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SMART HELMET & TRIPLE RIDING DETECTION USING IOT &ML

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ABSTRACT

Violations in traffic laws are very common in a highly populated country like India. The accidents associated with these violations cause a huge loss to life and property. Since utilization of bikes is high, mishaps associated with bikes are additionally high contrasted with different vehicles. One of the main causes of these is not using motorcycle helmets. So we propose an approach called Smart helmet detection and triple riding detection using ML and IOT using deep learning which automatically sends challan or send an SMS for individuals in case of identification of bicycle riders without headgear and who are triple riding utilizing surveillance videos in real-time. The proposed approach initially recognizes motorcycle riders utilizing background subtraction and object segmentation. At that point we utilize object classifier to classify violators. Since wearing helmet is critical while driving, our main aim is to decrease the danger of injuries in case of accident. By detecting the motorcyclists without helmets, triple riding or other violations we can therefore increase their safety while on road. Hence by automating we reduce the workload on the traffic control team and will be able to share the evidence with the team efficiently to impose fines on violators. In recent years, the rise in road accidents and vehicle thefts has become a serious concern, urging the need for innovative solutions to enhance road safety and vehicle security. This paper presents a novel approach combining helmet detection and biometric-based vehicle security using machine learning techniques to address these issues. This system provides two steps of security in first step it validates triple riding in second step it identifies helmet wearing. If any one of these two will fail then vehicle will not start or stop. This proposed project title is helmet detection and biometric based vehicle security using machine learning with Arduino and ESP32 camera.

Keywords: Microcontroller, Helmet detection, Triple riding detection, Camera, Machine Learning, IOT, Sensors, Buzzer, etc

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I. INTRODUCTION

1.1 INTRODUCTION

Microcontroller are widely used in Embedded Systems products. An Embedded product uses the microprocessor (or microcontroller) to do one task & one task only. A printer is an example of Embedded system since the processor inside it perform one task only namely getting the data and printing it. Although microcontroller is preferred choice for many Embedded systems, there are times that a microcontroller is inadequate for the task. For this reason, in recent years many manufactures of general-purpose microprocessors such as INTEL, Motorola, AMD & Cyrix have targeted their microprocessors for the high end of Embedded market. One of the most critical needs of the embedded system is to decrease power consumptions and space. This can be achieved by integrating more functions into the CPU chips. All the embedded processors have low power consumptions in additions to some forms of I/O, ROM all on a single chip. In higher performance Embedded system, the trend is to integrate more & more function on the CPU chip & let the designer decide which feature he/she wants to use.

1.2 EMBEDDED SYSTEM

Physically, embedded systems range from portable devices such as digital watches and MP3 players to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure

In general, "embedded system" is not an exactly defined term, as many systems have some element of programmability. For example, Handheld computers share some elements with embedded systems such as the operating systems and microprocessors which power them but are not truly embedded systems, because they allow different applications to be loaded and peripherals to be connected. Embedded systems span all aspects of modern life and there are many examples of their use. Telecommunications systems employ numerous embedded systems from telephone switches for the network to mobile phones at the end-user. Computer networking uses dedicated routers and network bridges to route data.

EXAMPLES OF EMBEDDED SYSTEM:

Automated teller. machines (ATMS). Integrated system in aircraft and missile. Cellular telephones and telephonic switches. Computer network equipment, including routers timeservers and firewalls. Computer printers, Copiers. Disk drives (floppy disk drive and hard disk drive). Engine controllers and antilock brake controllers for automobiles. Home automation products like thermostat, air

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conditioners sprinkles and security monitoring system. House hold appliances including microwave ovens, washing machines, TV sets DVD layers/recorders. Medical equipment. Measurement equipment such as digital storage oscilloscopes, logic analysers and spectrum analysers. Multimedia appliances: internet radio receivers, TV set top boxes.Small hand-held computer with P1M5 and other applications. Programmable logic controllers (PLC's) for industrial automation and monitoring. Stationary video game controllers.

1.3 CHARACTERISTICS:

Embedded systems are designed to do some specific tasks, rather than be a general-purpose computer for multiple tasks. Some also have real-time performance constraints that must be met, for reasons such as safety and usability; others may have low or no performance requirements, allowing the system hardware to be simplified to reduce costs. Embedded systems are not always standalone devices. Many embedded systems consist of small, computerized parts within a larger device that serves a more general purpose. For example, the Gibson Robot Guitar features an embedded system for tuning the strings, but the overall purpose of the Robot Guitar is, of course, to play music. Similarly, an embedded system in an automobile provides a specific function as a subsystem of the car itself.

The software written for embedded systems is often called firmware, and is usually stored in read- only memory or Flash memory chips rather than a disk drive. It often runs with limited computer hardware resources: small or no keyboard, screen, and little memory.

1.4 MICROPROCESSOR (MP):

A microprocessor is a general-purpose digital computer central processing unit (CPU). Although popularly known as a "computer on a chip" is in no sense a complete digital computer. The block diagram of a microprocessor CPU is shown, which contains an arithmetic and logical unit (ALU), a program counter (PC), a stack pointer (SP), some working registers, a clock timing circuit, and interrupt circuits.

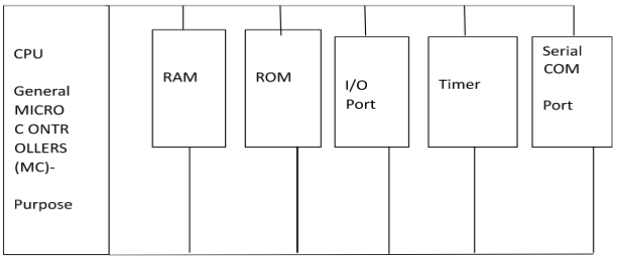

Fig 1.1 Block diagram of microprocessor

1.5 MICROCONTROLLER (MC):

Figure shows the block diagram of a typical microcontroller. The design incorporates all of the features found in micro-processor CPU: ALU, PC, SP, and registers. It also added the other features needed to make a complete computer: ROM, RAM, parallel I/O, serial I/O, counters, and clock circuit.

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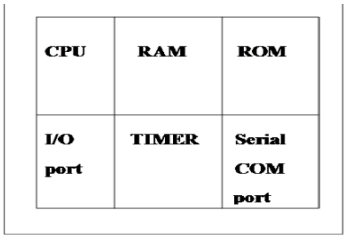

Fig 1.2 Microcontroller

1.6 COMPARISION BETWEEN MICROPROCESSOR AND MICROCONTROLLER

The microprocessor must have many additional parts to be operational as a computer whereas microcontroller requires no additional external digital parts. The prime use of microprocessor is to read data, perform extensive calculations on that data and store them in the mass storage device or display it. The prime functions of microcontroller is to read data, perform limited calculations on it, control its environment based on these data. Thus the microprocessor is said to be general-purpose digital computers whereas the microcontroller are intend to be special purpose digital controller. Microprocessor need many opcodes for moving data from the external memory to the CPU, microcontroller may require just one or two, also microprocessor may have one or two types of bit handling instructions whereas microcontrollers have many.

II. LITERATURE SURVEY

2.1 INTRODUCTION

All over the world around 1.35 million lives are lost each year, 50 million people are getting injured due to road accidents, according to a report titled " The Global status Revised Manuscript Received on December 05, 2019 report on road safety 2018" released by world health organization.

It is very hard to imagine that this burden is unevenly borne by motorcyclists, cyclists, and pedestrians.

This report noted that a comprehensive action plan must be set up in order to save lives.

Two-wheeler is a very popular mode of transportation in almost every country. However, there is a high risk involved because of less protection. When a two-wheeler meets with an accident, due of sudden deceleration, the rider is thrown away from the vehicle.

If head strikes any object, motion of the head becomes zero, but with its own mass brain continues to be in motion until the object hits inner part of the skull. Sometimes this type of head injury may be fatal in nature.

In such times helmet acts as life saviour. Helmet reduces the chances of skull getting decelerated, hence sets the motion of the head to almost zero.

Cushion inside the helmet absorbs the impact of collision and as time passes head comes to a halt.

It also spreads the impact to a larger area, thus safeguarding the head from severe injuries.

More importantly it acts as a mechanical barrier between head and object to which the rider came into contact. Injuries can be

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minimized if a good quality full helmet is used.

Traffic rules are there to bring a sense of discipline, so that the risk of deaths and injuries can be minimized significantly. However strict adherence to these laws is absent. Hence efficient and feasible techniques must be created to overcome these problems.

To reduce the involved risk, it is highly desirable for bike-riders to use helmet. Worrying fact is that India ranks in top as far as road crash deaths are considered. Rapid urbanization, avoiding helmets, seat belts and other safety measures while driving are some of the reasons behind this trend according to analysis done by experts. In 2015 India signed Brasilia Declaration on Road Safety, where India committed to reduce road crash deaths to 50 percent by 2020.

Observing the usefulness of helmet, Governments have made it a punishable offense to ride a bike without helmet and have adopted manual strategies to catch the violators.

However, the existing video surveillance-based methods are passive and require significant human assistance.

III. PROBLEM STATEMENT

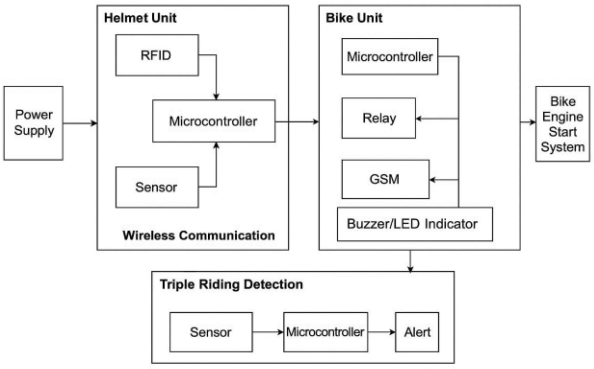
Methods for object detection generally fall into either machine learning-based approaches or deep learning-based approaches.

For Machine Learning approaches, it becomes necessary to first define features using one of the methods below, then using a technique such as support vector machine (SVM) to do the classification.

On the other hand, deep learning techniques that can do end to-end object detection without specifically defining features and are typically based on convolution neural networks (CNN).

3.1 BLOCK DIAGRAM OF EXISTING SYSTEM

The below figure 2.1 shows block diagram of existing system



Block diagram of Existing System

3.2 DISADVANTAGES OF EXISTING SYSTEM

Labor-Intensive: Manual monitoring requires significant human resources and is prone to errors.

Delayed Enforcement: Processing violations and issuing fines can be slow and inefficient.

Limited Coverage: Surveillance cameras without automation cannot effectively detect and process violations in real-time.

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IV. PROPOSED SYSTEM

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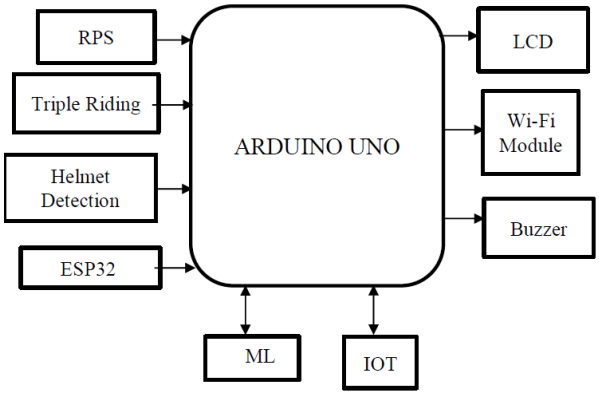
Automated Detection: Utilizes background subtraction and object segmentation to identify motorcycle riders.

Object Classification: Uses deep learning techniques to classify helmet usage and detect triple riding.

Real-Time Processing: Sends automatic challans or SMS notifications to violators.

Biometric Security: Combines helmet detection with fingerprint scanning to prevent vehicle operation if violations are detected.

4.1 BLOCK DIAGRAM OF PROPOSED SYSTEM



V. BLOCK DIAGRAM OF PROPOSED SYSTEM

HARDWARE COMPONENTS

The following hardware tools used in the proposed system

Arduino UNO, Helmet Detection, Wi-Fi Module, LCD, Buzzer, Power supply

SOFTWARE COMPONENTS

The following software tools used in the proposed system : Arduino IDE, Proteus Design Tool

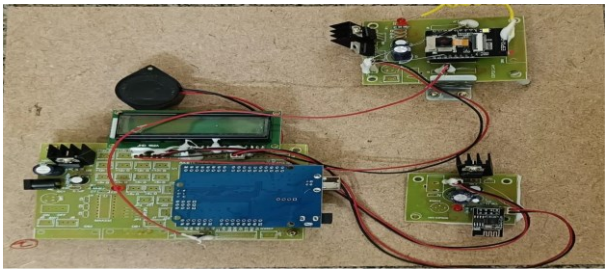
TECHNOLOGY USED

IOT

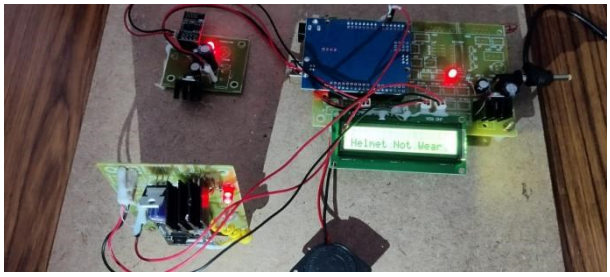
VI. RESULT AND DISCUSSION

PROTOTYPE

the prototype of the project



Prototype of the Project



When Supply is Connected to Kit

EXPERIMENTAL RESULTS

the real-time monitoring of the

Realtime monitoring

VII. CONCLUSION

A Non-Helmet Rider and Triple Riding Detection system is developed where a video file is taken as input. If the motorcycle rider in

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the video footage is not wearing helmet while riding the motorcycle, or riding with three members, then the license plate number of that motorcycle is extracted and displayed for above cases separately. Object detection principle with YOLO architecture is used for motorcycle, person, helmet and license plate detection. Google Spreadsheet is used for license plate number extraction if rider is not wearing helmet or triple riding. The characters are extracted from LP so that it can be used for other purposes. All the objectives of the project is achieved satisfactorily.

VIII. FUTURE SCOPE

The system implemented is a prototype. It can be expanded to process the day-today traffic video by attaining the permissions of the required authorities. A large database is created to maintain the records of the violators and their payment of the challans being monitored every few minutes. Also, the identification of the license plate becomes the core part of this project. So, a camera of high resolution is recommended to maintain precision and accuracy. For sending the challan directly to offender's mobile numbers, the subscriptions for SMS are required, as of now it is sent through mail ids, but the motto to send the challan to their mails as well as through SMS along with their violation photo, time and date. Our system is developed to process the above-mentioned future implementations.

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