Feasible Real Time Helmet Detection Using Raspberry PI - SLES

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CERTIFICATE

This is to certify that the report titled ***Feasible Real Time Helmet Detection Using Raspberry PI - SLES*** *is a bona fide record of work done by* ***Yash Himmat Kataria (2047235)*** *of CHRIST (Deemed to be University), Bangalore, in partial fulfilment of the requirements of 3 Semester MCA during the year 2021.*

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ABSTRACT

With the ever-increasing population of today's world, the obvious outcome was an increase in the number of vehicles on road. Due to this increase in traffic and the increasing Fuel prices, Two-Wheelers have become the most popular mode of transport. Two-Wheelers have the significant disadvantage of safety, and therefore not surprisingly, the most common road accidents involve motorcycles and maximum cases result in fatal injuries.

To combat this issue, helmets were introduced which have been shown to be extremely effective in saving lives of riders. Witnessing the practicality of helmet, several state governments have made it a punishable offense to ride the bike without a helmet. The technique used to enforce the law includes Police Officers spending a significant proportion of their time spotting riders without helmets, stopping them and issuing them with traffic violation tickets. Besides the obvious time wastage, the incapability of catching each and every violator, and lack of police force, citizens are ignorant of the situation and a significant portion of the population avoid using the helmet. Even though in recent times the government has taken several steps such as increasing the fine amount, having more officers on road and so on, its efforts were futile and its effects only lasted for a short period.

This project is aimed at getting rid of all such disadvantages by automating the entire process and therefore freeing up the time of police officers, reducing traffic issues and ensuring the safety of citizens. The system will an object detection model for classifying riders not wearing helmets. The model once trained is converted to a TensorFlow Lite format to improve overall efficiency and effective cost. The proposed system will automatically detect bike riders not wearing helmets and transfer it to a website where it can be viewed by the law enforcement officers. It uses a Raspberry Pi 4 along with a web camera and processing is done on board and in real time.

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CHAPTER 1: INTRODUCTION

1.1 PROJECT DESCRIPTION

India has the worst road safety standards in the world, a fact repeatedly outlined in World Health Organization reports and backed up by the government's own reports. The NCRB data shows that as many as 43,540 people were killed in accidents involving Two-Wheelers in a single year. More Indians die each and every year in road accidents than the total casualties suffered by India's armed forces in all the wars fought since independence.

Helmets were therefore introduced which have been shown to be extremely effective in saving lives of riders. Seeing the obvious use of the helmet, Governments have made it punishable offense to ride a bike without helmet.

To enforce the Helmet wearing Law, Police Officers spend a significant proportion of their time spotting riders without helmets, stopping them and issuing them with traffic violation tickets. This system obviously has several drawbacks. Besides the obvious time wastage, the incapability of catching each and every violator, and lack of police force, citizens are ignorant of the situation and a significant portion of the population avoid using the helmet. Besides that, catching hold of violators includes the cops usually causing a commotion by coming in between the road to stop the violator. The bikes in turn speed up and narrowly avoid accidents. This in turn causes traffic jams. In recent times the government has taken several steps to implement road such as increasing the fine amount, having more officers on road, having awareness programs and so on. But its efforts were futile and its effects only last for a short period.

The proposed system at its core is basically an automated surveillance system along with a companion android application. The automated surveillance system is made up of a camera and a Raspberry PI 4, which has the necessary computing power to perform object detection and spot Two-Wheeler riders not wearing Helmets and send their images to an online cloud database. The application provides Police officers the ability to verify the violators collected by the object detection system and send them challans using their email or phone number.

1.2 EXISTING SYSTEM

Most existent methods suffer from several problems such as occlusion of objects and varying illumination conditions. They tried to address it by using SVM [14], [15], [16] for classification between bikers and non-bikers and bikers wearing helmets and not, which made localization of occluded objects easier. But for any of that to work efficiently, we need to have good quality features from the bikers to classify accurately which is difficult using HOG [12] or LBP [13] or SIFT [11] on images with less pixels. Also, most of the Deep Learning-based approaches use CNNs but ultimately don't work well real time detection and are computationally expensive.

Limitations of Existing System:

- The proposed systems which do not use specialized hardware usually have low accuracy or work only under certain conditions.
- The systems which use modern machine learning techniques are power hungry and this creates a bottleneck on the feasibility of deploying such systems in large scale.
- Systems which use special hardware have better accuracy, performance and versatility. These systems are not implemented due to increased cost of customized hardware which is not economically possible considering the large-scale requirement.
- Most of the suggested methods also don't work in real time.

1.3 OBJECTIVES

The aim of this project is to develop a surveillance system which is efficient and has very low power usage overall. Its needs a companion application with Easy-to-use interface for Law enforcements officers. It should be a truly feasible system with small budget and energy requirements. It should effectively make law enforcement officers free for better traffic management and flow. It should be easy to maintain and be able to work on solar power thus making it eco-friendly. It should be extensible so that new features can be added eventually.

1.4 PURPOSE, SCOPE AND APPLICABILITY

1.4.1 PURPOSE

The project is built to automate the process of catching violators of traffic laws and enable police officers to verify the violators and send challans to them.

- The system is developed for Traffic law enforcement.
- The system's companion app allows Police officers to register and login into the system thus making them a user.
- The admin has the major authority over all the modules.
- The admin mainly maintains the Police and violators details and can generate or view reports.
- The user can verify the violators.
- The user can send challans to the violators via email or phone.
- The system can be used to monitor the overall violators for a given area.
- Reports related the challans sent and violators verified can be generated when required.

1.4.2 SCOPE

The scope of the project is within the police organization. The limitation here is that the application can only be used by police officers with a valid phone number and email. The project contains 2 parts: a) the surveillance system which is a camera along with the necessary software codded into a Raspberry PI 4. b) The companion application – SLES which is used by the Police to verify violators. Only Police officers who are verified by the app can verify and assign challans to the violators.

1.4.3 APPLICABILITY

The application is applicable to any State or National police of any given country. It is mainly used by Police officers who are the primary users of the application. They will use the application to verify the violators and assign challans. They can also view statistics of the violators for a given location and the challans sent per day for a given location.

1.5 OVERVIEW OF THE REPORT

The report explains in detail the system requirements in which the problem statement, hardware requirements, software requirements and constraints are briefed followed by the system design in Chapter 3 containing architecture, model and database designs. In Chapter 4 the implementation details are included. The various test cases are given in Chapter 5 and finally the conclusion of the project is given along with references.