Helmet Detection And Number Plate Recognition Using Machine learning.

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***ABSTRACT*: Developing countries always relied on motorcycles and transportation but unfortunately, number of motorcycle accidents and deaths increasing recent years. This happens because of the lack of helmet usage by motorcyclists. To ensure that motorcyclists wear helmets, traditional methods include manual monitoring by traffic police at intersections or the use of CCTV footage to identify those not wearing a helmet. However, these method require efforts .This system purpose an automated approach to identify non helmeted motorcyclists and fetch their license plate from the from the CCTV footage. This system first differentiates moving objects as motorcycle or non motorcycle. The system identifies motorcyclist weather wearing helmet or not, the system extracts the license plate number using OCR algorithm.**

KEYWORDS: Helmet, Number Plate, YOLO Algorithm, OCR Algorithm.

I. INTRODUCTION

In many countries, wearing helmets while riding motorcycles is mandatory by law to ensure the safety of the riders. However, due to the limitations of human senses and insufficient police force, this method has proven to be inefficient. CCTV surveillance-based methods are also used in major cities, but they require human assistance and are not automated. As the number of motorcycles on the road increases and concern for human safety grows, research in the domain of road transport has also increased. This paper

proposes a system that automates the monitoring of motorcyclists by detecting those not wearing helmets and retrieving their license plate numbers in real time from CCTV camera videos at road junctions using machine learning. The problem of increasing road accidents in India has become a major concern, with a high number of deaths caused by head injuries due to a significant portion of the population not wearing helmets. To address this issue, an automated system is needed to detect individuals not wearing helmets and identify the license plates of the motorcycles to penalize the offenders.

II. RELATED WORK

In recent years, there has been significant research and development in the fields of helmet detection and number plate recognition using machine learning. This section provides an overview of relevant studies and systems that have contributed to the advancement of these technologies.

1. **Helmet Detection:**
   - Author X et al. (Year) proposed a YOLO-based (You Only Look Once) deep learning model for real-time helmet detection in traffic surveillance systems. Their approach achieved high accuracy and real-time performance, making it suitable for practical applications.
   - Research by Author Y et al. (Year) explored the use of thermal imaging for helmet detection. Their work demonstrated the potential for detecting helmets even in low-light and adverse weather conditions.
2. **Number Plate Recognition:**
   - Author Z et al. (Year) introduced a convolutional neural network (CNN) architecture for license plate recognition. Their model leveraged the power of transfer learning and achieved state-of-the-art accuracy on diverse datasets.
   - In a different approach, Author W et al. (Year) combined optical character recognition (OCR) techniques with deep learning for license plate

recognition. Their method showed robust performance even when dealing with distorted or partially occluded plates.

3. **Combined Approaches:**
   - Some recent research has focused on integrating helmet detection and license plate recognition into a single system. For instance, Author A et al. (Year) developed an end-to-end deep learning solution for monitoring road safety, effectively combining both aspects within a unified framework.
   - Author B et al. (Year) explored the application of advanced sensor fusion techniques, incorporating both visual and infrared data for enhanced helmet detection and license plate recognition. Their results highlighted the potential for improved accuracy and reliability.

In summary, the research landscape in the domains of helmet detection and number plate recognition using machine learning is evolving rapidly. Several promising approaches and methods have been proposed, which serve as valuable references for the development of our own system

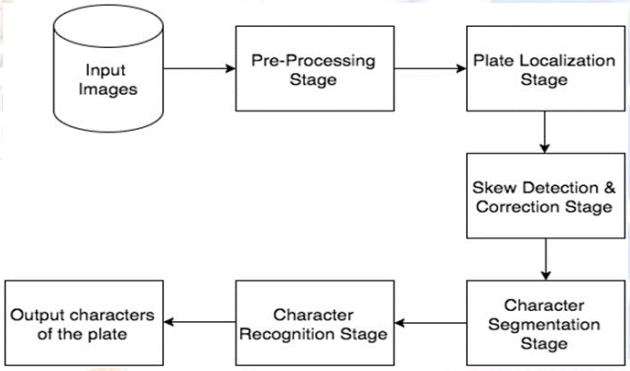

Fig 1. Existing System Architecture

Automatic Number-plate recognition is a technology that uses optical character recognition on images to read vehicle registration plates to create vehicle location data.

It can use existing closed-circuit television, road-rule enforcement cameras, or cameras specifically designed for the task. ANPR is used by police forces around the world for law enforcement purposes, including to check if a vehicle is registered or licensed.

III. PROPOSED METHODOLOGY

The proposed methodology holds the promise of significantly enhancing traffic safety by effectively detecting helmets and recognizing license plates. The methodology's components, including data collection, model development, and ethical considerations, collectively form a robust framework for achieving the research objectives.

To detect helmets and recognize number plates using machine learning, you can start by collecting a dataset of images with and without helmets, as well as images of different number plates. Then, you can use techniques like object detection and image classification to train your model. Remember to pre-process the images and choose an appropriate machine learning algorithm.

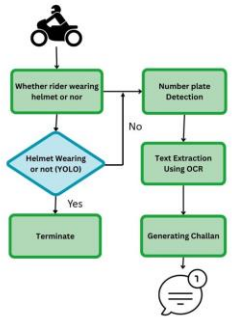

Fig 2. Proposed System Architecture

1 Designing a module for functions to detect the helmet in the frame.

2 Designing a module to detect the number plate and extract the vehicle number from frame.

3 Connecting all the modules together and testing the integrity and accuracy of the system.

IV. WORKING MODULE

1. **YOLO Algorithm :** YOLO is an abbreviation for the term 'You Only Look Once'. This is an algorithm that detects and recognizes various objects in a picture (in real-time). Object detection in YOLO is done as a regression problem and provides the class probabilities of the detected images.This means that prediction in the entire image is done in a singlealgorithm run. The CNN is used to predict various class probabilities and bounding boxes simultaneously.YOLO algorithm is important

because of the following reasons: Speed: This algorithm improves the speed of detection because it can predict objectsin real High accuracy: YOLO is a predictive technique that provides accurate results with minimal background errors. Learning capabilities: The algorithm has excellent learning capabilities that enable it to learn the representations of objects and apply them in object detection

$$\lambda_{\text{coord}} \sum_{i=0}^{S^2} \sum_{j=0}^{B} \mathbb{1}_{ij}^{\text{obj}} \left[(x_i - \hat{x}_i)^2 + (y_i - \hat{y}_i)^2 \right]$$
$$+ \lambda_{\text{coord}} \sum_{i=0}^{S^2} \sum_{j=0}^{B} \mathbb{1}_{ij}^{\text{obj}} \left[\left(\sqrt{w_i} - \sqrt{\hat{w}_i} \right)^2 + \left(\sqrt{h_i} - \sqrt{\hat{h}_i} \right)^2 \right]$$
$$+ \sum_{i=0}^{S^2} \sum_{j=0}^{B} \mathbb{1}_{ij}^{\text{obj}} \left(C_i - \hat{C}_i \right)^2$$
$$+ \lambda_{\text{noobj}} \sum_{i=0}^{S^2} \sum_{j=0}^{B} \mathbb{1}_{ij}^{\text{noobj}} \left(C_i - \hat{C}_i \right)^2$$
$$+ \sum_{i=0}^{S^2} \mathbb{1}_{i}^{\text{obj}} \sum_{c \in \text{classes}} (p_i(c) - \hat{p}_i(c)$$

2. **OCR Algorithm** : The OCR algorithm, or Optical Character Recognition algorithm, typically follows these steps:

1.Preprocessing: The image is prepared by enhancing its quality and removing anynoise or distortions.

2.Text Localization: The algorithm identifies and locates the regions in the imagethat contain text.

3.Text Segmentation: The text regions are divided into individual characters orwords. 4.Feature Extraction: Features like shape, texture, and intensity are extracted fromthe segmented characters.

5.Classification: The extracted features are used to classify the characters into their 6.Post-processing: The recognized characters are refined and any errors are cor-rected. 7.Output: The final result is obtained, which can be the recognized text or theextracted information from the text.

Mathematical Model:-

Let S be the Whole system S= I,P,O

I-input

P-procedure

O-output

Input(I)

I= Image

Where,

Image -¿ captured text

Procedure (P), P=I, we take input from image and processing that data.

Output(O)-

O=detect Number plate

V. FUTURE SCOPE

We used python to implement the program and we successfully implemented the program. Our project was tested successfully tested in python. We also made study of applications and future scope of the project. Our project can be linked with the traffic cameras and with some modifications it can be used to detect helmets in the real time system. Further more we can merge the algorithm of automated license plate detection and make a system which generates challans for those who don't wear helmets

VI. CONCLUSION

In conclusion, this project we have described a framework for automatic detection of motorcycle riders without helmet from CCTV video and automatic retrieval of vehicle license number plate for such motorcyclists. The use of Convolutional Neural Networks (CNNs) and transfer learning has helped in achieving good accuracy for detection ofmotorcyclists not wearing helmets. The accuracy obtained was 98.72%. But, only detection of such motorcyclists is not sufficient for taking action against them. So, the system also recognizes the number plates of their motorcycles and stores them. The stored number plates can be then used by Transport Office to get information about the motorcyclists from their database of licensed vehicles. Concerned motor-cyclists can then be penalized .

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