WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Bike Riders Detection Without Helmet And Triple Seat

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ABSTRACT:-

Bike Rider Detection Without Helmet & Triple Seat aims to improve road safety using a Raspberry Pi 3B+ and computer vision techniques. The system analyzes live video feeds to detect whether a motorcycle rider is wearing a helmet and ensures the number of passengers does not exceed two. If violations are identified—such as a missing helmet or triple seating—the system automatically sends a notification to authorities for prompt action. By promoting helmet usage and enforcing passenger regulations, the project seeks to reduce road accidents and encourage safer riding habits, contributing to overall traffic safety and compliance.

Keywords:- Machine Learning, Computer Vision

1. Introduction

Road safety is an essential issue in modern society, as increasing numbers of vehicles on the roads have led to a rise in traffic-related accidents and injuries. Among these, motorcycle accidents are particularly concerning, given their high fatality rates. In many of these cases, the lack of helmet usage by riders and the presence of more than two passengers on a motorcycle are significant factors contributing to accidents. Helmets are a primary safety measure for reducing the severity of injuries during accidents, and limiting the number of passengers to two enhances the stability and control of the motorcycle. Despite legal mandates, compliance with these regulations remains a challenge due to a lack of awareness and inadequate enforcement.To address these critical issues, the project titled “Bike Rider Detection Without Helmet & Triple Seat” aims to create an automated system capable of identifying non-compliance with helmet usage and passenger limitations on motorcycles. This system is designed using the Raspberry Pi 3B+ microcontroller and advanced computer vision techniques. It analyzes real-time video feeds to detect whether the rider is wearing a helmet and to count the number of passengers on the motorcycle. The system’s primary goal is to identify and report any violations—such as a missing helmet or triple seating—by generating automated alerts that are sent to the relevant authorities for timely intervention. The use of computer vision techniques in the system allows for the recognition of key features like helmets and the detection of multiple passengers on a motorcycle. The Raspberry Pi 3B+ serves as the central processing unit, efficiently handling video feed analysis in real-time. This automated system reduces the dependency on manual checks, which can be both labor-intensive and prone to human error. By leveraging technology, the project aims to establish a more reliable and consistent method of enforcing road safety measures. The proposed system not only supports law enforcement agencies by automating the detection of violations but also serves to create awareness among riders regarding the importance of following safety regulations. By enforcing helmet usage and limiting the number of passengers on motorcycles, the project seeks to minimize the risk of severe injuries during accidents and promote safer road habits among the general public. Overall, this project offers a proactive solution to key road safety challenges, enhancing compliance with safety regulations and reducing the likelihood of traffic-related fatalities. By implementing this system, it is expected that both riders and authorities will benefit from a streamlined approach to enforcing essential safety measures, thereby creating a safer road environment for all.

2. Literature Survey

The growing concern for road safety, particularly regarding motorcycle usage, has led to an increased emphasis on innovative monitoring systems. The implementation of automated detection systems that address critical safety issues, such as helmet usage and passenger limits, has become a focal point in recent research.

2.1 Survey of Helmet Detection Systems

In this Automated helmet detection systems have garnered significant attention due to their potential to enhance compliance with safety regulations. Recent studies have explored the use of machine learning algorithms, particularly Convolutional Neural Networks (CNNs), to achieve accurate real-time helmet detection. For example, a study by Pramono et al. (2020) demonstrated the effectiveness of CNNs in differentiating between helmeted and non-helmeted riders, suggesting that such systems can significantly improve safety enforcement on the roads. The application of computer vision

techniques, as shown in Gupta et al. (2021), highlights the practical benefits of using algorithms that can effectively monitor helmet usage in various environmental conditions.

2.2 Survey of Passenger Counting Techniques

Monitoring the number of passengers on motorcycles is essential for enforcing regulations against overloading. Recent advancements in object detection technologies have enabled more reliable passenger counting methods. The YOLO (You Only Look Once) algorithm has been effectively employed for real-time passenger detection, as demonstrated by Zhou et al. (2019). Their research illustrates the algorithm's capability to accurately identify and count multiple riders, thereby ensuring compliance with passenger limits. Furthermore, studies by Khan et al. (2022) suggest that integrating machine learning techniques with real-time monitoring can enhance the accuracy of passenger detection systems, contributing to safer road conditions.

2.3 Automated Monitoring Systems

The integration of automated systems into traffic safety protocols has shown promising results in enhancing compliance with safety regulations. Singh et al. (2021) developed a monitoring system utilizing Raspberry Pi and camera modules, demonstrating the advantages of automation in detecting traffic violations, including helmet and passenger infractions. Their findings indicate a significant improvement in detection efficiency compared to traditional monitoring methods. A comprehensive review by Kumar et al. (2020) emphasizes the need for intelligent traffic management systems capable of real-time monitoring and reporting of violations.

2.4 Real-Time Notification Systems

Implementing real-time notification mechanisms is crucial for effective monitoring and enforcement of safety regulations. Research by Ahmed et al. (2018) indicates that automated systems that send instant alerts to authorities upon detecting violations enhance response times and overall enforcement effectiveness. Timely notifications can deter non-compliance and promote a culture of safety among riders. Additionally, Ranjan et al. (2021) highlighted the importance of mobile applications in facilitating user-friendly interfaces for reporting violations and receiving alerts, thereby improving communication between the monitoring systems and authorities.

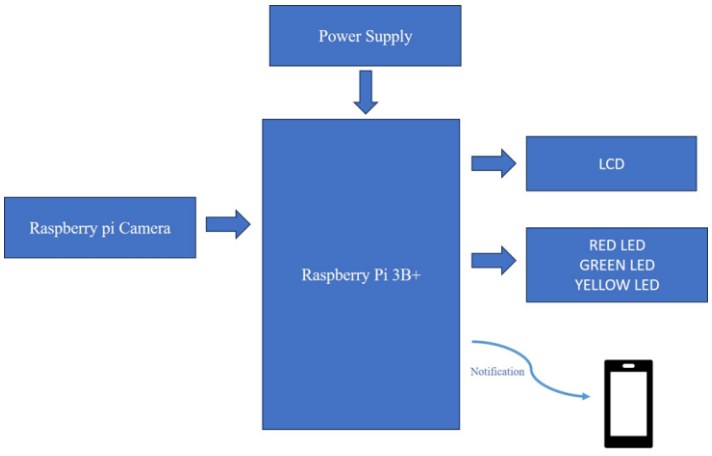
2.5 Challenges and Limitations

Despite the advancements in monitoring systems, several challenges remain in their implementation. Variations in helmet designs, environmental factors, and occlusions can affect detection accuracy. Gupta et al. (2022) noted the necessity for robust algorithms capable of adapting to diverse real-world scenarios to maintain accuracy and reliability. Privacy and data security concerns also warrant careful consideration in the design and deployment of automated monitoring systems to ensure compliance with regulations.

2.6 Societal and Legislative Impact

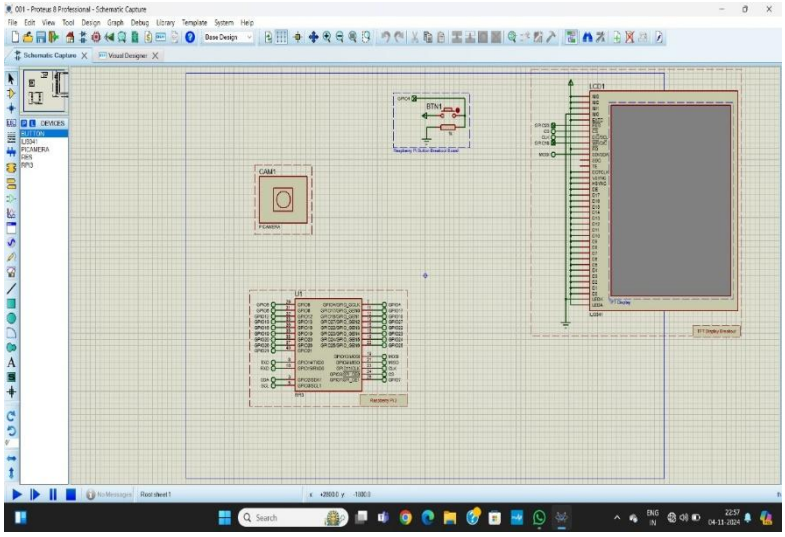
The effectiveness of legislative measures and public awareness campaigns is integral to enhancing road safety. Research indicates that robust enforcement of traffic laws, coupled with educational initiatives regarding helmet usage and passenger limits, can lead to a notable decrease in motorcycle accidents. A study by Sharma et al. (2021) highlighted the significant impact of legislative frameworks on compliance rates, advocating for a comprehensive approach that includes technological interventions alongside public education.

3. Proposed Methodology



Block diagram

4. Results



Simulation of project

5. Conclusion

The implementation of a machine learning-based system for detecting bike riders without helmets and those riding with triple passengers using Raspberry pi has demonstrated promising results in enhancing road safety enforcement. By integrating computer vision techniques with real-time video processing, the system is able to accurately identify traffic violations in cost-effective and efficient manner. The portability and low power consumption of the Raspberry pi make it suitable for deployment in various traffic monitoring scenarios. This project not only aids in automatic detection and reporting of violations but also reduces the dependency on manual surveillance.

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