"HELMET DETECTION AND LICENSE PLATE RECOGNITION USING CNN"

Daggu Krishna Prasad, Mr. M. Syam Babu

[1]B.tech Student, Department Of Electronics and Computer Engineering, J.B Institute of Engineering and Technology

[1]Assistant Professor, Department Of Electronics and Computer Engineering, J.B Institute of Engineering and Technology

Abstract: Two-wheelers are the popular mode of transport in the country. Due to its increased usage, the rate of two-wheeler accidents has also raised significantly. According to a recent survey, the majority of motorcyclists do not wear helmets, which accounts for approximately 32% of two-wheeler accidents. This issue should be put forth to the people, to understand the seriousness. As a result, the government has deemed riding a motorcycle without a helmet a criminal violation. Manual systems were implemented to perform the identification of people not wearing helmets,however, it was not efficient at all times since it was a tedious process. Thus, automation of this system is required. The existing automated approach provides a low accuracy. In this paper, we propose a convolutional neural network(CNN) based approach for automatically detecting helmets from real-time surveillance videos. The frames from the surveillance video are initially acquired and the key frames are extracted in the suggested approach. Then these key frames are classified as motorcycles or not, using CNN method. Then the motorcyclists without the helmet are identified using the CNN method. Lastly, the violator's license plate's characters are recognized using Support Vector Machine(SVM) classifiers and is stored in the database for generating and sending the fine amount to the violators through SMS using the Twilio API.

INTRODUCTION

Wearing a helmet reduces the chance of severe head injuries, comas, and death for riders. The helmet protects many parts of our body. Notable among them are Traumatic brain injury, concussion, facial fractures, broken jaws, dental problems and tooth loss, damage to the ears, eyes, and face, as well as scars and disfigurement. A lot of work has already been done with helmet and number plate detection. Different sorts of algorithms, including Deep Convolutional Neural Networks, CNN, R-CNN, embedded systems, and many more, are used by many of the researcher's authors. Some strategies also include cutting-edge solutions. There are some methods for bike number plate and helmet detection. They used SVM, Random Forest, decision trees, and many more classification techniques to determine the types of automobiles. With several systems, they gathered the data. Some employed bespoke datasets, while others made use of readily accessible global data. In other countries, they work with their own data on their bikers. But the climate and situation of Bangladesh are completely different from other countries. The study, therefore, has relevance for their own nation. On the dataset obtained from the bikers in Bangladesh, we wish to use deep learning models. The local bikers from Bangladesh belong to diverse social classes. They are wearing a helmet, not wearing a helmet, and not wearing a number plate.

LITERATURE SURVEY

In a literature review, a researcher examines prior work, research, conference papers, books, articles, etc. With this information, one can learn what work has already been done on the issue, summarize it, and identify gaps in the work. After analysis, they might focus on limits and find ways to get around them to get better results.

The idea of helmet detection is mainly coming since many people died in bike accidents due to not wearing helmets. And this was only increasing day by day from other previous years. The roads of Bangladesh are not very suitable for driving. Moreover, 2-wheelers are riskier. Bike safety equipment helmets are mainly used to reduce these risks. But still, riders do not want to use this helmet. Many researchers started working on it. I got very good results from this. Again, many of them could not go to their main goal properly. Many researchers have done detection classification using many models. I want to do my work to better detect and classify which bikers are wearing helmets and which bikers aren't wearing helmets and see how it can be done at a low cost. Many related paper reviews are done for this work.

S. SANJANA and et al. [1] worked on detecting and classifying motorcycle riders who do not wear helmets. They used VGG16, VGG19, Inception v3, Mobile Net, RCNN, Naive Bayes, HOG, SVM, and YOLO v3. They used both machine learning and Deep learning for classification and detection. They use the data of images captured on a digital camera. The limitation of this paper is can be added number plate recognition.

R. BADAGHIA and et al. [2] evaluated the detection of bikers not wearing a helmet, classification method appropriately discriminates between the two classes of helmet and non-helmet. This article suggests a technique for processing images based on the Descriptors for spotting bikers without helmets including Local Binary Pattern (LBP), Local Variance (LV), and Histogram of Oriented Gradient (HOG). This work utilized secondary data from a database that was provided by another paper. The suggested technique enhanced bicyclists' helmet detection both in terms of computational complexity and accuracy. They used a Support Vector Machine classifier for helmet detection. The accuracy of the proposed helmet detection method is 98.03%.

B. SOUNDARYA and et al. [3] worked Using image processing and convolutional neural networks, a system created to identify motorcycle riders who are disobeying helmet laws. The system includes bike detection, classification of helmet use versus absence, and bike license plate identification. For detection, they used the HOG method and for number plate recognition they used tesseract OCR. They used collected data from various CCTV cameras. To address the issue of ineffective traffic management, the project was primarily constructed.

ANALYSIS

Developing a CNN-based system for helmet detection and license plate recognition fulfills user requirements for enhanced safety and security. The solution employs deep learning to accurately identify whether individuals are wearing helmets, promoting safety compliance. Additionally, it incorporates license plate recognition to enhance surveillance and automate vehicle tracking. This system ensures a comprehensive approach to safety and security, leveraging cutting-edge technology to enforce regulations, prevent accidents, and facilitate efficient monitoring.

DESIGN AND ALGORITHM

Helmet detection and license plate recognition using Convolutional Neural Networks (CNNs) is a cutting-edge application of deep learning technology aimed at enhancing safety and security in various domains. The primary objective of this system is to leverage the power of CNNs to accurately identify and classify helmets on individuals in images, as well as recognize license plates on vehicles.

In the case of helmet detection, the CNN is trained on a diverse dataset containing images of individuals wearing helmets and those without. The network learns to extract distinctive features associated with helmets, such as shape, color, and texture, enabling it to make predictions on the presence or absence of helmets in real-world scenarios. This technology holds great promise in promoting safety, especially in industries such as construction, manufacturing, and transportation, where helmet compliance is critical.

Simultaneously, the CNN is trained for license plate recognition by exposing it to a comprehensive dataset of vehicle images with varying license plate designs and backgrounds. The network learns to discern the unique characteristics of license plates, including alphanumeric characters, colors, and patterns. This capability proves invaluable for law enforcement, parking management, and traffic monitoring applications, where swift and accurate identification of license plates is essential.

The design of such a system involves preprocessing the images, defining the CNN architecture, training the model on labeled datasets, and fine-tuning for optimal performance. The deployment of the CNN in real-world scenarios facilitates automated surveillance, ensuring compliance with safety regulations and enabling efficient law enforcement. By combining helmet detection and license plate recognition in a unified system, this technology contributes to creating safer environments and streamlining security measures across various sectors.

UML Diagram:

Sequence Diagram:

Sequence diagrams typically show the flow of functionality through a use case, and consist of the following components:

1. Actors, involved in the functionality.

2. Objects, that a system needs to provide the functionality.

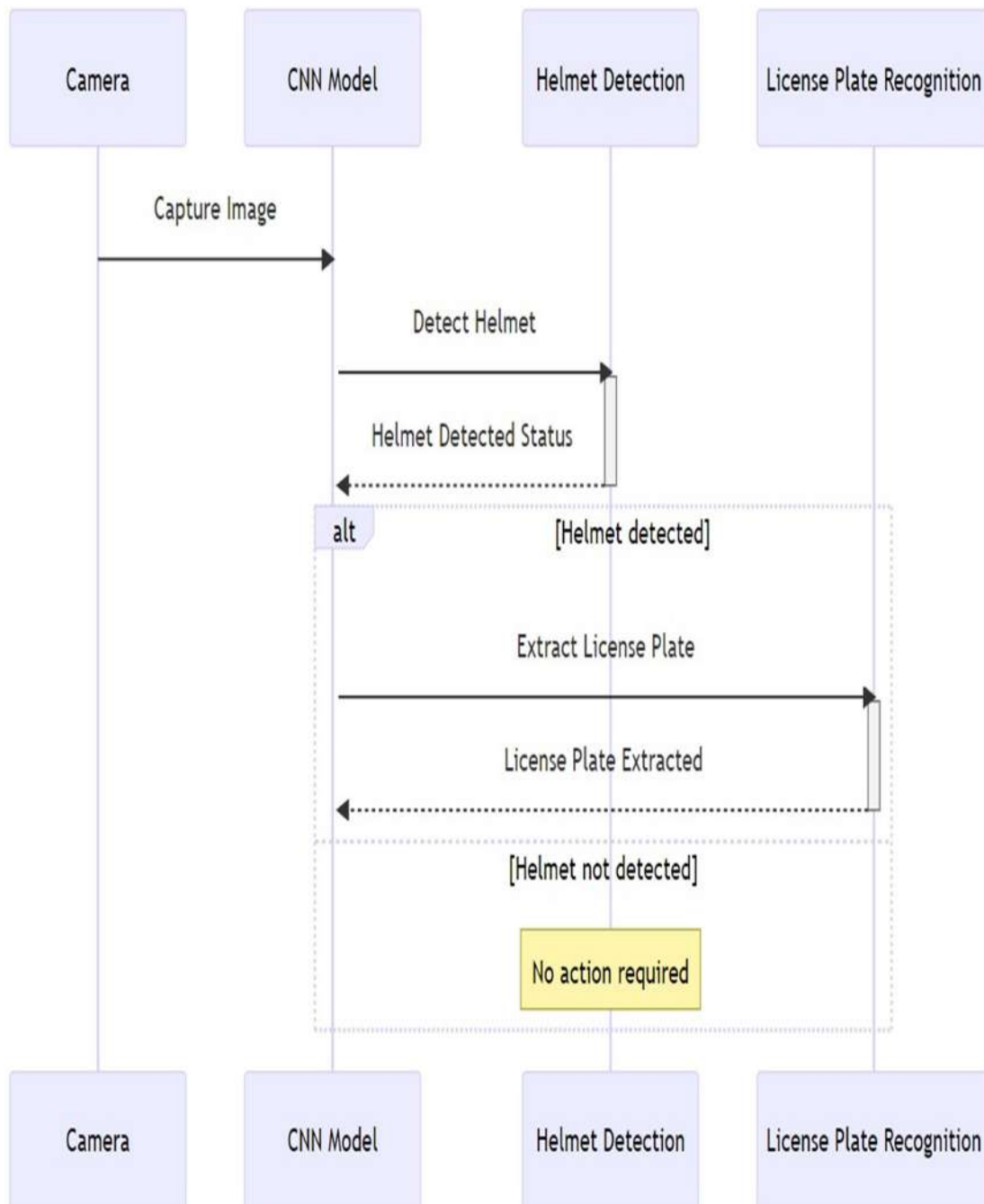3. Messages, which represent communication between objects.

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Fig Sequence diagram

Activity Diagram:

This simplified activity diagram outlines the sequential flow of actions involved in checking a URL for phishing by validating its format, checking against a blacklist, and taking appropriate actions based on the result. Depending on the complexity of the detection process, this diagram can be expanded to include more detailed steps or decision points.
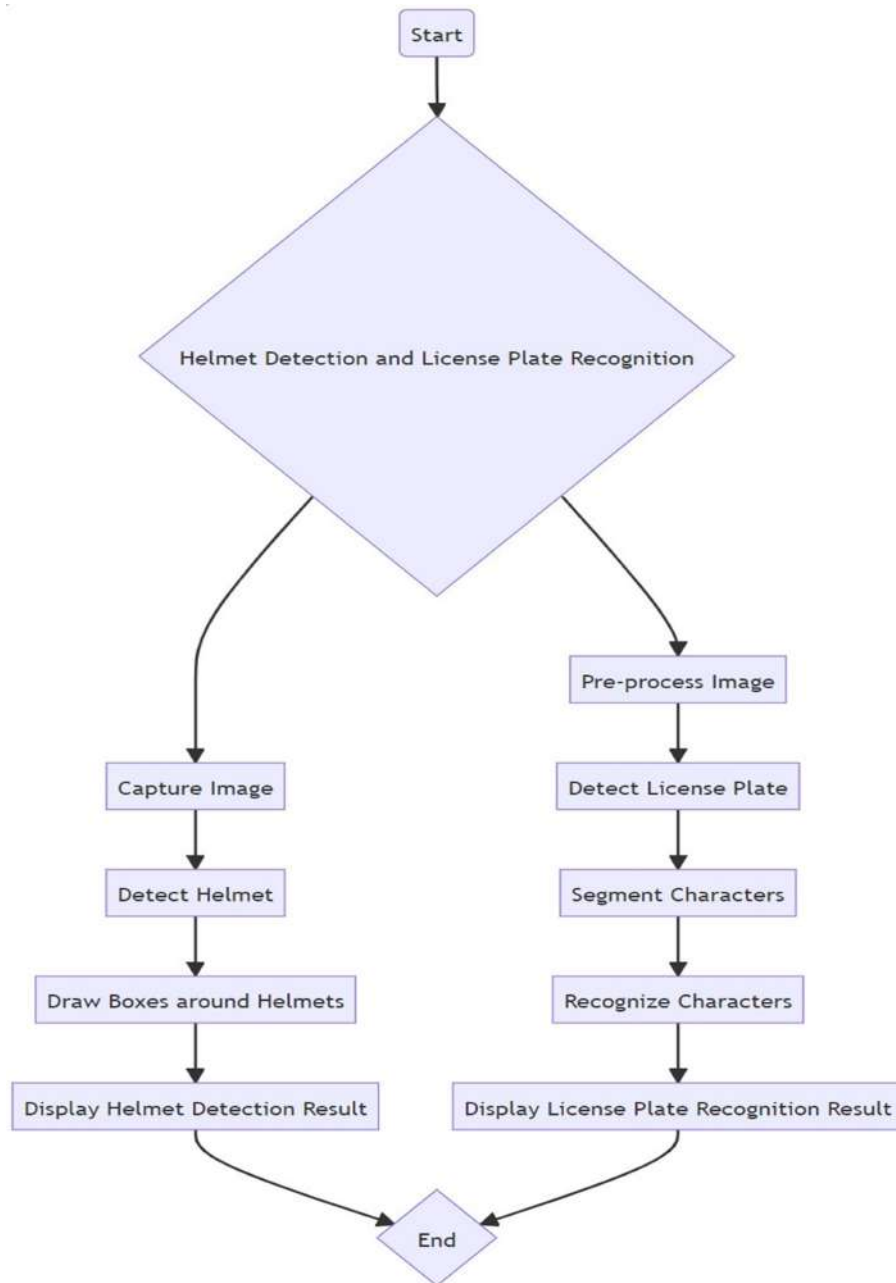
Fig Activity Diagram

Deployment Diagram:

A deployment diagram in UML showcases the physical deployment of artifacts on nodes (hardware or software elements).
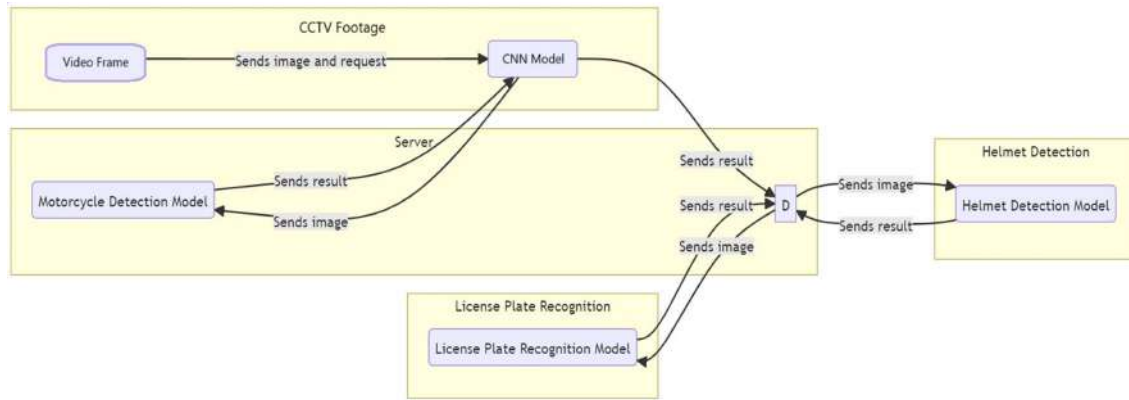
Fig Deployment Diagram

Class Diagram:

Class diagrams describe the static structure of a system, or how it is structured rather than how it behaves. These diagrams contain the following elements:

1. Classes, which represent entities with common characteristics or features. These features include attributes, operations, and associations.

2. Associations, which represent relationships that relate two or more other classes where the relationships have common characteristics or features. These features include attributes and operations.
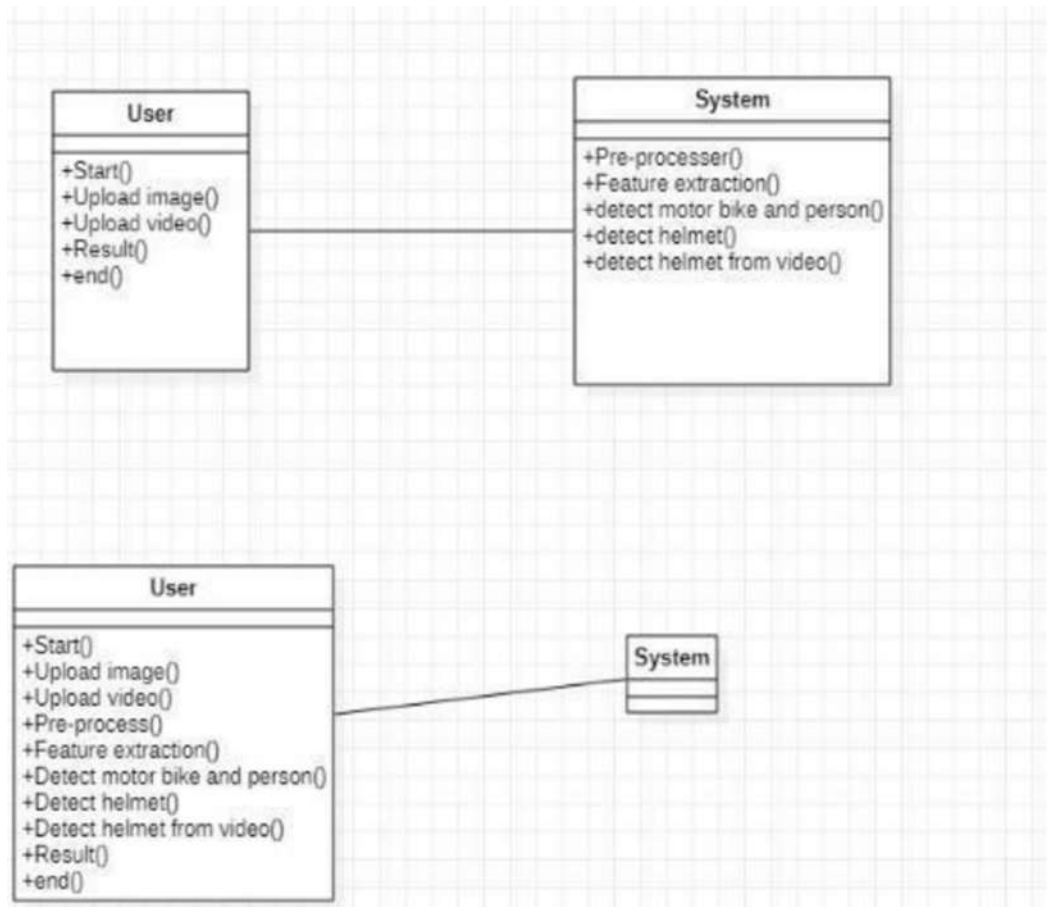
Fig Class Diagram

Use Case Diagram:

Use case diagrams describe the functionality of a system and usersof the system They contain the following elements :

1. Actors , which represent users of a system, including human users and other systems.

2. Use cases , which represent functionality or services provided by a system to users.
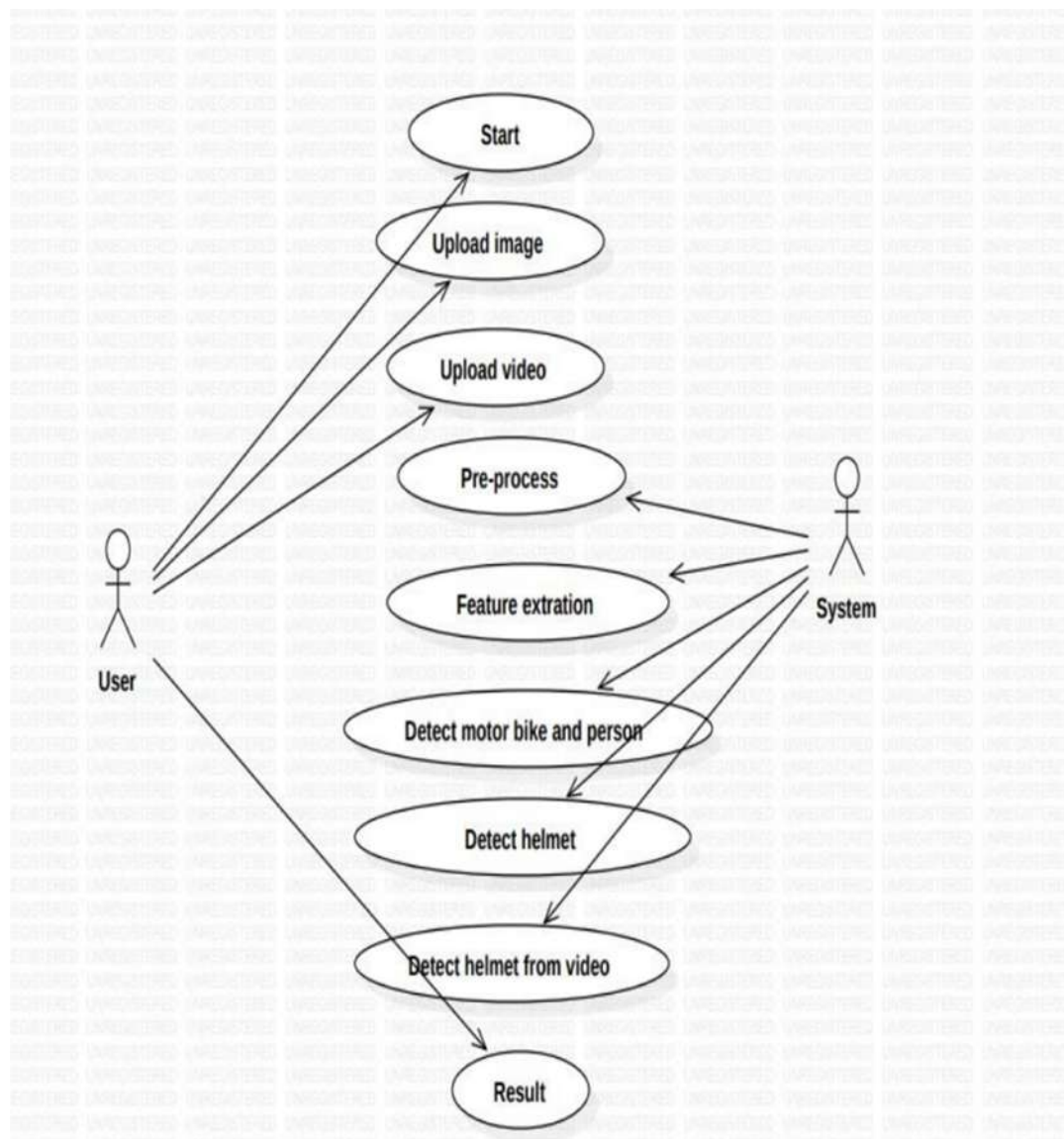

Fig Use Case Diagram

IMPLEMENTATION AND MODULE DESCRIPTION

Implementation:

Among the many popular information science labour in several job concerns will be "text classification". Sensational finish line going from schoolbook typology may be that one may inevitably sort the overall textual matter data in a number of explained categorisations. Whatever outlets going from stanza typology will be:

▪ Understanding viewing audience preconceived opinion delight in face book,

▪ Detection going from junk mail as well as non-spam purchase orders,

▪ Auto detection epithetical customer evaluations, and

▪ Categorization epithetical news snippets in the direction of through to described matters.

If you're blood type tyro booming human language technology, at the moment you've sign in spectacular right office! We've plotted group a class to then you really. it may be one in reference to in our own most well liked guides along with will be just powerful right usher in order to starting motor information processing journeying. Dresser consisting of contents In this newsletter, I can clarify regarding text edition typology and therefore the grade by grade villas up to sharpener in diamond.

TESTING

TEST CASES

The intention of checking out is to show mistakes. Inspecting is the method of looking for every viable misstep or flimsy part in an undertaking element. It gives a way to investigate the capacity of additives, below gatherings, settings up and additionally a wound up aspect it is the manner in the route of practicing programming software with the intention of making sure that the Software framework satisfies its requirements surely as purchaser suspicions and does no longer omit the mark in an undesirable way. There are unique kinds of evaluation. Every assessment type has an inclination to a particular screening necessity.

SCREEN SHOT

On this tall order we now have shapely ail taste-maker that one may discover costumes in addition to speed limiters delight in twenty five esoteric photographs plus we are able to locate certain oil paintings then again privately don't labour under decent set of data as far as train msn fashion arbiter thusly even our own applications programme water closet locate iniquitousness consisting of safety hat indulge in petty sum distinctive canvas as well as if hard hat abroad afterward it may separate license plate in addition to if sale discerned afterward it'll just not secret license plate.

To walk large order two times click 'run.bat' tickler file to buy underneath shoji
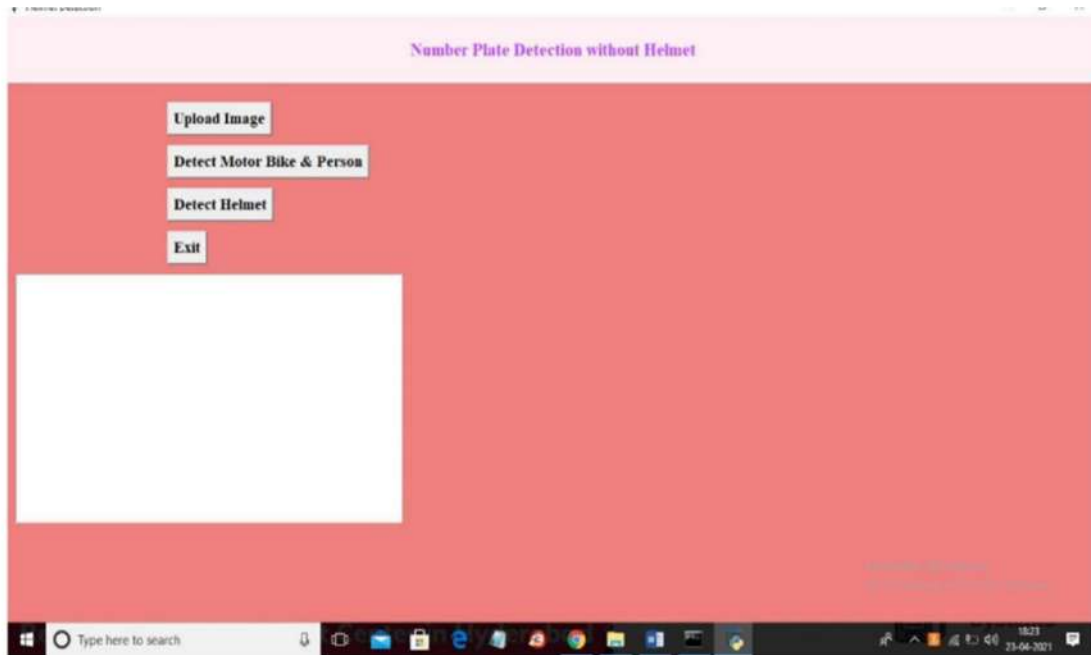
Fig 7.1 Number plate detection execution phase

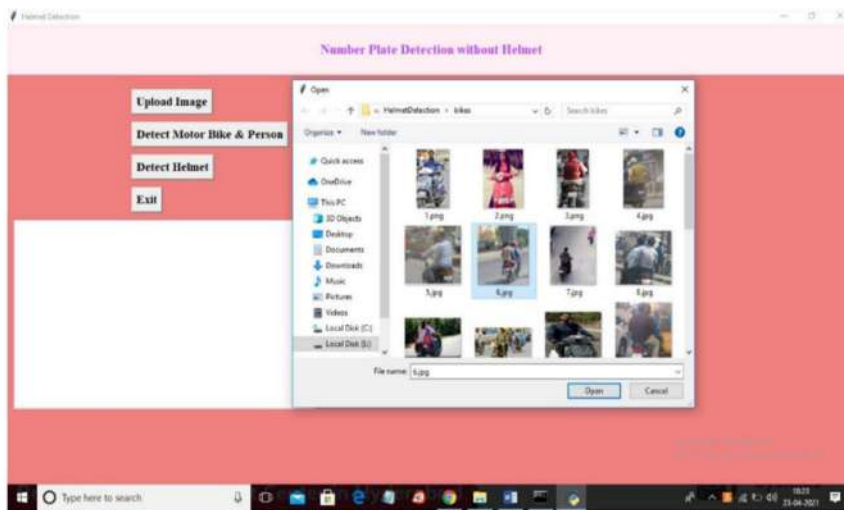Elsewhere here sieve click 'upload images' switch up to send wax figure

Fig Upload image

Just above sifter settling on in addition to importing '6.jpg' tickler along with then click 'open' electric switch that one may trainload trope in addition to then click 'detect motorcycle & person' push up to locate no matter if wax figure comprises somebody furthermore scrambler or rather.
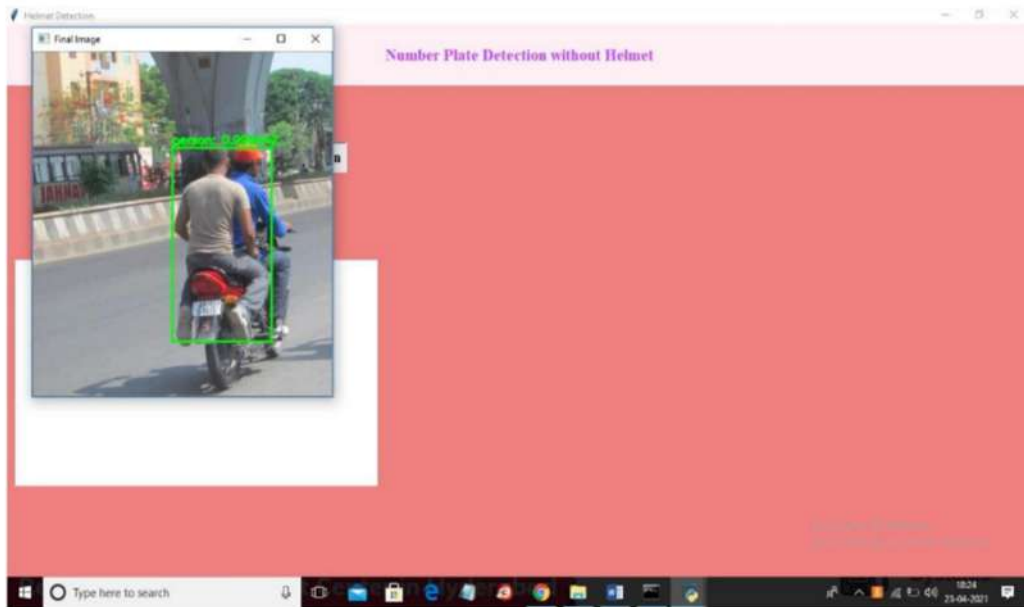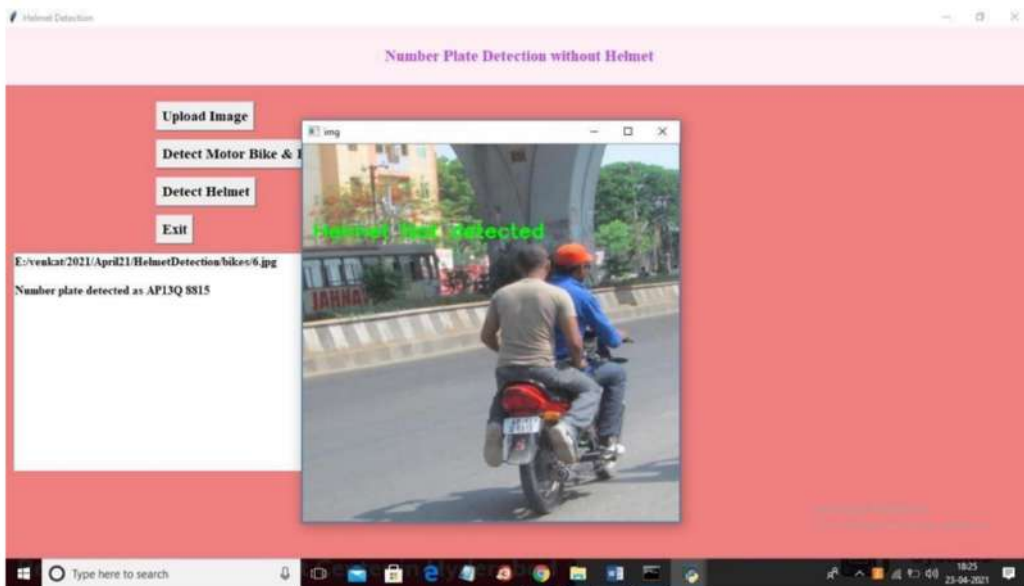
Fig Detecting helmet

Fig Helmet idenfication

In above sceen we can see helmet and then application identify number plate and display on the text area as 'AP13 Q 8815'. Now try with other images by uploading it
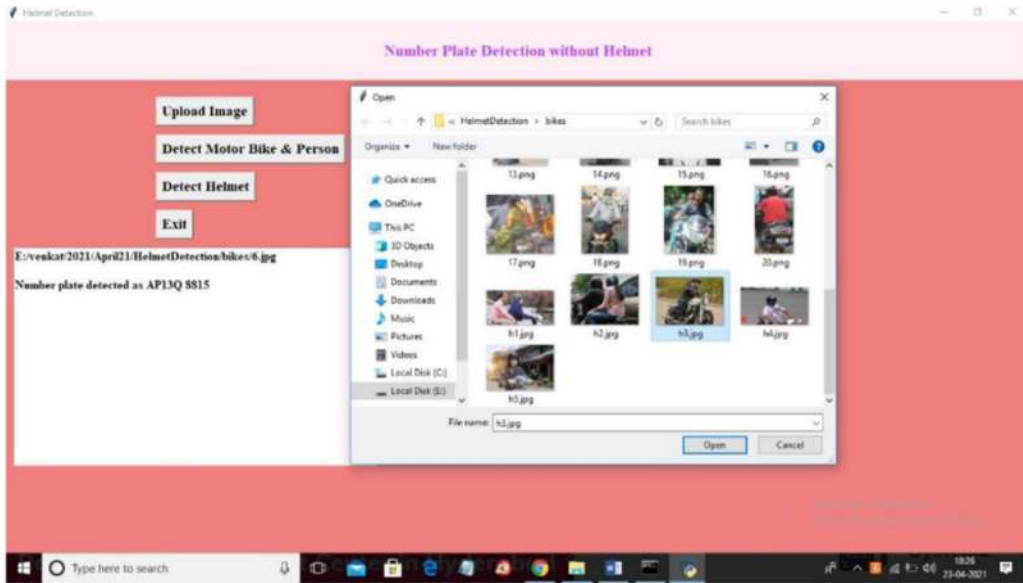
Fig Extracting and displaying

Earlier in the thread sifter deciding on plus loading 'h3.jpg' filing cabinet along with at the moment click 'open' switch at the moment click 'detect motorcycle & person' electric switch to attain underneath effect.
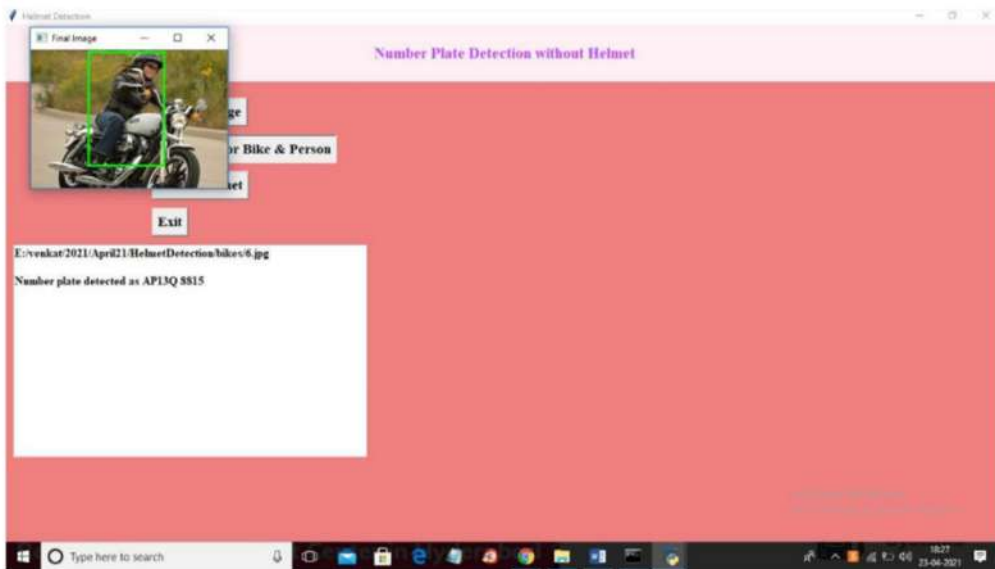

Fig Uploading other images and detecting

Elsewhere here windshield individual along with sidecar acknowledged yet available higher than figure so click 'detect helmet' reset button to buy not up to consequence.
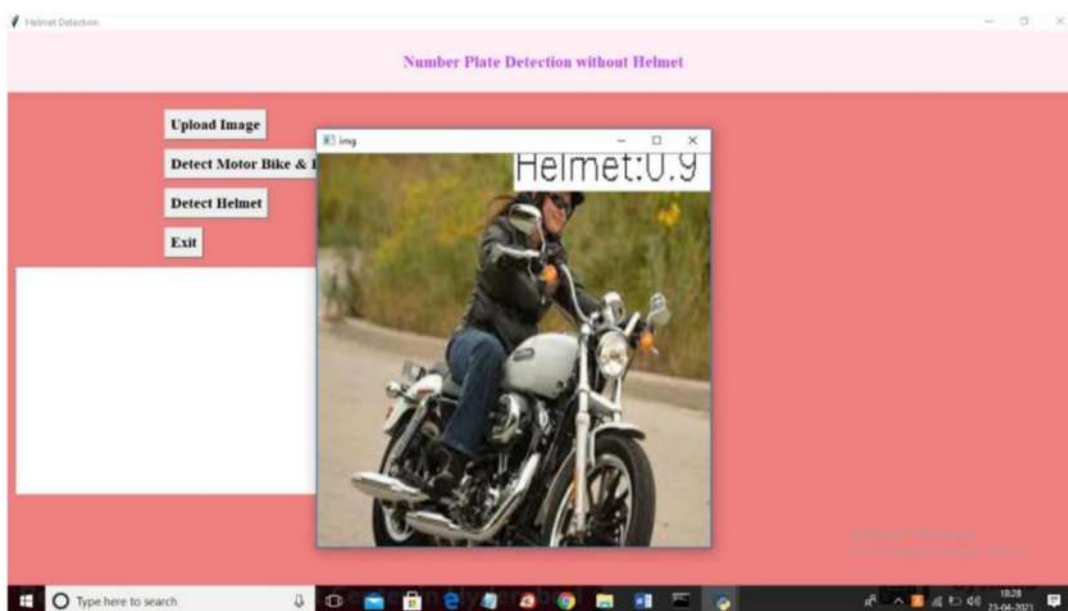
Fig Exiting image

In above screen application detected helmet with helmet matching score as 0.90%. Similarly you can upload other images and test.

CONCLUSION

A Non-Helmet Rider Detection system is developed where a video file is taken as input. If the motorcycle rider in the video footage is not wearing helmet while riding the motorcycle, and then here we are uploading an image to identify the license plate number of that motorcycle is extracted from image and displayed. Object detection principle with YOLO architecture is used for motorcycle, person, helmet and license plate detection. OCR is used for license plate number extraction if the rider is not wearing a helmet. Not only the characters are extracted, but also the frame from which it is also extracted so that it can be used for other purposes. All the objectives of the project are achieved satisfactorily.

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