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Design and Assembly of Tracking System for Helmet

Manisha Vilas Kasbe, Tejal Vilas Kasbe, Swaranjali Dattatray Deshmukh, Asavari Dhananjay Jadhav, Prerna Bhagwan Wankhede

Department of Mechanical, Punyashlok Ahilyadevi Holkar Solapur University, Maharashtra, India

ABSTRACT

A smart helmet is a wearable device that has attracted attention in various fields, especially in applied sciences, where extensive studies have been conducted in the past decade. In this study, the current status and trends of smart helmet research were systematically reviewed. The results showed that the number of smart helmet applications reported in literature has been increasing rapidly since 2018. The applications have focused mostly on ensuring the safety of motorcyclists. A single board-based modular concept unit, such as the Arduino board, and sensor for monitoring human health have been used the most for developing smart helmets. Approximately 85% of smart helmets have been developed to date using wireless communication technology to transmit data obtained from smart helmets to other smart devices or cloud servers. The use of vehicles increases in the proportion of the population.

Due to the traffic congestion, the accidents are also increasing day by day. This causes the loss of life due to the delay in the arrival of ambulances to the accident spot or from the accident spot to the hospital. So, it is necessary to take the accident victim to the hospital as soon as possible. In case of an accident it will send a message through GSM. The distinctive utility of the project is fall detection; if the rider falls down from the bike or got into an accident it sends a message.

I. INTRODUCTION

A. Causes of Accident

Due to employment, the usage of vehicles like cars, bikes have increased, because of this reason the accidents can happen due to over speed. People are going under risk because of their over speed, due to unavailability of advanced techniques, the rate of accidents can't be decreased. To reduce the accident rate in the country this paper introduces a solution. Automatic accident detection and alert systems are introduced. From the survey we can know that in India 4 people die every hour because they do not wear helmets[1]. In 2017, more than 48,746 two-wheeler users died in road accidents and are now increasing day by day. Hence there is a need for a smart helmet system which provides safety and security to the two-wheeler rider.In today's era, especially in the young generation, the craze of motorbikes is really remarkable. As the bikers in our country are increasing, the road mishaps are also increasing day by day, due to which many deaths occur, most of them are caused by the negligence in wearing helmet.

B. Prevention of Accident

We can also notice that many laws and regulations are posed by the government in order to avoid these accidents. Accidents can be defined as the unplanned event or the mistake that may occur resulting in injury and sometimes it also leads to death.

The accidents in case of two wheelers are more compared to other vehicles. This may be avoided by wearing helmets[2][3]So there is a need to make à protection system in a helmet for the safety of bike riders. The smart helmet that is made is fitted with different sensors responsible for detection[4][5]. The smart helmet that is made is fitted with different sensors responsible for detection. There are two main units in this project. Each unit uses a microcontroller.

II. OBJECTIVES

a) To determine location of accident and track through GPS system.
   1) Detecting latitude and longitudinal positions.
   2) To locate vehicle's location and transfer information to monitoring station.

b) To communicate with family members and emergency services.
   1) Emergency warnings are given.
   2) Prevent fatalities and injuries

c) To prepare a smart product which is economical.
   1) Collision detection is possible.
   2) The product is having minimum cost.

III.METHODOLOGY

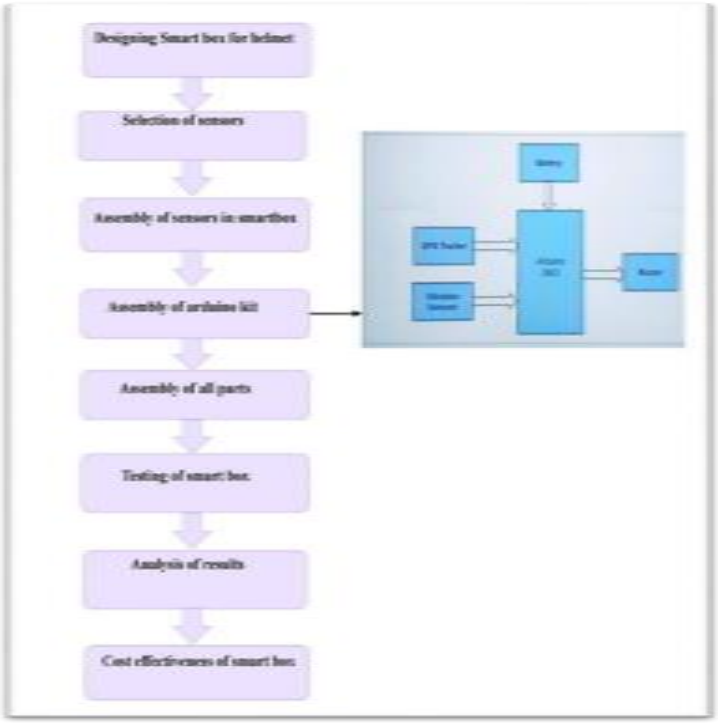

Fig . 1 . Methodology

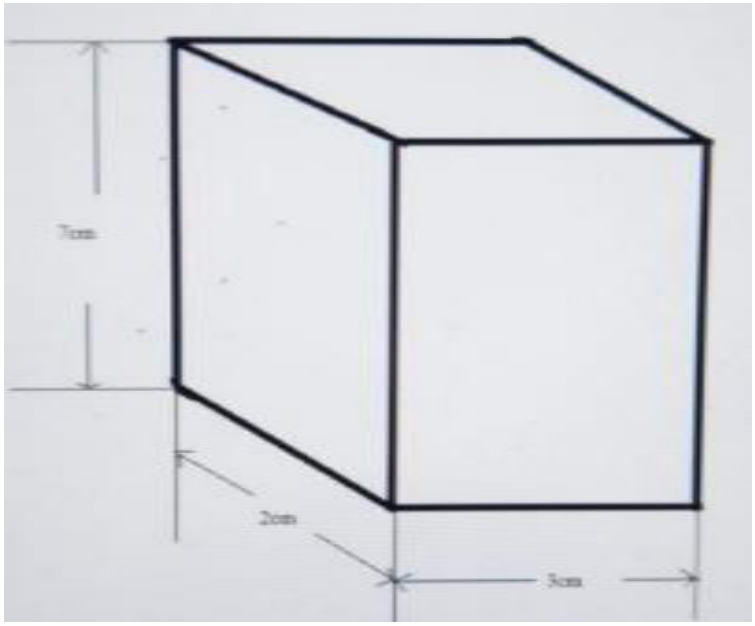

Fig . 2 . Smart Box

A. Smart Box

It is a compact box where we can place the Arduino along with the other connected components. It increases flexibility to the design and also it is safe to use for all the components to fit in it.This is as shown in Fig.

B. Working of smart helmet

The smart helmet is an Automatic vehicle accident detection and messaging system.The accident can be sensed by a vibration system. The solar panels absorb the sunlight radiations and then convert it into electrical energy using photovoltaic effects which are fitted at the outer side of the helmet. This energy is then transferred to the battery which stores this electrical energy and power ups all the components fitted inside the helmet.

The information of crash or accident is then detected via vibration sensors.Using arduino the mobile number can be saved in SIM the messages when the accidents occurs.

Tracking the rider location gets more easy when some accident occurs.The arduino then converts this signal into information which is carried out to the GPS.The GPS then tracks the location and SMS is sent to the registered mobile numbers from the SIM card [6][7].

The buzzer is used to indicate that the battery is charged or discharged and also acts as a system to detect and transfer signals from the arduino.

IV. RESULTS

We have done autocad drawing on AutoCad software with proper fitting of all the components with required Dimensionsa

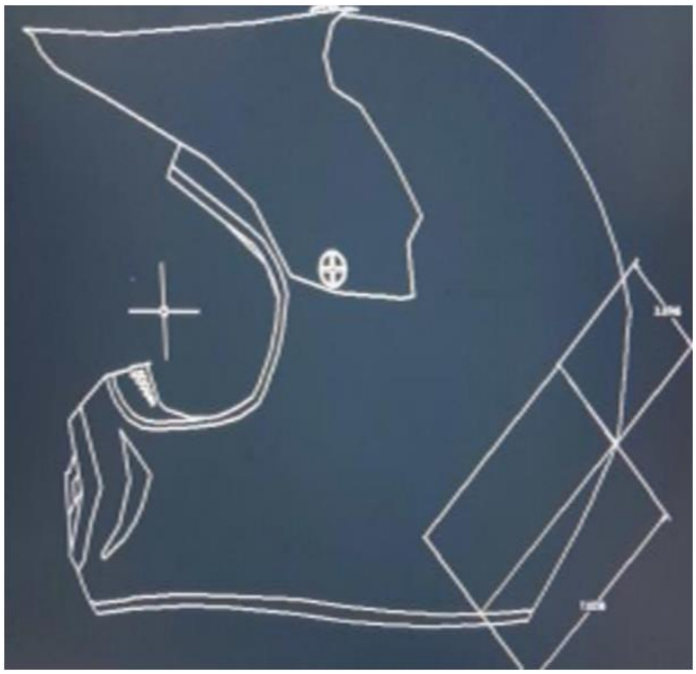

Fig . 3 . Smart Box inside helmet

A. Vibration Sensors

This is SW-420 NC Type Vibration Sensor Module Vibration Switch for Arduino When the module is not vibrating, the vibration switch has been set to low output state output, the green indicator light is closed [8].The product vibrates, vibration switches momentary disconnect, output high drove, the green light does not light up [9].

Fig. 4 . Vibration Sensors

B. Passive buzzer

It can produce a range of sound tones depending on the input frequency, i.e it can generate tones between 1.5 to 2.5 kHz by switching it on and off at different frequencies either using delays or PWM.

C. Battery

This is a NiMH rechargeable battery of capacity 700 Milliamp Hours of 1.5V 1000 Milliamp Hours.Its main function is to supply power to all the components including arduino,hence they will work properly [10][11].

Fig. 5. Battery

D. GSM MODULE

GSM is a global system for mobile communication and is used to send messages to pre-programmed numbers. The modulation technique used is GSMK. The protocol used by the GSM modem for setup and control is based on the Hayes AT-Command set. AT is the abbreviation of Attention. GMAT commands are extension commands.

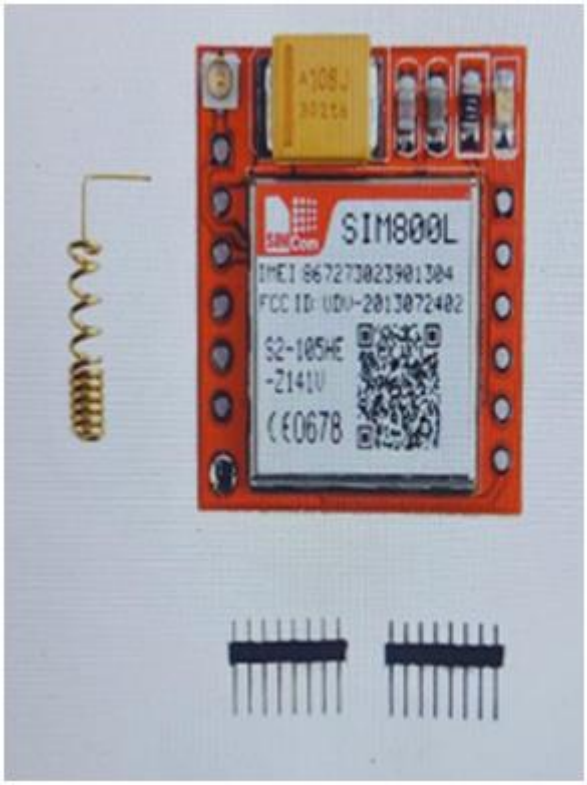

Fig .6 .GSM Module

V. LITERATURE REVIEW

1) B. Choi et al.[1] has used the wearable sensing devices (e.g.GPS and physiological sensors) can open a new door toward occupational safety and health management in physically demanding and hazardous construction (e.g., tracking worker's locations in dangerous working areas and monitoring of worker's physiological status).

2) Wright & Keith[2] have integrated electronics and computers into clothing and other accessories that can be worn comfortably on the body. wearable devices include glasses, watches, headbands, and jewelry have the largest impact in the areas of health, medicine, and fitness. Librarians are also exploring wearable technology's potential for enhancing services and expanding outreach to their organizations.
3) C. Wang et al.[3] have discovered that Stair falls on construction sites are leading causes of fatal injuries, and the dangers for workers are greater because they usually carry heavy loads. The purpose of this study was to detect near fall incidence during stair descent and analyze the changes in terms of classifying the weight-shifting patterns in the head and the feet during stair descent and also helpful in detecting near falls of workers on construction sites.
4) M. V. A. Patel et al.[4] have used a Proper Switch Mounted in helmet the two-wheeler would not start without helmet so safety of rider is assured and if accident has occurred our system will give information to the ambulance about the accident, so they can take certain measures to save the life of the person who meet with an accident.This is done by using GPS and GSM module.
5) Muthiah & Sathiendran[5] have used Intelligent Safety Helmet for motorcyclists to increase the rate of road safety among motorcyclists.Here, we focus on intelligent headlamps that react according to the rider's facial movement. It makes use of an accelerometer and other sensors to direct small electric motors built into the headlight casing to turn the headlights accordingly.
6) P. Ahuja K. Bhavsar[6] developed a thought proposed model that comes from social responsibility towards the society. Lack of immediate First Aid and Emergency medical services during accidents are the prime cause of death in the majority of cases of accidents. This thought of taking responsibility for society resulted in our proposed model “Microcontroller based smart helmet using GSM & GPRS”.
7) T. Eldemerdash et al.[7] developed a accident detection system that communicates the accelerometer values to the processor which continuously monitors for variations. When an accident occurs, the related details are sent to the emergency contacts by utilizing a cloud based service. The vehicle location is obtained by making use of the global positioning system. The system promises a reliable and quick delivery of information relating to the accident in real time.
8) P. Parameshwari et al.[8] said that in developing nation like India, with advancement in the transportation technology and rise in the total number of vehicles, road accidents increases rapidly.So the microcontroller controls the function of relay and thus the ignition. The system also enables detection of an accident at any place and reports about the accident to predefined numbers with the GSM module.
9) J. R. Biswas et al.[9] have proposed a solution to minimize the after effects of a motorcycle accident and also try to create a culture of helping someone in need anonymously. The Raspberry Pi detects accidents and its intensity.The alert generated contains the helmet’s owner’s name, location of accident and region-wise intensity of force measure for analytics. The alert is sent within 20 seconds, so if a person is conscious, the alert can be stopped using a PIN number.
10) A.R. Budiman et al.[10] said that the role of a helmet as a head protector must be worn by motorcycle riders and make sure the strap is perfectly locked. So from the test's results, the smart helmet system in this study has an average response time of 1.4 seconds in the helmet use and strap lock detection system and 0.3 seconds in speed and shock detection system. In addition, the average difference of speed calculation between smart helmets and GPS is 3.3 km/hour.
11) A. Suman et al.[11] have an aim that to propose a cost effective and user-friendly protection system for the rider's safety as accidents are a major problem in today's scenario. So the aim of this work is to

propose a cost effective and user-friendly protection system for the rider's safety. Its main objective is to reduce injuries caused to riders of two wheelers during road accidents and provide swift delivery of help and medical care.

VI. CONCLUSIONS

Nowadays, most cases of accidents are caused by motorbikes. The severity of those accidents is increased because of the absence of helmets or by the usage of alcoholic drinks. In our project, we have a tendency to develop an electronic intelligent helmet system that efficiently checks the wearing of helmets and drunken driving. By implementing this system a safe 2-wheeler journey is possible which would decrease the head injuries throughout accidents caused by the absence of a helmet and additionally reduce the accident rate due to drunken driving.

The designed system is highly useful to avoid accidents which happen around the night time. It provides more than 70% safety for two-wheelers. It is a fact that the implementation of the system will increase the cost of vehicles but it is better to have some percent safety rather than having no percentage of safety. This system could be further enhanced with future technologies to provide further safety and security to vehicle systems.

So based on this research we can conclude that safety of the rider is ensured as a protection and as a emergency system after the accident.

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