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Violation Prevention of Traffic Rules and Helmet Detection using Machine Learning

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Abstract:
Researchers say that most of the human lives are lost during the accidents and it can be prevented by wearing helmet. Although our Government has implemented various traffic laws regarding wearing helmets, many people do not follow those. Our project helps the Government in implementation of these traffic laws in an effective manner. In our project, we detect if anybody crosses the zebra crossing during their appropriate red signal, and also if anybody does not wear the helmet while riding a two wheeler. The image of the person and the register number of the vehicle will be captured on the spot. With the help of the AADHAR that has been linked to their bank account, other identification details are cross-verified. The fine amount will be deducted automatically from their bank account by the Government and the bill will be sent to the mail id of the respective person.

Keywords: Traffic Rules, Helmet, Violation, Raspberry Pi, IR sensor, Image processing, Machine learning.

I. INTRODUCTION

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 to travel by motorcycle **Error! Reference source not found.**, [2]. In the last couple of years alone, most of the deaths in accidents are due to damage in the head [3]. Consequently, wearing helmets has been made mandatory as per traffic rules, violation of which attract hefty fines. In spite of doing that, a large number of motorcyclists still don't obey the traffic rules. Presently, all major cities have already deployed large video surveillance networks to keep vigil on a wide variety of threats. Although such existing systems are cost-efficient solutions, these systems involve a large number of humans whose performance is not sustainable for a long period of time. Recent studies have shown that human surveillance proves ineffective, as the duration of monitoring of videos increases, the errors made by humans also increases [4]. To date, several researchers have tried to tackle the problem of detection of motorcyclists without helmet by using different methods but have not been able to accurately identify motorcyclists without helmets due to challenging conditions such as occlusion, illumination, poor quality of video, varying weather conditions, etc. One major reason of the poor performance of existing methods is the use of less discriminative representation for object classification as well as the consideration of irrelevant objects against the objective of detection of motorcyclists without helmets. Also, the existing approaches make use of handcrafted features only.

II. EQUIPMENTS

A . HARDWARE

i. Raspberry Pi

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote the teaching of basic computer science in schools and in developing countries. The original model became far more popular than anticipated, selling outside its target market for uses such as robotics. It does not include peripherals (such as keyboards, mice and cases). However, some accessories have been included in several official and unofficial bundles. The Raspberry Pi hardware has evolved through several versions that feature variations in memory capacity and peripheral-device support. This block diagram depicts Models A, B, A+, and B+. Model A, A+, and the Pi Zero lack the Ethernet and USB hub components. The Ethernet adapter is internally connected to an additional USB port. In Model A, A+, and the Pi Zero, the USB port is connected directly to the SoC. On the Pi 1 Model B+ and later models the USB/Ethernet chip contains a five-point USB hub, of which four ports are available, while the Pi 1 Model B only provides two. On the Pi Zero, the USB port is also connected directly to the SoC, but it uses a micro USB (OTG) port. Processor, RAM, Networking, Peripherals, Video, Real Time Clock

Figure.1. Raspberry pi 3 Model B

ii. IR Sensor

IR sensor emits portion of electromagnetic spectrum to detect the motion of the object. The wavelength of the IR is greater than the visible light and lesser than the micro waves. The region from 0.75um to 1000um is the infrared region. REES52 sensor is used in this system for detection of crossing vehicles during red signal. It consists of LED as transmitter and photo detector as receiver. The range of the sensor is about 2-4cm. It

consist of 3 pins one for ground and another for VCC and another pin for output. A supply of 5V is given to the Sensor. Interfacing the sensor with the microcontroller is simple and easy. Detection of objects at long range GP2Y0A02YK0F IR sensor is used. The range of this sensor is 15cm to 150cm. In real life it can detect object at distance up to 5 feet.

Figure.2. IR sensor

B. SOFTWARE

i. Raspbian OS

Raspbian is a Debian-based computer operating system for Raspberry Pi. There are several versions of Raspbian including Raspbian Stretch and Raspbian Jessie. It has been officially provided by the Raspberry Pi Foundation as the primary operating system for the family of Raspberry Pi single-board computers. Raspbian was created by Mike Thompson and Peter Green as an independent project. Raspbian is highly optimized for the Raspberry Pi line's low-performance ARM CPUs. Raspbian uses PIXEL, Pi Improved X windows Environment, Lightweight as its main desktop environment as of the latest update. The scripts and files created are run on the Raspbian OS.

ii. Python

Python is a wonderful and powerful programming language that's easy to use (easy to read and write) and with Raspberry Pi lets you connect your project to the real world. Python syntax is very clean, with an emphasis on readability and uses Standard English keywords. The easiest introduction to Python is through IDLE, a Python development environment. Open IDLE from the Desktop or applications menu. IDLE gives you a REPL (Read-Evaluate-Print-Loop) which is a prompt you can enter Python commands in to. As it's a REPL you even get the output of commands printed to the screen without using "print". Two versions of Python are available: Python 2 and Python 3. Python 3 is the newest version and is recommended, however Python 2 is available for legacy applications which do not support Python 3 yet. IDLE also has syntax highlighting built in and some support for auto completion.

III. WORKING

The Raspberry Pi acts as a central processing unit. IR sensor detects for the motion of the vechile during the red signal. The IR sensor is made OFF during the green signal as there is no need for it. The detection of the helment in the two wheeler is done with the help of image processing. General providences of two data sets will be given to the controller. One data set for the classification of two wheeler with helmet and the another data set is for the classification of the two wheeler without helmet. Continuous monitoring of the traffic system is done with the help of the camera. Resolution of the captured image is 720p as we use Logitech camera for image detection.

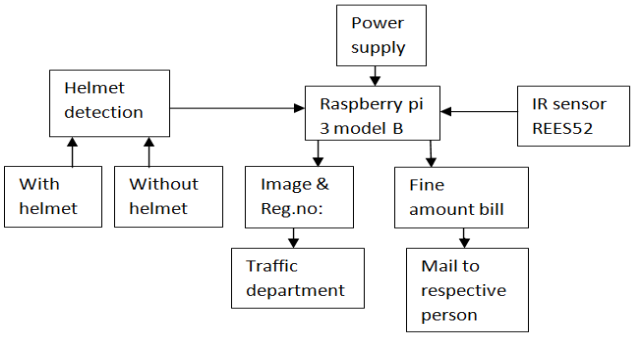

Figure. 3. Block Diagram

IV. RESULT

The vehicle that crossed the zebra crossing during its appropriate red signal and the person who didn't wear the helmet while riding a two wheeler were successfully identified. Also, the image of the respective person and the Reg. no. of their vehicle were successfully captured and the fine amount has been deducted. This project has been demonstrated in our college campus.

V. CONCLUSION

If we are to implement this system in our roads, the accident rate will be reduced drastically. The number of two-wheeler riders that are wearing helmets will be increased and thus, saves lives of many people during accidents. This system completely helps in reducing corruption in the Traffic Police Department.

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