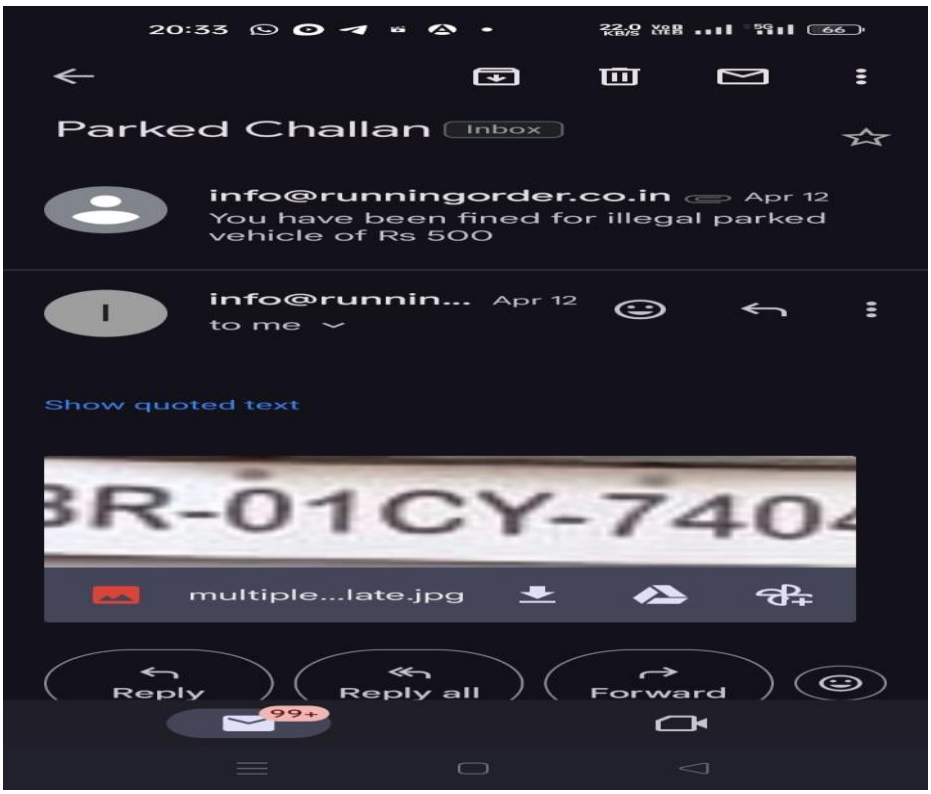

FIG. 7.3 Output of Challan Generated

This is the triggered warning that is sent by the system to the user when the illegal parked vehicle is detected.

8. CONCLUSION

The model can not only be used to detect illegal parking, but also to reduce traffic congestion in various places by sending information about unauthorized parking to the control office with the help of Raspberry Pi processor and advanced techniques of image processing. It will decrease the number of illegal parking. The system is taking little time for processing and identification. To improve the system performance, it is needed to improve the accuracy of the SVM classifier, reduce the total time of operation, and identify the cars perfectly by discarding other objects in the searching window. The system can be upgraded by ensuring vehicle registration via any smart card, fine and parking charge collection via online payment and parking slot booking in advance via SMS.

9. REFRENCES

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