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Helmet Detection for Motorcyclist Safety Using Machine Learning

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ABSTRACT:The proposed system focuses on developing a system that utilizes machine learning to promote the use of helmets by motorcyclists. The project involves collecting a dataset, pre-processing the images, extracting features, training a machine learning model, and deploying the model to a device. The system can detect whether a motorcyclist is wearing a helmet or not before they start riding. The project emphasizes the importance of using a combination of measures, including education and enforcement, to ensure maximum safety. Overall, the project aims to use machine learning to create a more effective way to enforce helmet use by motorcyclists.

I. INTRODUCTION

This project aims to address the issue of promoting helmet use among motorcyclists to reduce the risk of head injuries during motorcycle accidents. According to statistics, head injuries are the leading cause of death and disability among motorcyclists. Despite this, many motorcyclists still choose not to wear helmets, either due to ignorance or a lack of awareness of the importance of helmets. Therefore, there is a need for an effective method to promote helmet use among motorcyclists. This project proposes a solution that utilizes machine learning techniques to detect whether a motorcyclist is wearing a helmet or not before they start riding. The system involves collecting a dataset of images of motorcyclists with and without helmets, preprocessing the images, extracting features, training a machine learning model, and deploying the model to a device. Once deployed, the system can analyze real-time video feeds from roadside cameras and detect motorcyclists without helmets. The project emphasizes the importance of using a combination of measures, including education and enforcement, to ensure maximum safety. The proposed system aims to use machine learning to create a more effective way to enforce helmet use by motorcyclists. The project has the potential to save countless lives by promoting the use of helmets among motorcyclists and reducing the risk of head injuries during motorcycle accidents.

II. RELATED WORK

We have found different papers related to helmet detection. The issue of promoting helmet use among motorcyclists to reduce the severity of head injuries during motorcycle accidents has been a longstanding concern. In recent years, machine vision techniques have emerged as a potential solution to this problem, with automatic detection systems using convolutional neural networks (CNNs) gaining attention. A study by Rattapoom Waranusast et al. (2013) addresses this issue by presenting a CNN-based approach to detect motorcyclists without helmets. The system analyzes real-time video feeds from roadside cameras and is trained using a dataset of over 2000 images of motorcyclists with and without helmets. The CNN was trained using a supervised learning approach, achieving a high detection rate of over 90% in detecting motorcyclists without helmets, even under varying lighting conditions. The study highlights the importance of promoting helmet use and suggests that automatic detection systems can be an effective tool for this purpose. The paper provides valuable insights into the development of automatic detection systems for promoting motorcycle safety and encourages further research in this area. Overall, the study shows that machine vision techniques, particularly CNNs, have the potential to be a promising tool for improving motorcycle safety. However, further research is needed to refine and optimize such systems, and to investigate their effectiveness in real-world settings. Several other studies have also

explored the use of machine vision techniques for helmet detection in different settings. For instance, a study by Islam et al. (2018) proposed a deep learning-based system for helmet detection in construction sites, which used a combination of CNNs and long shortterm memory (LSTM) networks to achieve high accuracy. Similarly, a study by Chen et al. (2019) developed a helmet detection system using an improved YOLOv3 algorithm, which could detect helmets in real-time with high accuracy, even in crowded and complex environments. Furthermore, another study by Zhang et al. (2021) proposed a helmet detection system using a deep residual network (ResNet) and a novel loss function, which achieved high accuracy in detecting helmets in various scenarios, including low-light and occlusion. Overall, these studies demonstrate the potential of machine vision techniques for helmet detection in different contexts, and highlight the importance of promoting helmet use for improving safety in various industries and activities. However, there are also some challenges and limitations associated with using machine vision techniques for helmet detection, such as the need for large and diverse datasets for training and the potential for false positives and negatives. Therefore, further research is needed to address these challenges and optimize machine vision techniques for helmet detection, with the ultimate goal of promoting safety and reducing the risk of head injuries in various settings.

III. METHODOLOGY

Proposed system will use YOLO V3(You Only Look Once version 3) where it will detect Helmet with accuracy and provides faster results. Proposed system can use a low-resolution USB camera however we are planning to use the web camera for the prototype. Web camera will stream the live video and frames will be captured for image processing. The events are recognized as follows, When the Key is turned on the camera automatically gets activated. The Engine can only be started when the camera detects the Helmet on the rider. If the camera doesn't detect the helmet, then the bike circuit will be open and the bike won't start. Fig 1 shows the the system design and its working.

This system is a proactive measure that ensures the safety of the rider and prevent physical injuries occurred during accidents. The traditional video surveillance systems and detecting helmet is very tiring and inefficient for riders as it does make riders to compulsorily wear a helmet. The proposed system ensures the rider to wear the helmet and only then the motorcycle will be ready to ignite.

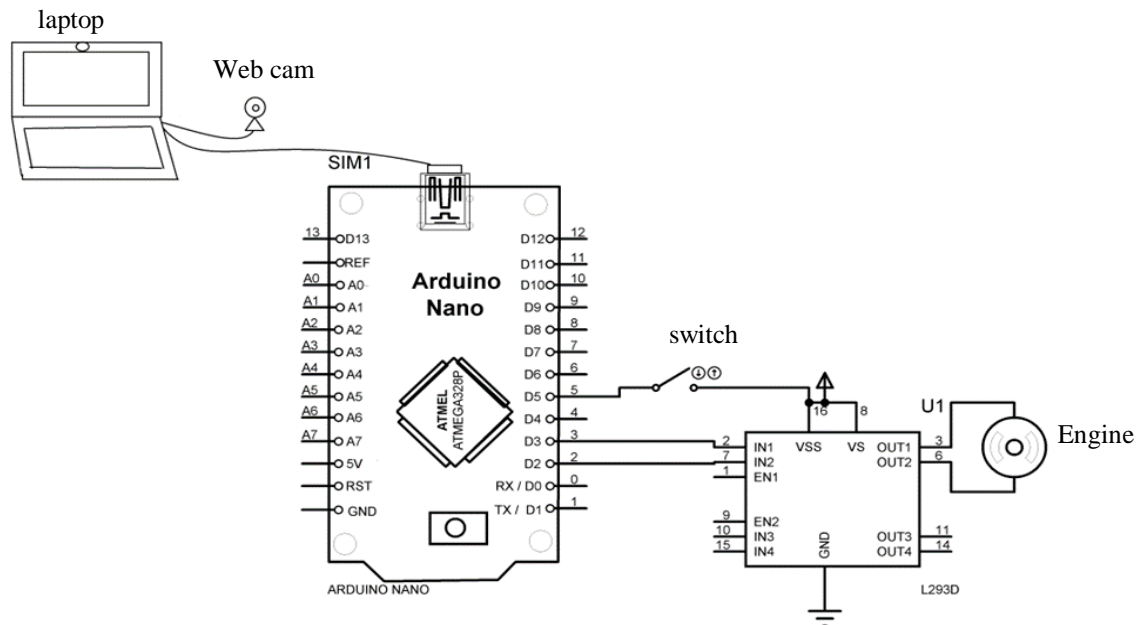
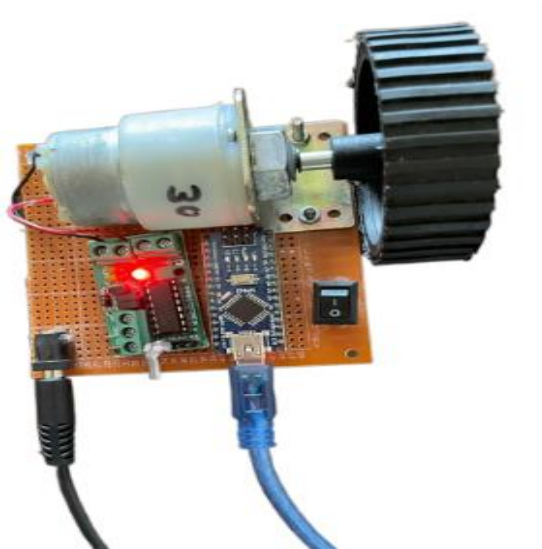


Fig 1. Depicts the Design of the System

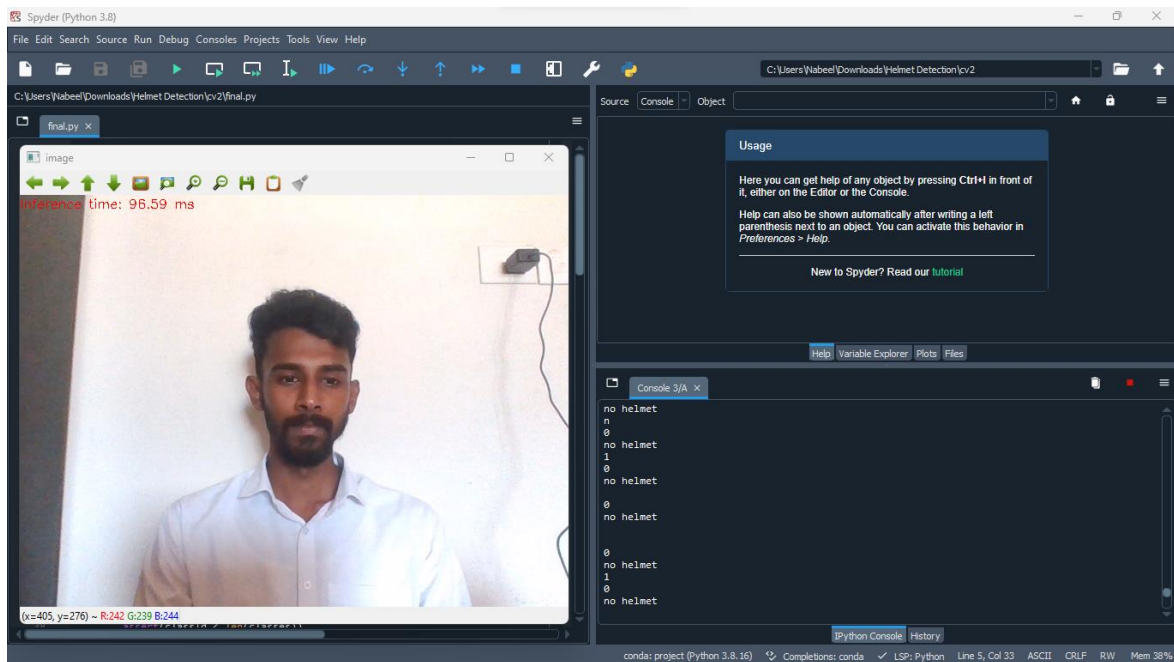


IV. EXPERIMENTAL RESULTS

Figures shows the results of HelmetDetection by using the YOLO V3 algorithm. Figures. (a),(b) and (c) shows the whole process of Helmet Detection and its Hardware.

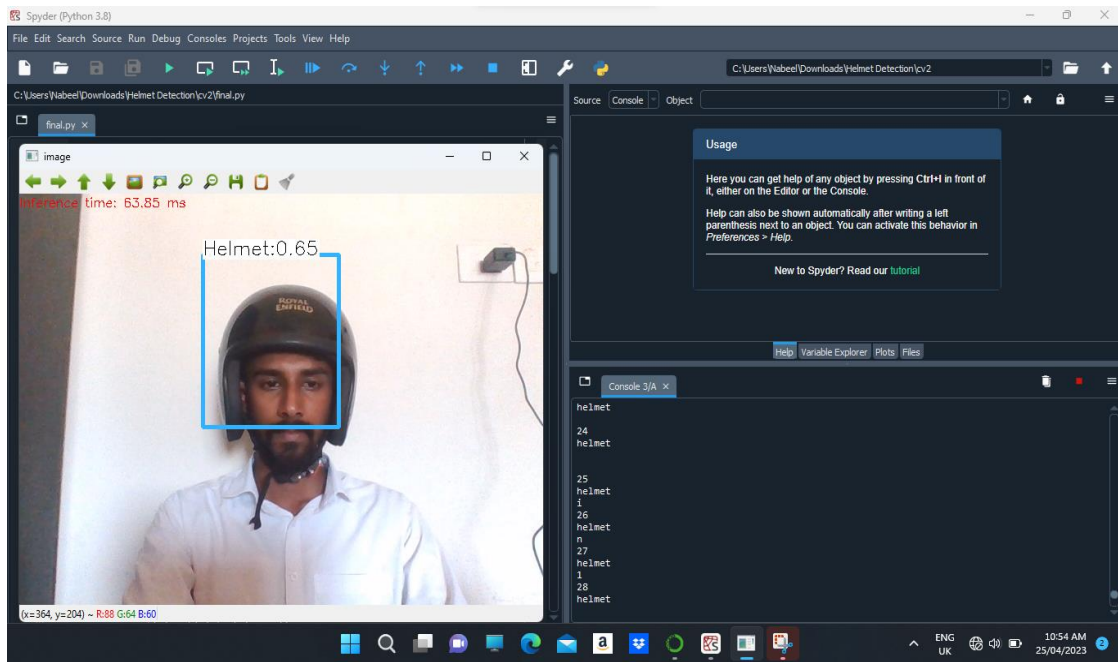


(a)



(b)

Figures shows the results of Helmet Detection, (a) Shows the hardware used for the helmet detection process in this case. (b) shows the image of a person without the helmet and the corresponding output in the console displayed as “no helmet” with the number of times it is being retried.



(c)

Figures shows the results of Helmet Detection, (c) shows the person with the Helmet and the corresponding text is displayed in the console as “helmet” with the number of times it is being retried.

VI. CONCLUSION

The proposed project can be concluded that when the adapter switch is turned on (which is considered as the key of the bike), the system gets activated and when the switch is turned ON the camera gets activated and detects the helmet if present. If the helmet is not detected the value in the console is shown as '0' and no helmet is shown as the output and the motor will not rotate. The motor will rotate only if the helmet is detected and the output is shown as some binary values and the circuit gets the power supply the motor will rotate. When the rider removes the helmet again the no helmet detection appears and the motor stops rotating.

The proposed system can be updated by breaking the circuit connection while the helmet is removed when riding the bike and indicating the rider to wear the helmet in certain amount of time (say 20 seconds). The indication to rider is given by an alert sound and after 20s the circuit gets cut. This is done to prevent any other accidents that may occur if the bike is in the middle of the road and to prevent any problems that may occur if the bike gets OFF in between the road. Another future update will be the addition of a one-time security key to start the vehicle in emergency situations.

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