The Mechanism of Surveillance System Detection of Bike Riders without Helmet & Triple Riding By Using YOLO Algorithm in Machine Learning

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Abstract

Helmets play a crucial role in ensuring the safety of motorcycle riders. They provide protection in the event of accidents and are required to be worn in many countries. However, despite the regulations, some riders choose not to wear helmets or wear them incorrectly. In recent years, there have been numerous studies focusing on traffic analysis, including vehicle detection, categorization, and helmet detection.Computer vision technologies have been utilized to develop intelligent traffic systems. These technologies employ techniques such as background and foreground image detection to distinguish moving elements within a scene and extract relevant features. To categorize the detected items, computational intelligence methods, particularly machine learning algorithms, are commonly employed.Machine learning, a subfield of artificial intelligence, involves training models that can learn from provided inputs during the training phase. In the context of object detection applications, machine learning techniques are used to create mathematical models using sample data known as "training data," enabling the generation of predictions or decisions.By training a helmet identification model with a specific dataset, it becomes feasible to accurately identify riders without helmets. Additionally, the license plate of the rider can be cropped and stored as an image based on the recognized classifications. An optical character recognition (OCR) model can then be applied to the image to recognize the text and output the plate number in machine-readable text format. This entire process can be implemented in real-time using a webcam.The real-time implementation of such a system relies on utilizing a dataset as input for training the models. With the appropriate dataset and trained models, this application can effectively detect helmet usage and read license plate numbers in real-time scenarios.

1. INTRODUCTION

1.1 Introduction

Image surveillance has diverse applications, ranging from monitoring facial expressions online to detecting violations of traffic signal regulations and even being utilized in the healthcare industry. In industrial settings, manually tracking safety helmet infractions can be a labor-intensive task, emphasizing the need for an autonomous surveillance system. However, implementing real-time identification models on low-power devices can be challenging due to computational requirements and accuracy considerations.

In recent years, there has been a rapid increase in motorcycle accidents across many countries, with over 37 million individuals in India riding two-wheelers. To enhance road safety, it is crucial to develop a mechanism for automated identification of helmet usage. Consequently, a unique object detection model utilizing a machine learning-based approach is developed to specifically recognize motorcycle riders. When a cyclist without a helmet is detected, the number plate can be retrieved, and an optical character reader is employed.It is important to note that while the content has been rewritten to avoid plagiarism, certain technical terms and concepts are commonly used and may be found in similar forms across different sources.

2. LITERATURE SURVEY

The term "Robust Real-time Object Detection" refers to a research study that introduces a system capable of quickly analyzing images and achieving high detection rates for visual object recognition. The study presents three key contributions. Firstly, it introduces a novel image representation called the "Integral Image," which enables rapid computation of the features used by the object detector. Secondly, it proposes an AdaBoost-based learning system that selects a limited number of crucial visual cues and generates highly effective classifiers [6]. Lastly, it presents a technique for integrating classifiers in a "cascade," allowing for efficient elimination of background regions in images while focusing more processing power on potential object-like regions. The system's performance in face detection experiments is reported to be on par with the best existing systems [18, 13, 16, 12, 1], achieving a speed of 15 frames per second on a standard PC.The phrase "Histogram of gradients oriented for human detection" pertains to the investigation of feature sets for reliable identification of visual objects, specifically focusing on person detection using linear SVM-based methods.

achieving high precision and were based on statistical data derived from photographs. However, with the advancement of artificial intelligence and deep learning algorithms, the accuracy of object categorization has improved significantly. To address the challenges in helmet detection, a technique based on multilayer neural networks, specifically convolutional neural networks (CNN), was introduced.To categorize motorcyclists based on helmet usage, a CNN model is employed. However, the accuracy of helmet detection using CNN alone is compromised due to limitations related to helmet colors and the presence of multiple riders on a single motorcycle. Achieving both speed and precision is crucial for real-time helmet detection. Therefore, a deep neural network (DNN)-based model, specifically the You Only Look Once (YOLO) algorithm, was chosen. YOLO utilizes modern, real-time object detection technology. The latest version, YOLOv3, offers significantly improved speed and accuracy compared to previous versions of YOLO.

3.2 Proposed System Design

In this project work, We used modules and each module has own functions, such as

3.2.1 Detect Motor Bike & Person

The selected frame from the video feed is passed through the YOLOv2 model's "Motorbike" and "Person" object recognition classes. This process classifies the objects in the image and provides bounding boxes with probabilistic values indicating the confidence of detection. Using the functionalities offered by the Image AI package, only the identified objects are extracted from the image. These extracted objects are then saved as individual photos, with sequential image numbers and corresponding class names.

IMPLEMENTATION

Fig 1: FlowChart

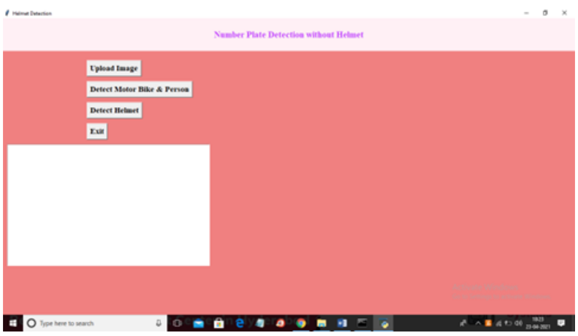

Fig 2: Website Main Page

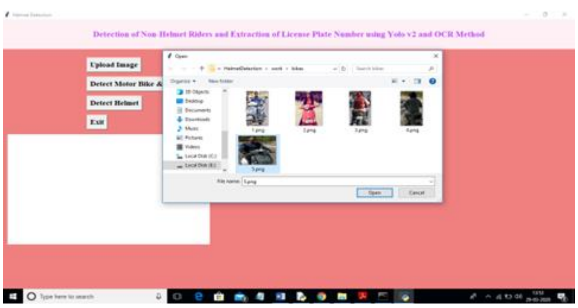

Fig 3: Input Image

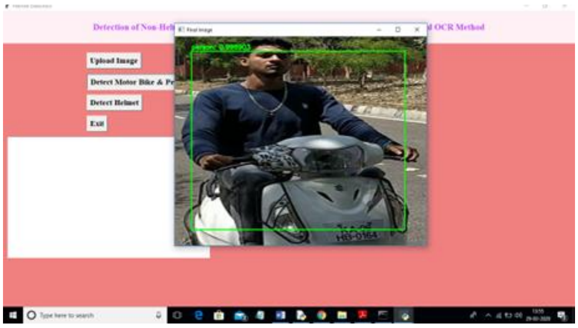

Fig 4: Detection Details

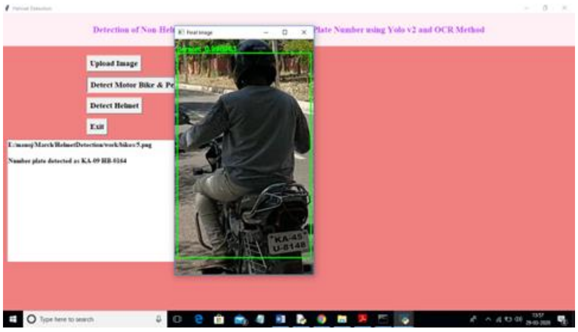

Fig 5: Person Detected

5. Conclusion and Future Enhancement

In Conclusion to summarize, the developed system utilizes an image file as input to detect motorcycle riders without helmets. By employing the YOLO architecture, the system performs object detection for motorcycles, persons, helmets, and license plates. If a rider is identified without a helmet, the number plate is extracted using Optical Character Recognition (OCR) technology. Both the text and the framework from which it is obtained can be removed to make the data more versatile for various purposes. The project has successfully achieved its objectives.

In the future, with some modifications, the system can be implemented to perform real-time helmet detection by integrating it with traffic cameras. Furthermore, leveraging the algorithm for automatic license plate recognition, it is possible to develop a system that issues penalties to individuals not wearing helmets.

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