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Thalavapalayam, Karur - 639 113, TAMILNADU.

AI TRAFFIC CONTROL-INTELLIGENT SOFTWARE FOR SEAMLESS URBAN SOCIETY

A MINOR PROJECT-III REPORT

Submitted by

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BACHELOR OF ENGINEERING

in

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

M.KUMARASAMY COLLEGE OF ENGINEERING

(Autonomous)

KARUR – 639 113

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M.KUMARASAMY COLLEGE OF ENGINEERING, KARUR

BONAFIDE CERTIFICATE

Certified that this **18ECP105L - Minor Project III** report **"AI TRAFFIC CONTROL -INTELLIGENT SOFTWARE FOR SEAMLESS URBAN SOCIETY"** is the Bonafide work of "**ANUJA T(927622BEC012), ARCHANA T (927622BEC014), HARINE M(927622BEC064)"** who carried out the project work under my supervision in the academic year 2024 - 2025 **ODD SEM**.

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PROJECT COORDINATOR

INSTITUTION VISION AND MISSION

Vision

To emerge as a leader among the top institutions in the field of technical education.

Mission

M1: Produce smart technocrats with empirical knowledge who can surmount the global challenges.

M2: Create a diverse, fully -engaged, learner -centric campus environment to provide quality education to the students.

M3: Maintain mutually beneficial partnerships with our alumni, industry and professional associations

DEPARTMENT VISION, MISSION, PEO, PO AND PSO

Vision

To empower the Electronics and Communication Engineering students with emerging technologies, professionalism, innovative research and social responsibility.

Mission

M1: Attain the academic excellence through innovative teaching learning process, research areas & laboratories and Consultancy projects.

M2: Inculcate the students in problem solving and lifelong learning ability.

M3: Provide entrepreneurial skills and leadership qualities.

M4: Render the technical knowledge and skills of faculty members.

Program Educational Objectives

PEO1: **Core Competence:** Graduates will have a successful career in academia or industry associated with Electronics and Communication Engineering

PEO2: **Professionalism:** Graduates will provide feasible solutions for the challenging problems through comprehensive research and innovation in the allied areas of Electronics and Communication Engineering.

PEO3: **Lifelong Learning:** Graduates will contribute to the social needs through lifelong learning, practicing professional ethics and leadership quality

Program Outcomes

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO1: Applying knowledge in various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of Engineering application.

PSO2: Able to solve complex problems in Electronics and Communication Engineering with analytical and managerial skills either independently or in team using latest hardware and software tools to fulfil the industrial expectations.

Keywords	**Matching with POs,PSOs**
Artificial Intelligence, safety measure, Detection.	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2**

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ABSTRACT

Infrastructure for intelligent mobility is required, and we now have the technology to help. The effectiveness of current systems might be increased in a number of ways with the help of artificial intelligence, particularly deep learning. Intelligent systems must have the ability to recognize and categorise autos accurately. In the not too distant future, in a nation like India with a fast expanding population and little space, these devices could be essential in helping us get around. This programme aims to address a few issues that are particularly significant in India. Motorcycle riders are required by law in many countries to wear helmets, although many people choose to ignore the requirement for a variety of reasons. We discuss the development of a framework for identifying bicyclists who are disobeying helmet laws using sophisticated convolutional neural networks (CNNs). The system uses the YOLO algorithm, motorcycles, helmet detection, categorization, and helmet vs. no-helmet method counting. For the number plate detection procedure, convolutional neural networks using sequential CNN models are being used. The CNN classification approach suggests categorizing the licence plate in the picture and extracting user information. Next, determine the fine amount. Making SMS alerts available to consumers is the final step in reducing motorbike accidents. We evaluate the framework's precision and speed.

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LIST OF ABBREVIATIONS

ACRONYM		ABBREVIATION
YOLO	-	You Only Live Once
CNN	-	Convolutional Neural Network
LPR	-	License Plate Detection
ALPR	-	Automated License Plate Recognition
ROI	-	Region Of Interest
GUI	-	Graphical User Interface
LBP	-	Local Binary Patterns
ADL	-	Architecture Description Language

1. INTRODUCTION

Traffic accidents are one of the major causes of death, injuries and property damage. The reasons that lead to these accidents are driving over speed limit, driving under influences and not using helmets and seatbelts.[1] It is reported in India there are almost 5 lakh traffic related accidents which have caused over 1 lakh deaths. Out of this approximately half of them are motorcycle related accidents. Travelling by a motorcycle has a higher risk of accidents than driving by a car or other vehicles. Motorcycle accidents have a high likelihood in resulting in an injury most of which are concussions and brain damage. This risk is higher for the riders who are not wearing a helmet. Wearing a helmet can somewhat prevent the rider from fatal injuries to the head and thus preventing death.[2] In our country, the law asks the citizens to wear a helmet when riding or travelling in a motorcycle but there are many people violating it. So in order to make sure that the motorcycle riders are wearing helmet, a system should be there to detect helmet on a motorcycle riders and issue a penalty to these not wearing it. The existing systems used are either manual detections or using algorithms that are slow or less accurate. The proposed system uses YOLO model for detection which is fast and has high accuracy. The process of issuing the penalty is also automated in the system by detecting the registration number of the vehicle by means of the Convolutional neural network algorithm and messaging the owner of the vehicle.[3] This system can be further developed to detect more safety equipment's. As we head towards a more machine oriented future where we let machines take the important decisions, the need to design state of the art models with real time analysis and output capability is of paramount importance.

1.1 OBJECTIVE

The primary objective of this project is to develop an efficient, real-time system for detecting traffic violations related to helmet usage among motorcycle riders, leveraging advanced deep learning techniques.[4] The system aims to enhance road safety by identifying riders who are not wearing helmets, a major factor contributing to severe injuries and fatalities in motorcycle accidents. Utilizing the YOLO model for helmet detection, the system ensures high-speed processing with superior accuracy compared to traditional methods. Additionally, the project incorporates an automated penalty issuance mechanism through the recognition of vehicle registration numbers using a Convolutional Neural Network (CNN). This integration streamlines the enforcement process by instantly notifying vehicle owners of violations via automated messaging.[5] The overarching goal is to promote compliance with traffic safety regulations, minimize human intervention, and pave the way for future enhancements to detect other safety equipment violations. This initiative aligns with the vision of a machine-driven future, emphasizing the need for state-of-the-art models capable of real-time analysis and decision-making to improve public safety and operational efficiency.

1.2 MODULES DESCRIPTION

Framework construction

Camera capturing

Helmet Classification

Number plate recognition

Alert system

MODULE S DESCRIPTION

FRAMEWORK CONSTRUCTION

Intelligent traffic systems optimize the movement of automobiles over transport networks. This optimization includes Automatic Car License Plate Detection and Recognition. Research on Automatic car license plate detection LPR has gained momentum in recent years due to neural networks and deep learning. It can be applied to many areas like traffic law enforcement and road traffic monitoring.[6] To identify License plate technologies such as computer vision and artificial intelligence algorithms can employed. The steps involved in ALPR are image acquisition, preprocessing of the image, finding the region of interest (ROI), segmentation and optical character recognition. In this module, admin can create the GUI for store the user details. User details contain the information such as Vehicle number, mobile number and so on. These details are trained as RTO database.

CAMERA CAPTURING:

Since motorcycles are affordable and a daily mode of transport, there has been a rapid increase in motorcycle accidents due to the fact that most of the motorcyclists do not wear helmets which makes it an ever-present danger everyday.[7] In this module, enable the camera to analyze the traffic violations. Implement binarization steps to separate the foreground from background scenes. Foreground detection is one of the major tasks in the field of computer vision and image processing whose aim is to detect changes in image sequences. Background subtraction is any technique which allows an image's foreground to be extracted for further processing

(object recognition etc.). Many applications do not need to know everything about the evolution of movement in a video sequence, but only require the information of changes in the scene, because an image's regions of interest are objects (humans, cars, text etc.) in its foreground.[8] After the stage of image pre-processing (which may include image denoising, post processing like morphology etc.) object localisation is required which may make use of this technique .Foreground detection separates foreground from background based on these changes taking place in the foreground. It is a set of techniques that typically analyse video sequences recorded in real time with a stationary camera.

HELMET CLASSIFICATION

In this module implement object detection system using YOLO algorithm. Then detect the objects and draw bounding box on that objects. Verify the features which are contains the helmet objects. If helmet object not occurred means, forward to next module. For training our custom object detection model, we will need a lot of images of objects which we're going to train nearly a few thousand. Number of images is directly proportional to accurate precision.We first perform feature extraction to determine the distribution and mathematical characteristics of the dataset; then we build YOLOv3 on our pre-processed data for training to build our model to detect helmets on the camera. Based on the features of the dataset, we can obtain relevant information that will provide better support in building neural network training. For feature extraction, Calculation of the proportion of each target in the original image, calculate the average length of the target, calculate theaverage width, calculate the average area, and calculate the average percentage of the target.

NUMBER PLATE RECOGNITION

In this module, implement number detection approach based on text strokes values which is defined in the form of minimum and maximum values in order to obtain the license plate only and remove other very small or very large identified objects which were outside the threshold range.

The objects passed successfully through predefined threshold criterion were forwarded to the training process. In this module, text strokes in number plate detected using Conditional Random field. Detected texts are drawn as bounding box. Text can be recognized using Convolutional neural network algorithm. In this module implement CNN algorithm to recognize the detected text.

CNN is a piece of software that converts printed text and images into digitized form such that it can be manipulated by machine.[9] CNN is a complex problem because of the variety of languages, fonts and styles in which text can be written, and the complex rules of languages etc.Character segmentation is done on the binary image of the extracted license plate.

The algorithm used for the same is horizontal scanning which makes use of a scanning line which finds the conditions satisfying the start and end position of the character. In this module, number plate can be detected and recognized using Convolutional neural network algorithm. First detect the text strokes in number plate and recognized the number. Then return as Label box in real time camera capture. Finally matched with database and extract the owner details.

ALERT SYSTEM

In this module, recognized user details are extracted from database which are extracted from trained database. CNNs will compare input images pixel by pixel or group of boxes.[10]

The regions that appearances for are called landscapes. By definition rough feature contests in roughly the similar places in two images, convolutional neural network gets a lot of improved at sighted likeness than entire–image matching patterns. And send the fine amount details to appropriate the user in the form of SMS alert.

2. LITERATURE SURVEY

2.1 TITLE OF EACH PAPER

2.1 TITLE: Automatic Helmet Violation Detection of Motorcyclists from Surveillance Videos using Deep Learning Approaches of Computer Vision

AUTHOR: Adil Afzal

These days, recognition and classification of moving objects are frequently used in a variety of applications, including the recording of human movement and systems for smart transportation (ITS). Currently, the use of intelligent transportation systems has grown to be one of the engineering applications for computer vision. Traffic Observation and accident prevention are the primary difficulties in the ITS, or two-wheeled independent transportation systems there has been a daily increase in the number of motorbikes on the roadways.

Fast rise in motorcycle accidents caused by carelessness motorcycle riders' carelessness and haste. Motorcycle accidents are on the rise, and this situation highlights the need to handle it as a serious problem in countries in development like Pakistan.

The carelessness of not one of the most crucial factors for motorcyclists is wearing a helmet and the majority of them suffered head injuries from not wearing a helmet.

Which resulted in harm to the head and brain because of the riders of motorcycles do not wear helmets. In recent years, Injuries among the decades-long majority of accident death causes are head .

According to traffic laws, wearing a helmet is also required. Rules for motorcycle riders, with penalties for breaking them enormous fine however, regrettably, there are several motorcycle riders who disregard this guideline. A lot of people are involved in the video surveillance procedure, but their performance is not long-lasting. According to a recent study, human surveillance is insufficient; the human error rate rises as the length of the surveillance video lengthens. The computer currently, a vision-based automated system is required.

A circumstance that can determine whether or not the motorcycle riders are no helmet at all. This helmet's automatic detecting system also lessens the workload of the traffic police. The primary goal of this study aims to lessen catastrophic accidents on the roads with the automated computer vision-based system, accidents detection of motorcycle helmets.

2.2 TITLE: Behavioral aspects of safety culture: Identification of critical safety-related behaviors of motorcyclists in Indonesia's urban areas via the application of behavioral-based safety programs

AUTHOR: Andrijanto

Road users depend their behavior only on the existing beliefs and opinions held by the larger society when road traffic organizations (RTO) fail to build an appropriate traffic safety culture (TSC). Drivers were misled into believing that driving safety initiatives were implemented due to a lack of traffic education, improper licensing system procedures, and ineffective law enforcement.

Drivers who encountered those circumstances learned from society and evolved their driving habits based on their own understanding. Road users who frequently participate in abnormal behavior have a poor understanding of the threats to their safety posed by traffic.

This activity may be misinterpreted by other road users, who may think that their courteous conduct may not be in compliance with traffic laws. Organizations have the power to manage safety through the creation and upkeep of policies and rules, and they are in charge of molding people's behavior in an effort to build a sense of safety culture among individuals.

Similar to how improving a culture of safety in relation to driving can increase traffic safety. In terms of regulating road traffic safety, the government has the broadest authority among institutions involved in it. To ensure that drivers adopt a

positive safety culture, the government must create safety policies (laws and regulations), offer driver education and training, ensure that road safety infrastructure is well maintained, and be in charge of conducting testing, evaluation, and the issuance of driver licenses.

Peer observations, self-reporting, and/or outcome measures can be used to look into the behavioural part of safety culture. Occupational safety has been successfully promoted in the past using a behavioural strategy. The phrase "What People Do" is consistent with the behavioral-based safety principle (BBS). The procedures for looking at the behavioural aspect can be similar to those for promoting BBS programmers.

Reason, Man stead, Straddling, Baxter, & Campbell attempted to increase driving safety by investigating driver error behavior; Geller recommended the use of BBS to promote driving safety behavior. Earlier researchers have used a behavioural approach to increase driving safety. BBS programmers are still not widely used to increase traffic safety on urban roadways, nevertheless.

2.3 TITLE: A Survey on Machine Learning Techniques for Vehicle Classification, Helmet Detection, and Number Plate Recognition

AUTHOR: Bhushan Nikumbhe

Many researchers are very interested in object tracking in video surveillance, which is a crucial application and a developing field of study in machine learning and image processing. The method of finding the existence of objects using a bounding box and the types or categories of the put objects is known as object detection. A visual. This essay offers a summary of tracking methods, their classification into various types, and focuses on significant and practical tracking methods. . We examine generic tactics as part of a literature study on various methods, and then summarise the examination of potential research topics.

The major objective of this research is to create systems for automatically identifying and classifying cars in order to follow and recognize things of interest on video screens and gauge a vehicle's speed without sensors. In the area of computer science, object detection is a difficult, technological, and practically useful problem. Vision in a video or image that enables us to recognise and find an object. The topic of object detection is recognizing the existence of various different items in a large movie. the suggested software initially, the application uses a webcam to collect the first frame. This framework will be used as the starting point. By computing the phase difference between the original frame and the next frame, the movement will be determined. The Threshold framework will be the name of the revised structure. Larger objects are then caught utilising additional sophisticated image processing techniques like Shadow Removal, Dilation, Contouring, etc. within the threshold framework. Utilizing image processing, this project entails estimating the vehicle's speed.

2.4 TITLE: Identification of Helmets on Motorcyclists and Seatbelt on Four-Wheeler Drivers

AUTHOR: Divyansh Saini

For catching violators of traffic laws, traffic police officials are always dependent on manual techniques. Traditional techniques are costly and frequently dangerous. Indians in particular are stubborn when it comes to wearing helmets and adhering to traffic laws. Basic techniques, such as standing in front of them, are used by traffic police to stop them. Vehicle to stop them firmly. The majority of drivers are stubborn and uninterested, which causes the police to act rashly and dangerously. Unfavorable weather is another one of the biggest difficulties for people performing manual traffic inspection. In the age of automation, a setup that requires little to no operator intervention incredibly helpful to the governing body.

Traffic police personnel deployed at various checkpoints or designated locations stay attentive and watch all entering vehicles for the presence of helmets and seatbelts on the drivers. This is one of the traditional methods for identifying traffic violators.

Recent investigations show that traffic departments throughout a number of developed nations are automating this process by the use of CCTV or another medium, directly imposing fines on offenders with an accompanying image of the time and place of the offence, and site of the arrest providing as evidence to those who disregard road safety regulations. It is true that the work that police officers do is physically taxing and demanding.

Be on the lookout at all times. The goal of our study is to dispel the myth that being physically present serves as a panopticon for surveillance. With our suggested method, it will be simple to spot reckless drivers who are not using seatbelts or helmets.

2.5 TITLE: Helmet detection on Two-Wheeler riders using machine learning

AUTHOR: Himanshu Adhikari

Riders generally frequently disregard road safety, which leads to accidents and passing. Most countries have legislation requiring bike riders to wear helmet coverings as a solution to this problem. Despite the legislation, a significant portion of police authority exists to cripple this behaviour by issuing a criminal traffic infraction citation. This interaction is currently manual and protracted. This project aims to address this issue by computerising the process for recognising the riders. Who do not wear caps while biking? Additionally, the framework also deletes the tag, making it possible to give tickets for minor offences. The system uses AI and image processing techniques to distinguish between riders on bikes, who don't have head protection. The suggested technology intends to give bike riders total safety. Despite the recent requirement for helmets, many people continue to drive without them. Particularly in poor nations. thus, maintaining keeping public safety in mind, a system is required. In order to automatically detect helmets and extract the individuals who don't wear helmets' licence plates roads. Such automation will benefit the administration will more often issue citations for helmet violations effectively and finally seeks to prevent the transgression by riders of two wheels. The system is designed to identify motorcycle riders who are not wearing helmets. This system primarily consists of three components: motorcycle detection, helmet detection, and recognising motorcycle riders' licence plates lacking a helmet. If the captured is determined to be image features a motorcycle or does not employ SVM determines whether the rider is wearing a helmet by employing the classifiers SVM and CNN. When a motorcycle rider is sans a helmet, followed by the driver's licence number of the OCR is used to recognise motorcycles.

3. EXISTING SYSTEM

3.1 EXISTING SYSTEM

Nowadays, road accidents are one of the major causes that lead to human death. Motorbike accidents can cause severe injuries. The helmet is important for every motorcyclist. However, many fail to conform to the law of wearing helmets. Helmets are essential equipment's to protect workers from danger during inspection and operation. Considering that some workers would not always obey the regulation, video surveillance systems covering the whole factory and supervisors are needed to monitor whether workers are wearing helmets or not.

However, with a large number of surveillance screens, it is difficult to identify any helmet violation behaviour during any time, which can lead to severe accidents. With the rapid development of image recognition technologies, computer vision based inspections have been one of the most important industrial application areas.

In this paper, an intelligent vision-based approach for helmet identification is proposed. This approach focuses on monitoring whether workers are wearing helmets or not, at the same time, identifying the colors of helmets.

A color-based hybrid descriptor composed of local binary patterns (LBP), moment invariants (HMI) and color histograms (CH) is proposed to extract features of helmets with different colors (red, yellow and blue). Then a hierarchical support vector machine (H-SVM) is constructed to classify all features into four classes (red-helmet, yellow-helmet, blue helmet and non-helmet).

3.2 DISADVANTAGES

1. Only support the image datasets
2. Accuracy is less
3. Need to train the more datasets for helmet detection
4. Detect the number plate from images

4. PROPOSED SYSTEM

There is no automated existing system which can detect motorcyclists who are not wearing helmets as well as masks due to which the traffic policemen have to manually keep records of such traffic rules violators either by remembering the number plate or by capturing a photo of the number plate.

This manual administration can sometimes lead to errors. In order to overcome these drawbacks, we have designed an automated helmet and face mask detection system which is able to catch all the motorcyclists who are not wearing helmets and masks just by storing the number plate of those bike riders. To overcome the disadvantages of the existing system, we have proposed an automated system which is more accurate and requires minimum human efforts.

The main application of this system is to catch all the motorcyclists who are not wearing helmets. In this project, implement the framework to identify the helmet traffic violations in real time environments. We can using object detection and recognition system to identify the helmet using YOLO algorithm and also recognize the number plate using Convolutional neural network algorithm to extract user details. The proposed approach is able to detect the object in different illumination and occlusion.

The system extracts objects class based on feature extracted. The system uses You Only Look Once (YOLO)-Darknet deep learning framework which consists of Convolutional Neural Networks trained on Common Objects in Context (COCO) and combined with computer vision. Based on CNN, we can detect the text object and recognize the objects to print the number plate. The Send fine amount as SMS to non-wearing helmet persons.

ADVANTAGES

- Implement in real time environments
- Accuracy is high
- Recognize the numbers in captured image
- SMS alert system

5. SYSTEM ARCHITECTURE

A system architecture or systems architecture is the conceptual model that defines the structure, behavior, and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviors of the system. System architecture can comprise system components, the externally visible properties of those components, the relationships (e.g. the behavior) between them.

It can provide a plan from which products can be procured, and systems developed, that will work together to implement the overall system. There have been efforts to formalize languages to describe system architecture; collectively these are called architecture description languages (ADLs).

Various organizations define systems architecture in different ways, including:

- An allocated arrangement of physical elements which provides the design solution for a consumer product or life-cycle process intended to satisfy the requirements of the functional architecture and the requirements baseline.
- Architecture comprises the most important, pervasive, top-level, strategic inventions, decisions, and their associated rationales about the overall structure (i.e., essential elements and their relationships) and associated characteristics and behavior.

- If documented, it may include information such as a detailed inventory of current hardware, software and networking capabilities; a description of long-range plans and priorities for future purchases, and a plan for upgrading and/or replacing dated equipment and software
- The composite of the design architectures for products and their life-cycle processes.

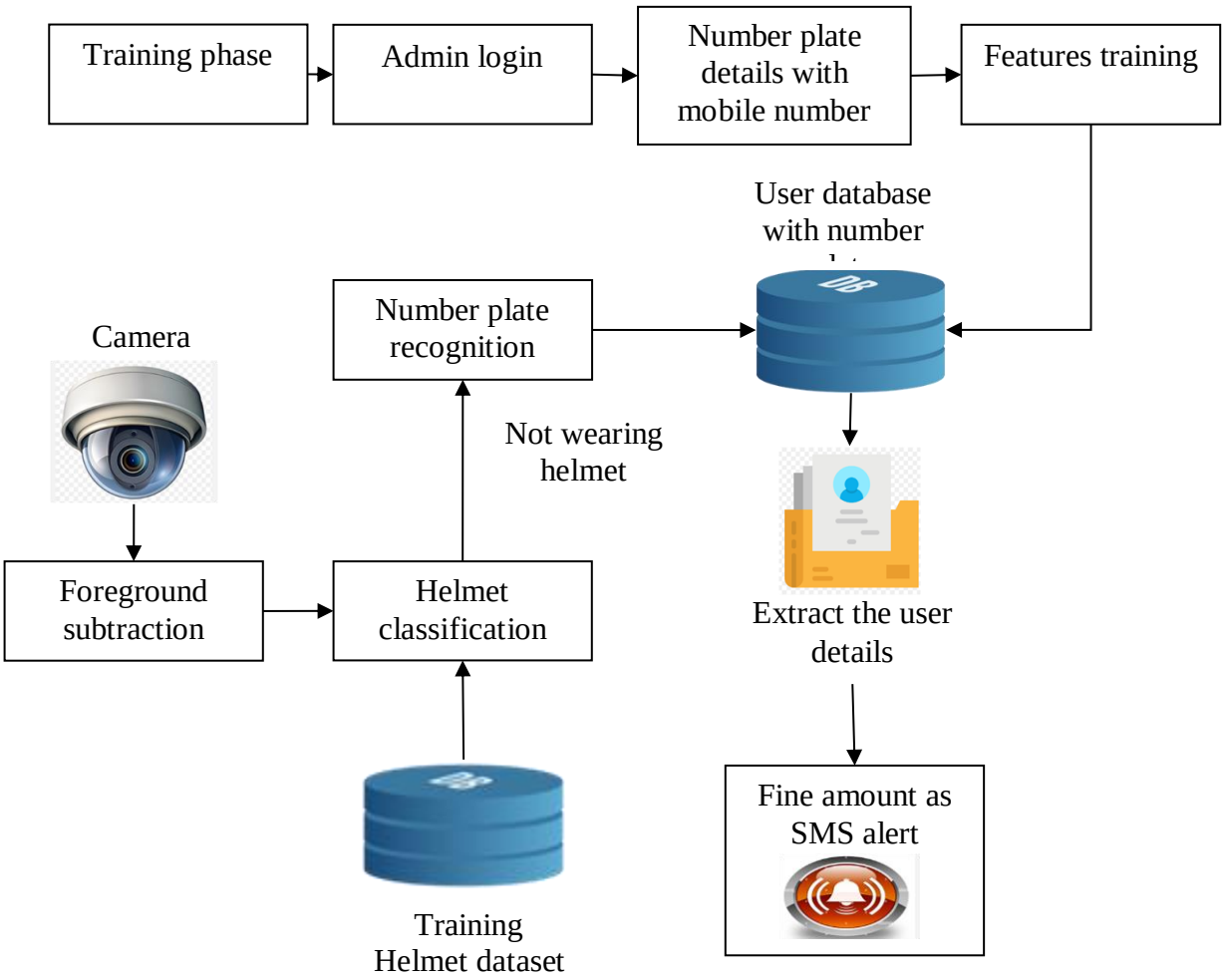

Fig 1.1-Flowchart

6. DATAFLOW DIAGRAM

A data flow diagram shows the way information flows through a process or system. It includes data inputs and outputs, data stores, and the various sub processes the data moves through. DFDs are built using standardized symbols and notation to describe various entities and their relationships. Data flow diagrams visually represent systems and processes that would be hard to describe in a chunk of text. You can use these diagrams to map out an existing system and make it better or to plan out a new system for implementation. Visualizing each element makes it easy to identify inefficiencies and produce the best possible system.

LEVEL 0

It is also known as a context diagram. It's designed to be an abstraction view, showing the system as a single process with its relationship to external entities. It represents the entire system as a single bubble with input and output data indicated by incoming/outgoing arrows.

LEVEL 1

In 1-level DFD, the context diagram is decomposed into multiple bubbles/processes. In this level, we highlight the main functions of the system and breakdown the high-level process of 0-level DFD into sub processes.

LEVEL 2

2-level DFD goes one step deeper into parts of 1-level DFD. It can be used to plan or record the specific/necessary detail about the system's functioning.

LEVEL 0

The Level 0 DFD shows how the system is divided into 'sub-systems' (processes), each of which deals with one or more of the data flows to or from an external agent, and which together provide all of the functionality of the system as a whole. It also identifies internal data stores that must be present in order for the system to do its job, and shows the flow of data between the various parts of the system.

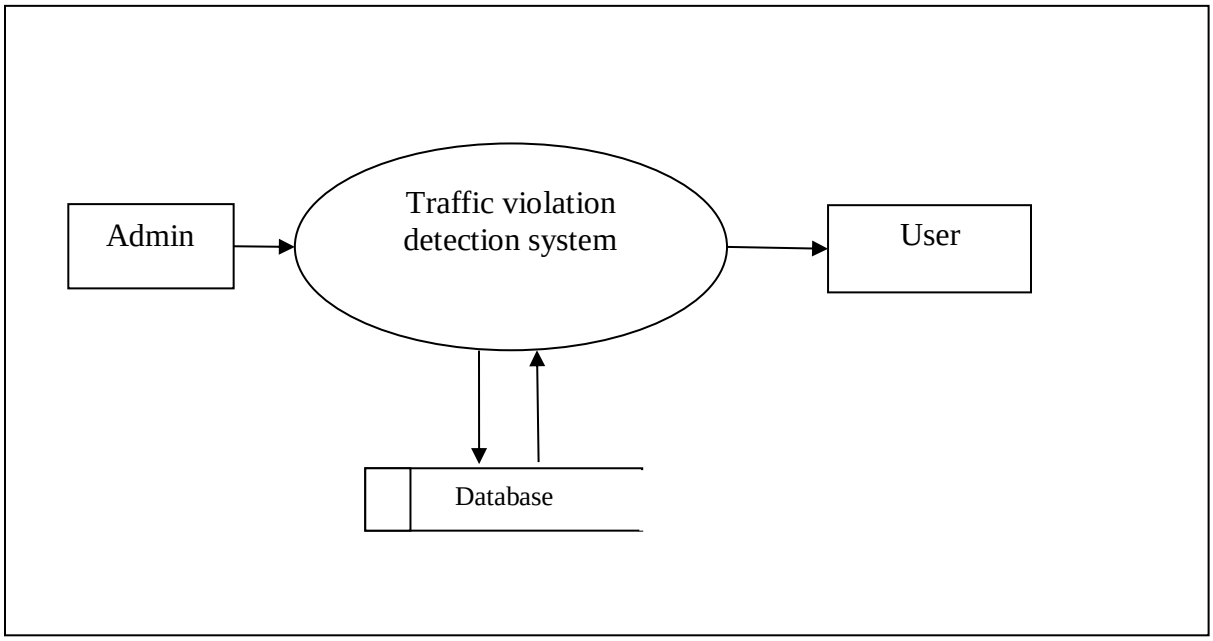

Fig 1.2-Block Diagram

DFD LEVEL-1

The next stage is to create the Level 1 Data Flow Diagram. This highlights the main functions carried out by the system. As a rule, to describe the system was using between two and seven functions - two being a simple system and seven being a complicated system. This enables us to keep the model manageable on screen.

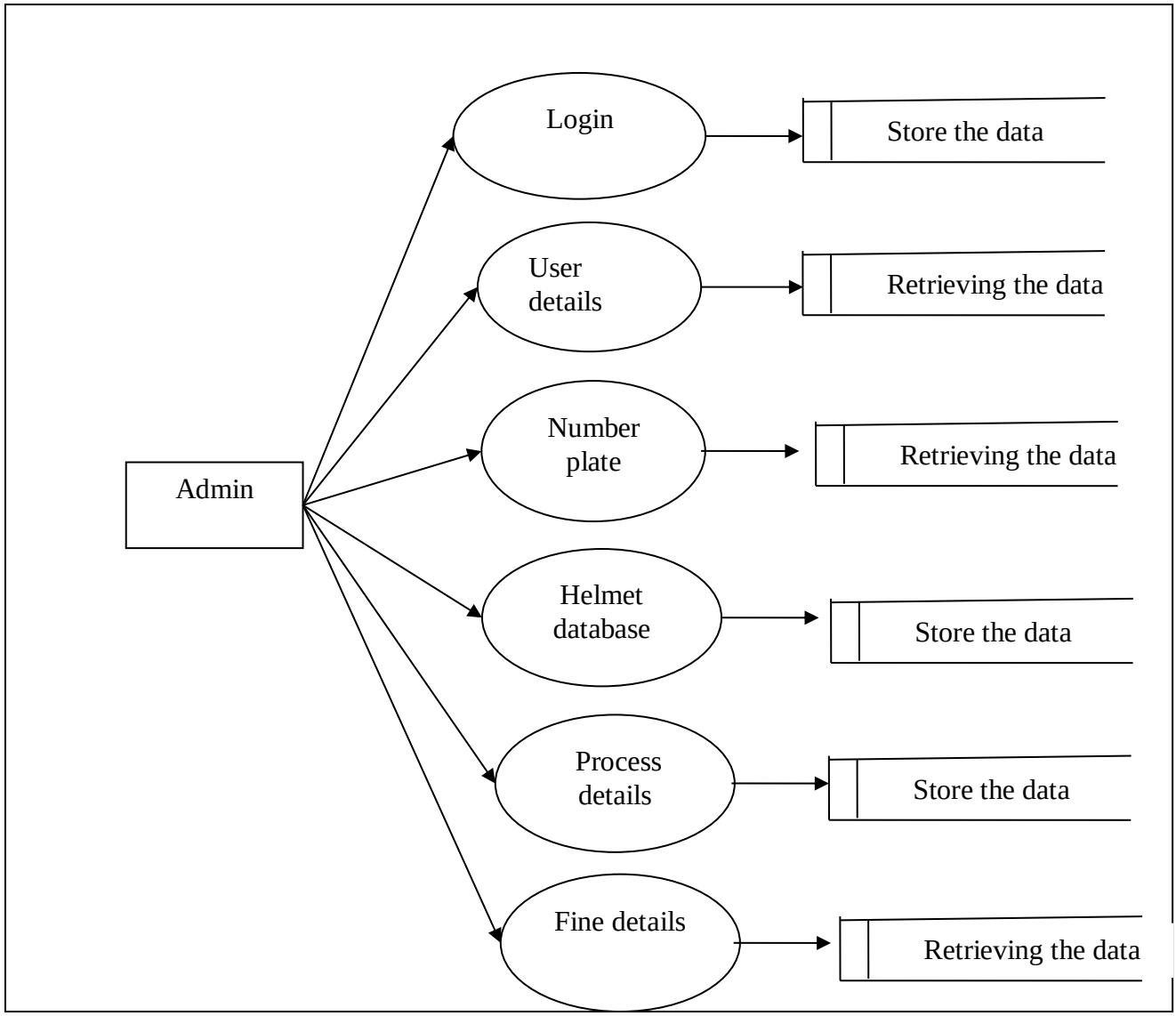

Fig 1.3-Admin Flowchart

DFD LEVEL-2

A Data Flow Diagram (DFD) tracks processes and their data paths within the business or system boundary under investigation. A DFD defines each domain boundary and illustrates the logical movement and transformation of data within the defined boundary. The diagram shows 'what' input data enters the domain, 'what' logical processes the domain applies to that data, and 'what' output data leaves the domain. Essentially, a DFD is a tool for process modeling and one of the oldest.

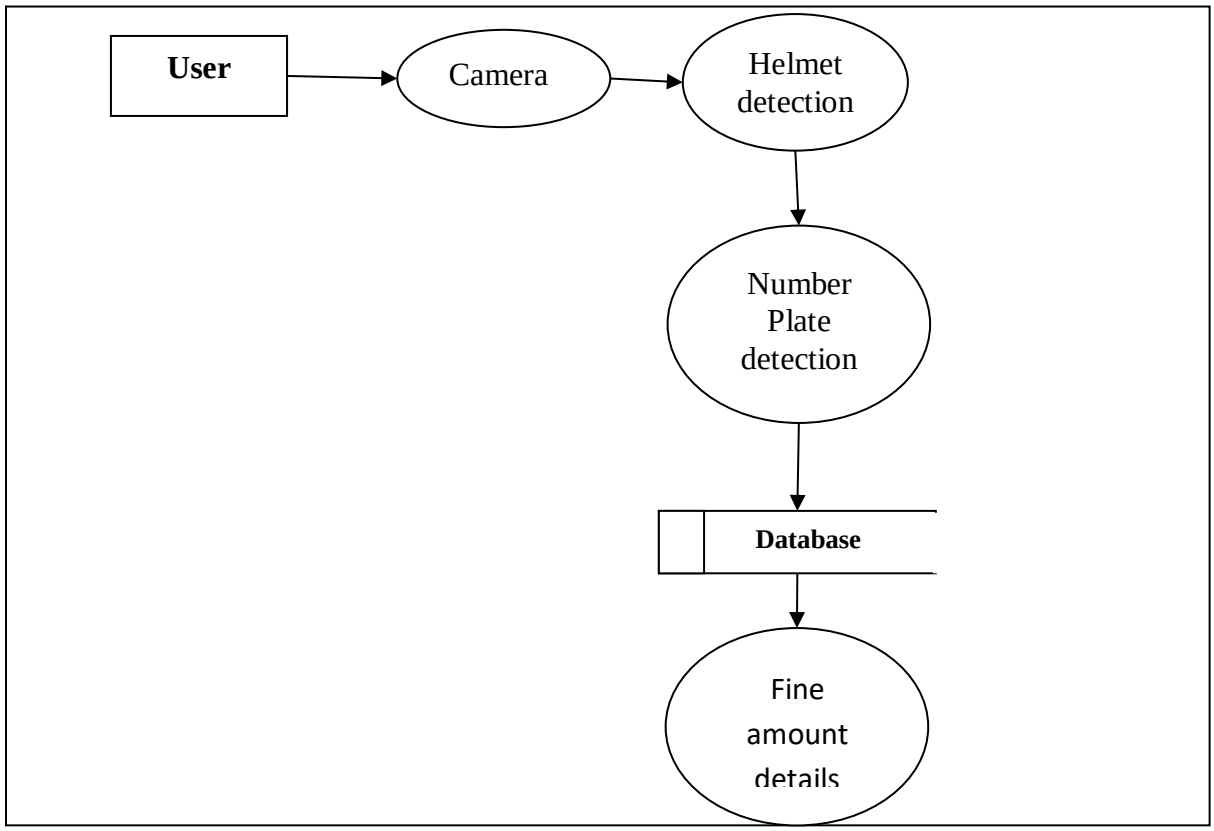

Fig 1.4-Data Flow Diagram

7. RESULT AND DISCUSSION

The implementation of the proposed system demonstrated significant success in addressing the critical issue of helmet compliance among motorcycle riders. By leveraging the YOLO model for helmet detection, the system achieved high-speed processing and exceptional accuracy, effectively identifying violations in real-time. The automated penalty issuance mechanism, enabled by vehicle registration number recognition using Convolutional Neural Networks (CNNs), streamlined the enforcement process by reducing human intervention and ensuring timely notifications to vehicle owners. Testing and validation showed that the system outperformed traditional manual and algorithmic approaches, particularly in its ability to handle high-volume data with minimal latency.The results indicate that the integration of deep learning models into traffic monitoring can substantially enhance road safety and regulatory compliance. Furthermore, the system's scalability and flexibility provide opportunities for future enhancements, such as detecting additional safety equipment violations or adapting to other traffic-related use cases. These findings underscore the importance of deploying advanced machine learning techniques in real-time systems to address societal challenges effectively and efficiently. To reduce the traffic fatal crashes, based on the current research results, the expressway should further strengthen the supervision and control of traffic violation behaviors, such as speeding. In addition, further improvements are required. First, a more complex multilevel hierarchy could be added to the study or use other methods to study the crash mechanism. It is beneficial to help us to have a clear understanding of the factors that affect traffic fatal crashes. This paper only considers the traffic fatal crashes and traffic violation behaviors in one year.

8. CONCLUSION AND FUTURE WORK

In this project we have described a framework for automatic detection of motorcycle riders without helmet from real time camera capturing and automatic retrieval of vehicle license number plate for such motorcyclists. The use of Convolutional Neural Networks (CNN) and transfer learning will help in achieving good accuracy for detection of motorcyclists not wearing helmets. But, only detection of such motorcyclists is not sufficient for taking action against them. So, the system will also recognize the number plates of their motorcycles and store them. In this project, we have used the YOLO v3 for identification of real time person with and without helmets. YOLO is suitable to detect the single object from the image, YOLO has a limitation that if there are multiple object in a single cell then YOLO is not suitable to all objects. And also accomplished deep learning based automatic license plate recognition model for Indian road users. Results denote that the preferred technique perform better than the existing methods by far in energizing datasets of Indian fonts with high irregularities, containing Number plates and successfully created a custom dataset of Indian font variants Successfully trained the model with Sequential CNN algorithm. The stored number plates can be then used by Transport Office to get information about the motorcyclists from their database of licensed vehicles. Concerned motorcyclists can then be penalized.

FUTURE WORKS

In future, we can extend the framework analyse various types of traffic violations and with embedded with hardware system. We can also predict the traffic misbehaving in various types' vehicles and also use other deep learning algorithms to improve the accurate functions.

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OUTCOME