

Two Wheeler Helmet Detection and Number Plate Extraction

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Abstract— Motorcycle accidents have become more common in recent years, owing to the fact that riders who exceed the speed limit are more likely to sustain injuries. In India, not only overdriving and dashing cause accidents, but also terrible roads and street bumps will cause twists of fate, despite the fact that human beings drive at low speeds. Also, if the raider violates the traffic regulation, police officers may also try to seize the riders; it is probably a bit tough to catch the riders because sometimes they can also break out; it will likely be too tough to board a case on them by using pictures of the registration code variety manually; consequently, it is especially necessary to build an automated helmet and registration code reputation primarily based on deep learning machines using the YOLO algorithm and R-CNN

Index Terms— Number plate detection, deep Learning, Region convolutional neural network, YOLO algorithm

I. INTRODUCTION

India is the second-largest country in the world by population. Many people use motorbikes every day to travel. Many bike road accidents occur as a result of the increased speed over the limited speed on bad roads, resulting in numerous injuries and deaths. Governments have made it illegal to ride a bike without a helmet because of the significance of doing so, and they have adopted enforcement tactics such as random checks and other manual procedures to identify offenders. The present image-based surveillance technologies, in contrast, rely heavily on human input and are passive. These systems' effectiveness deteriorates with time since they are dependent on people. Automation will make the monitoring of these violations more dependable and resilient while also reducing an amount of human resources needed. The solution for these accidents is to use number plate detection without helmet application. In this application, the first step is to identify the person on the motorcycle, the second step is to know if the person wears a helmet or not, and the last step is to detect the number plate if the person does not wear a helmet. The YOLO (You Only Look Once) algorithm is used for helmet detection and number plate detection. The YOLO algorithm is a famous deep learning algorithm for object detection. Overall, the technology of number plate recognition without a helmet can serve to increase traffic law enforcement and road safety.

II. LITERATURE SURVEY

Numerous study articles compare various methods for creating number plate detection without helmet applications. Maharsh Desai et al [1] draw the following conclusions: They intend to use background

subtraction and optical character recognition for fall detection and for helmet detection they use background subtraction and Hough transform descriptor. They extracted the background image and then on a particular segment they applied Hough Transform Descriptor. Hough Transform descriptor is basically used for detecting regular curves such as lines, circles etc. They detected circles here and find whether a person is wearing helmet or not. Ajith R et al [4] developed an algorithm for the number plates of motorcyclists can be identified using photos or videos captured by a camera. Vehicle classification, pre-processing, selecting the ROI (Region of Interest), recognition of number plate characters using image processing algorithms, and storing in the database with the image as the proof with date and time recorded are some of the steps in the algorithm for number plate recognition. To accurately identify each offender, stop the suspect's vehicle, and impose fines for violations, a database will be created with the evidence associated with the offence. The system uses pure machine learning to identify the various types of helmet it encounters at the lowest possible cost.

Prajwal M. J et al [6] suggested a method for real-time surveillance films automatic helmet-less bike rider recognition. The suggested method starts by identifying bike riders in security footage. Next, it uses a visual characteristic to detect whether the bike rider is wearing a helmet or not. Motorcycle riders are afterwards chosen from the moving objects using convolutional neural networks (CNN). Once more, the use of CNN on the upper one-fourth areas to further identify motorbike riders operating without a helmet. On two datasets, the performance of the suggested strategy is assessed. With a low false alarm rate of 0.5%, testing on real-time footage correctly identify 96.66% of bicycle riders without helmets.

Kunal Dahiya et al [7] suggested a method initially uses background subtraction and object segmentation to identify bike riders from surveillance video. The binary classifier and visual clues are then used to determine whether or not the bike rider is wearing a helmet. There was a performance comparison of three frequently used feature representations for classification, including the histogram of oriented gradients (HOG), the scale-invariant feature transform (SIFT), and local binary patterns (LBP), in order to assess our approach. According to the experimental findings, 93.80% of the real-world surveillance data may have been detected. Additionally, it has been demonstrated that the suggested solution operates in real-time with a processing time of 11.58 ms per frame and is less computationally expensive.

S. Swetha et al [8] suggested, two approaches for detecting licence plates—one based on Sobel edge detection and the other on morphological gradient detection—are compared. Two licence plate detection methods are constructed using OpenCV and PYTHON on a Windows machine, and the two algorithms are thoroughly compared in terms of licence plate detection accuracy. These techniques are quite effective and interactive, serving as a model for further licence plate recognition.

Chinmayi Gurav et al [9] developed a system that recognises the image of a vehicle's number plate from video using Raspberry Pi video processing, and the number is retrieved using various techniques and algorithms. The device can be used at college entrances and other places with strong access restrictions. The system records video of any passing vehicle, which is then transformed into images using the OpenCV programme.

Jayasimha Reddy pasam et al [10] developed a research, a CNN model was developed to recognise helmets and licence plates in a variety of images. In this type of technology uses previously acquired images for the picture recognition function. The initial stages of recognition are number plate extraction, character splitting, and template matching. Using the CNN paradigm, the programme must be able to handle number plates quickly and effectively in a variety of environmental circumstances.

Harpreet Kaur et al [11] implemented the system that records videos of the vehicles using a fixed camera that is positioned at red lights, toll booths, border crossings and petrol stations as well as in parking lots. Vehicle number plate detection is performed by the system using a clever edge detection algorithm and morphological operators. The results of the experiment demonstrate that the system is capable of accurately capturing vehicle video and detecting the licence plate in a variety of challenging situations, including day and night.

Kavyashree Devadiga et al [12] implemented the system which get an input from a video camera that will be mounted on the road. The frames would go through backdrop subtraction, where all entities besides the moving items will be removed, including people on the street. A trained model will then categorise and name the moving items. The COCO model will be used to categorise commodity things. Additionally, a specific training data set for a person wearing a helmet and a bike has been created using Tensor flow. Web scraping was used to gather multiple photographs of different sorts of helmets in order to recognise every helmet that the system encounters. First, a bounding box will be defined when a bicycle rider is recognised. That specific bounding box will serve as the search area's boundary. The system will then look in that box to see if there is a helmet. The box is dropped if a helmet is seen. The number plate checking subsystem will process the retained boxes. The wording

on the licence plate will be noted using OCR. The date, time, place of the infraction, the number plate number, and a photo of the bounding box will all be entered separately.

III. EXISTING SYSTEM

In the existing system, everything is done manually by the traffic police. It is difficult for the traffic police to know how many people wear helmets by looking at the CCTV cameras because they contain a large number of records. It also takes a lot of time to check in manually. Also, if the weather conditions are bad, we cannot get quality data from the CCTV cameras.

Maharsh Desai et al [1] used background subtraction and Hough transform descriptor algorithms. The drawback of this algorithm is: In Background reduction can be sensitive to noise in the image or video sequence. Camera noise, sensor artifacts or sudden changes in pixel values can create false positives or disturb the background model. And the Hough transform description algorithm can be computationally expensive, especially when dealing with large images or complex shapes. The algorithm usually involves repeated operations and accumulators, resulting in higher computational requirements. This can limit its real-time effectiveness and efficiency, especially in applications that require fast processing.

Ajith R et al [4] developed ROI algorithm and it has a drawback that is when it is used for object tracking, it may face challenges when objects move across the defined ROI boundaries or undergo significant transformations. Objects that enter or exit the ROI may be lost or incorrectly tracked, leading to tracking failures or false detections.

S. Swetha et al [8] proposed two algorithms. One is based on Sobel edge detection and the other is based on morphological gradient detection. The drawbacks are: The Sobel edge discovery calculation can be exceedingly touchy to clutter within the picture. Clutter can lead to untrue edge location or cause the calculation to identify insignificant edges. Pre-processing procedures like picture smoothing or clutter lessening are frequently required to moderate this issue. Morphological gradient detection tends to deliver thicker or more extensive edges compared to other edge discovery strategies. The identified edges may not precisely speak to the exact area or boundaries of the objects or highlights within the picture. This need of exact edge localization can be tricky in applications that require high precision.

Harpreet Kaur et al [11] proposed Canny edge detection algorithm. The disadvantage of it is in pictures with complex foundations or cluttered situations, the Canny calculation may create untrue discoveries or deficient edge representations. It does not intrinsically consider relevant data or higher-level picture highlights, which can affect the precision and unwavering quality of edge discovery in such scenarios.

IV. PROPOSED SYSTEM

The suggested system's primary goal is to decrease accidents through the use of number plate detection without a helmet. R-CNN is a two-stage detection technique. In the first stage, a subset of locations in a picture that might contain an item are discovered. In the second stage, each region's category for the object is determined. The YOLO (You Only Look Once) algorithm is then used to find the helmet. The YOLO algorithm is a model that has been pretrained. The number plate and helmet both aid in their detection. Apply OCR algorithms to recognize and extract the alphanumeric characters from the segmented areas, such as Tesseract or deep learning-based models. The image-based characters are transformed into machine-readable text by OCR techniques.

The input image in this initial step must be extremely clear and in the form of png or jpg. In this case, visual clarity is crucial. Bounding boxes are then used to detect the person and bike. The detect helmet is then clicked. If a helmet is present, it will display at the top of the image with an accuracy rate of. If not, the vehicle's license plate number is extracted. The proposed system is more accurate and cost-effective because we use YOLOv2 for object detection and YOLOv3 for helmet detection. For operations like number plate reading and verification, this technology eliminates or significantly reduces the requirement for manual involvement. This saves time and lessens human error, allowing staff to concentrate on activities that are more important.

The suggested method is easily expandable to accommodate more vehicles and various places. It can be used in a variety of settings, including checkpoints, parking lots, municipal streets, and highways, to meet the needs of varied applications. The system achieves excellent accuracy in number plate recognition by utilizing cutting-edge computer vision techniques and OCR algorithms. It can manage a range of environmental circumstances, including various illumination and weather conditions, leading to dependable and constant performance.

The below Fig 1 describes the overall steps of the project. At first we upload the image. The image should be in the form of jpg or png. If the image is in described form then it is accurate, otherwise display give accurate

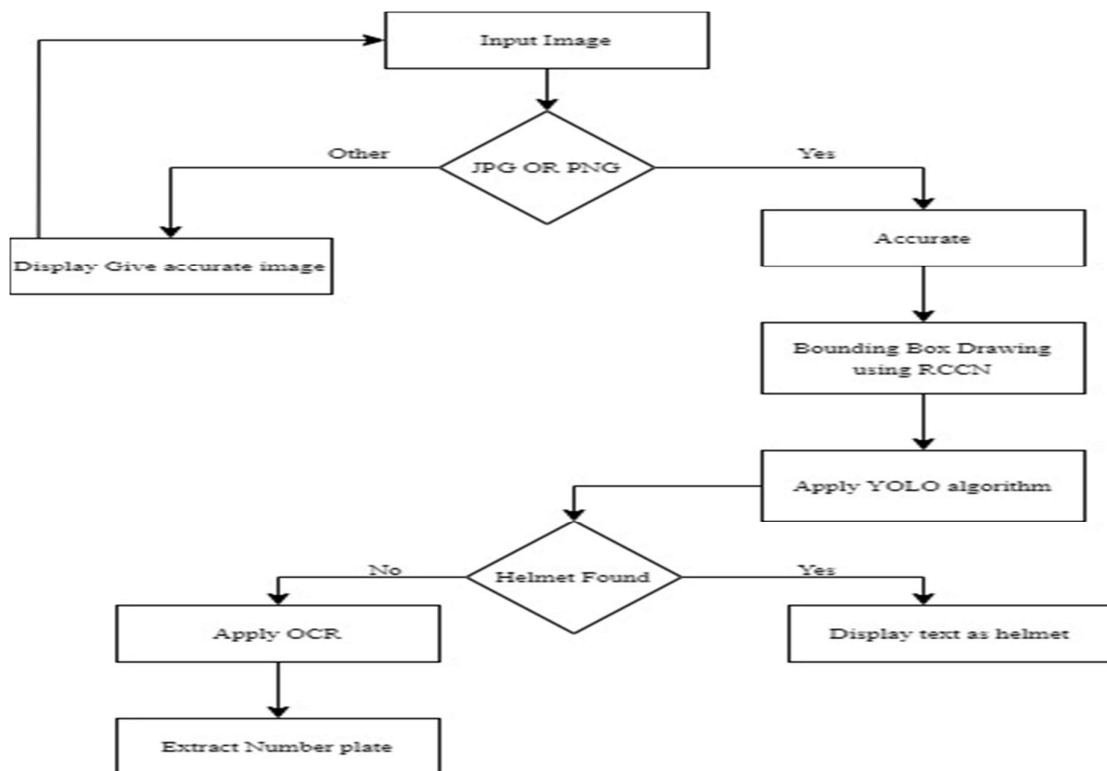


image. After that the bounding boxes are drawn using R-CNN. In the next step the yolo algorithm is applied for helmet detection. If the helmet is found then display the text as helmet, otherwise the number plate is detected and extracted

Modules

1.Upload Image : The image is given as input to the system in the form of jpg or png.

2.Helmet Detection : After taking input as an image, we obtain information from this if the person is wearing a helmet or not while riding a motorcycle. For helmet detection we use yolo algorithm. The pseudocode of the algorithm is given below.

```

image=readimage()
cell_count=7
class_count=4
thresold_value=0.7
step_count=height(image)/cell_count
prediction_array=new_arr(size(cell_count,cell_count,class_count))
prediction_box=new_arr(size(cell_count,cell_count,cell_count,cell_count))
final_count=[]
for(k=0;k<cell_count;k++):
  for(l=0;l<cell_count;l++):
    c=image(k:k+step,l:l+step)
    prediction_array[k,l]=class_pred(c)
    prediction_box[k,l]=bound_box(c)
    bound_box=[0 if prediction_box[l,k,0,4]>prediction_box[l,k,1,4]else 1]
    predict_class=indexof_maximum_val(prediction_array[k,l])
    if prediction_box[k,l,bound_box,4]*maximum_val(prediction_array[k,l])>thresold_value:
      final_count.append([pred_box[k,l,bound_box,0:4],predict_class])
print final_pred
  
```

3.Licence Plate Detection : In this, the number plate of the person who is not wearing a helmet is detected.

4.Licence Plate Extraction : The licence plate is extracted by using Optical Character Recognition(OCR) outputs the licence plate number. For number plate extraction we use OCR

V. TECHNOLOGIES USED

Python a is widely used programming language. One of the easiest and most object-oriented programming languages is this one. With Python, the number of lines can be decreased. R-CNN is a two-degree detection set of rules. The primary stage identifies a subset of areas in an image that might incorporate an object. The second level classifies the object in each area. OCR technology can be used to extract the characters from the number plate image and convert them into a digital format that can be stored and processed. Overall, a combination of these technologies can be used to create an effective number plate detection system without helmet detection, depending on the specific requirements and use case of the system.

VI. RESULTS

The project is implemented on windows system with 16GB RAM and 62 bit configuration. The Fig 2.shows the front end of the application and it shows various modules like upload image .By clicking on upload image the image is uploaded by the user. The image should be in the format of png or jpg.

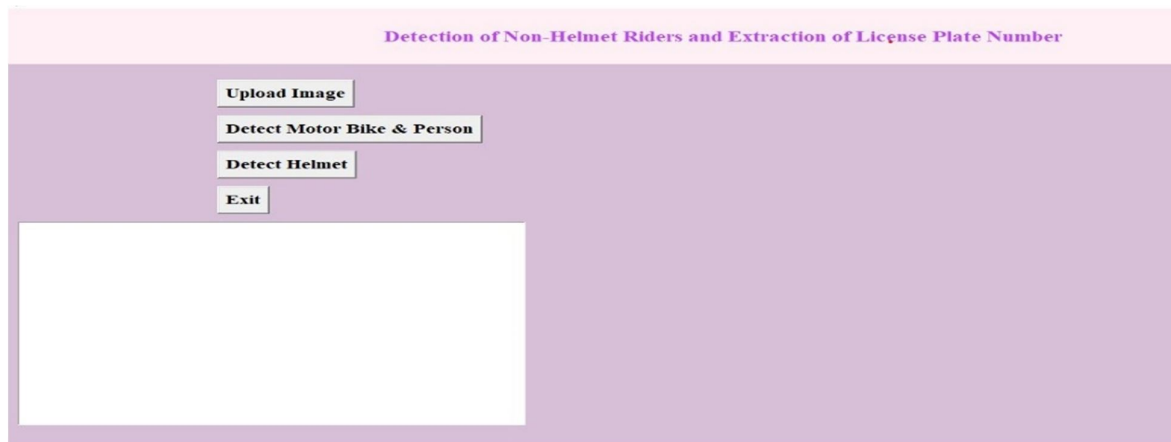


Fig 2.The image is uploaded.

After uploading the image the user clicks on detect motor bike and helmet as shown in Fig 3.The image uploaded is the person with helmet. In this the bounding boxes are drawn.

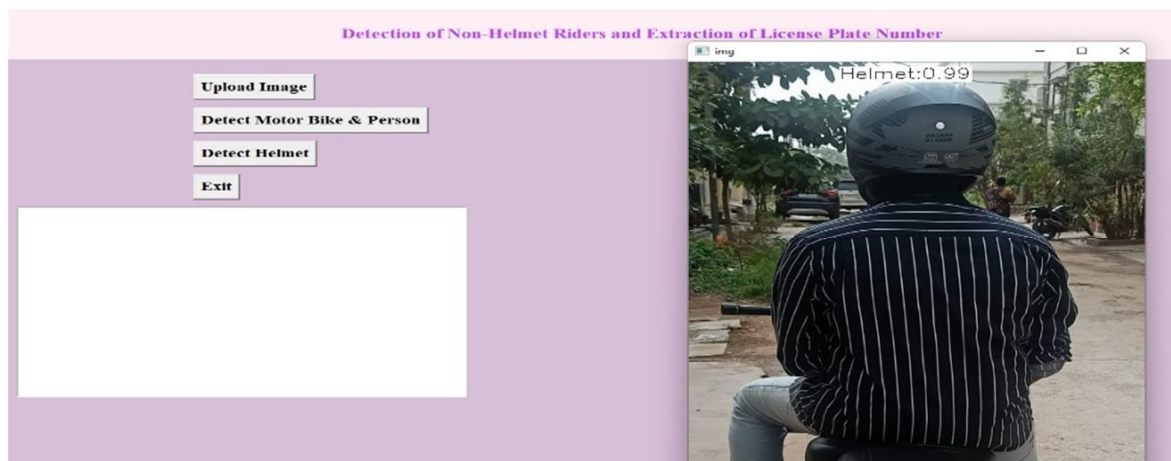


Fig 3. The bounding box is drawn.

After the drawing of the bounding box if the person is wearing helmet then the text helmet is appeared above the image of the person and with the accuracy as shown in Fig 4. The main difference between this application and other applications is that no application gives an accuracy detection rate for helmets or people. But this application gives it the most appropriate accuracy.

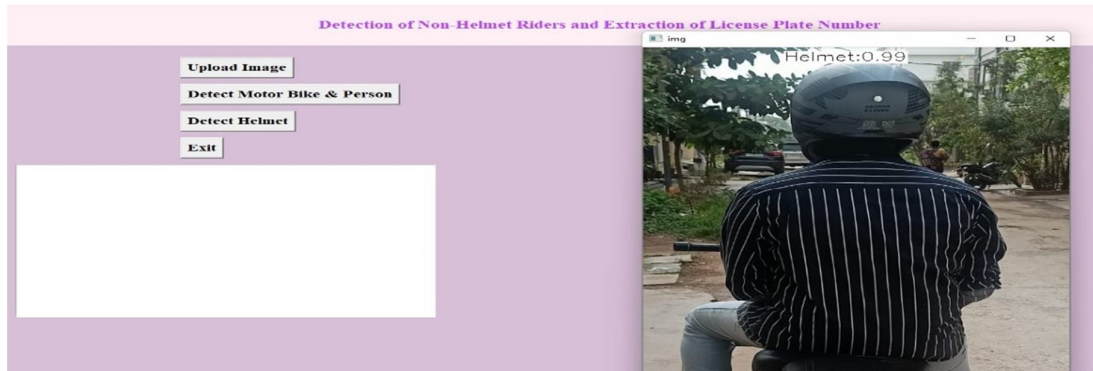


Fig 4. Person with helmet

In the next step the user upload the image of a person without helmet and the bounding boxes are drawn as shown in the Fig 5. In this we use YOLOv2 for object detection and YOLOv3 for number plate detection. In this application an extension version of the YOLOv3 algorithm are used, where other applications use only the YOLOv2 algorithm.

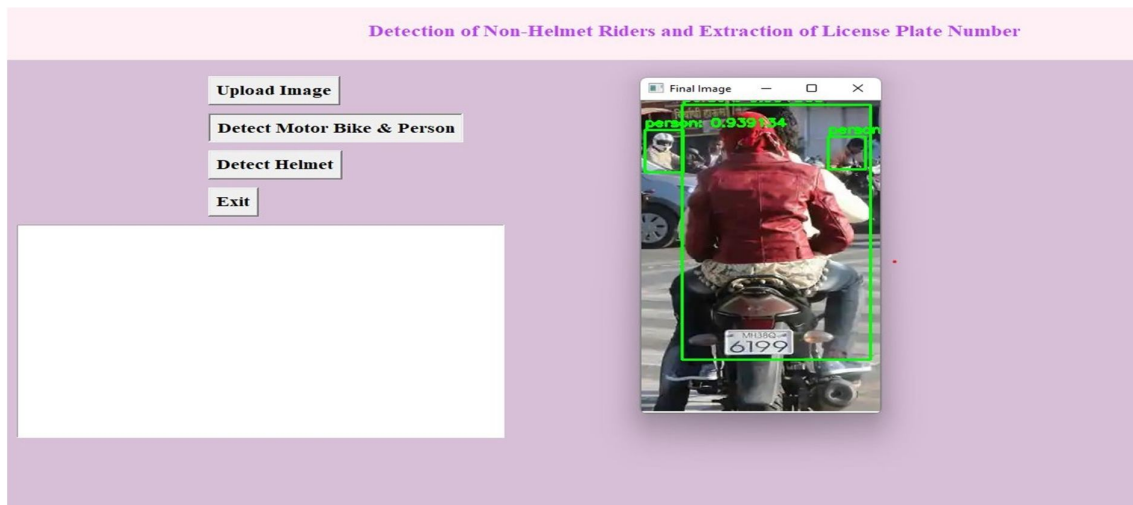


Fig 5. Bounding boxes of an image without helmet.

VII. CONCLUSIONS

Number Plate Detection Without Helmet is an extremely useful website to detect the licence plate of a person without a helmet. By using this application, we can reduce the number of accidents that occur in the day-to-day lives of people. In regards to the absence of helmet detection, it is important to note that wearing a helmet while riding a motorcycle is essential for safety. While number plate detection is useful, incorporating helmet detection would be a valuable addition to promote safety.

SCOPE OF FUTURE USE

The scope of future use of number plate detection without a helmet can potentially expand to include various applications, such as: Smart city initiatives which with the increasing trend towards smart city initiatives, number plate detection systems can be used as part of an integrated smart transportation system to improve traffic flow,

reduce congestion, and enhance overall transportation efficiency. Number plate detection can be used to detect and enforce parking violations in urban areas, improving traffic flow and reducing the incidence of illegal parking. Number plate detection can be used for surveillance and monitoring purposes, such as identifying and tracking suspicious or wanted vehicles.

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