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SMART HELMET USINGWEARABLE TECHNOLOGY

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ABSTRACT

All over the world, there are many instances of bike accidents are visible round us. Many people get injured in road accident more frequently because of the main reason not wearing a helmet or not wearing an ISI certified helmets. And the other reason is violating the rules and regulation formed by the government. In accidents people not wearing helmet usually get an injury on head or face, which may even lead to the death of the person. Keeping in mind all these problems, a smart helmet is designed which has its own control system inbuilt inside the helmet. The smart helmet designed by us could help the motorcyclist to reduce the injuries to head and face. The system consists of a control unit Raspberrypi microcontroller which is responsible for guiding the sensors, display, and camera connected to it. Sensors used are alcohol sensor which is responsible for checking the alcohol content of the rider. Gyroscope sensor is used to guide the riding during left and right turn by indicating using led indicators. A proximity sensor is used to detect whether the motorcyclist is wearing the helmet or not. Picamera is attached to the backside of the helmet; the camera captures the images and displays it on head-up display screen fitted inside the helmet. The supply of raspberry pi is the power regenerated from the conventional source of energy that is solar panels fixed at the top of the helmet.

Keywords:*Accident detection, Conventional source of energy, Helmet, Raspberrypi, Smart system, Sensors*

I. INTRODUCTION

According to World Health Organisation survey nearly 1.3 million humans die every year throughout the globe due to road accidents and around 30-40 million people suffer non-fatal injuries leading to disabilities of their body parts.

India is developing country were motorcycle is the most convenient way of road transportation because of it's low-cost, low fuel consumption, easily affordable and travel faster in less possible time. But on the other side people in metropolitans cities and urban areas people need to spend less time in travel, so they need to travel faster which may lead to accidents and are more prone to motorcycle crashes. In road accidents, head and face are most commonly found causes of death. Age group of 16-28 years is more prone to accidents and the leading cause of death.

The government of India has made use of helmet mandatory for every citizen of India. Wearing ISI certified helmet can reduce the injuries to head and face. Many rules and regulations have been proposed by the government of India to prevent road accidents and proper implementation of rules.So to prevent these types of alarming incidents /accidents we have designed a helmet which will provide solutions for all the above mention problems.

The helmet consists of proximity sensor which used to discover whether the rider is sporting the helmet or not. When sensor comes in contact with any non-metallic object such as human head the proximity sensor detects the object and the whole system is switched ON. The helmet includes alcohol sensor that is used to stumble on the share of alcohol consumption of the rider wearing the helmet. If the system founds that is rider is drunken then the whole system is switched OFF. We have also used gyroscope which acts as an indicator in the course of left and right turns while riding a bike. The whole system is under the control and coordination of Raspberry Pi microcontroller. The Raspberrypi is attached to a digital camera which is used to seize the pictures from the backend of the helmet and display on the screen which will help the rider to know about the vehicles approaching behind him.

The next section consists of the literature survey and the related works on the smart helmet and it's advantages. The survey consists of different approaches to improve the helmet and make it even smarter and also different proposed works in helmets. The third section consists of working principle of the helmet, the methodology behind the helmet and different types of sensors with the working model explanation. Forth section represents the result of the working model of the helmet. The Fifth section explains the conclusion and future works that can be adopted to improve the helmet. The last section is the Reference section from the Reference as being considered for writing this paper.

II.RELATED WORK

In literature survey, there are several smart helmet systems but with a different proposed solution and different approach.

SayanTapadar [1] has proposed a Bluetooth enabled smart helmet and detection of accidents and alcohol consumption of the user wearing the helmet. The sensors used right here are impact sensor, flex sensor, accelerometer (ADXL355) and breathe analyzer (MQ3). The accelerometer sensor senses the changes within the X, Y and Z axis and sends the sensed data to online software programming interface via the server. The breath analyzer senses the amount of alcohol present in the breath of the user wearing the helmet. The records sensed from the sensors are used to train the aid vector machine (SVM). The helmet additionally has a characteristic in order that it may connect to the smart phones through Bluetooth and communicate with online software programming interface with the net connection.

Sudhir Rap Rupanagudi [2] has presented a novel methodology, which helps in monitoring the real-time traffic scenario behind the motorcycle driver and also the intimation system to inform him about the same. In this

system, they have given highest priority during the motorcycle turning and is most highlighted. They used MATLAB 2011b for developing and design of the algorithm and Spartan 3E FPGA is used to assist in the simulation of the real-time environment. The helmet is mounted with a camera which will capture the behind the motorcycle driver and helps the algorithm to detect traffic behind the driver.

G. Sasikala [3] has proposed a system to create awareness in society to use the helmet and help people to lead to safety. It implements RF communication-based helmet detection systems. The system consists of two modules transmitter and receiver module. The transmitter module is attached to the helmet and receiver module is attached to the motorcycle. The transmitter module consists of a switch, HT12E encoder IC, 23RD transmitter module. The receiver module consists of RF receiver, HT12D decoder IC, 8051 microcontroller, input switches and relay switch.

AmitavaDas [4] the paper presents a new intelligent helmet which ensures that the bike will only start when the rider wears the helmet. Led indicator is used to demonstrate the working of the model. When the rider wears the helmet the trigger in the helmet is activated which in turn switches the relay of the bike ignition circuit. The helmet uses a simple cable replacement for wirelessly switching a bike so that the motorcycle begins with both key and the helmet.

Durga k Prasad Gudavalli [5] has proposed a system which provides safety and security for bike riders. The system has two modules one is Security Engine System and the other is Safety Engine System. The first system has an RFID reader and two RFID tags. When the RFID reader identifies the unique RFID tag this mechanism is used to ON and OFF of the bike. The second module SES is attached inside the helmet when the rider wears the helmet some quantity of strain is applied on the system and the bike starts and if no pressure is sensed then the system is in OFF state.

III. BACKGROUND

Table1 gives the details regarding the number of death occurred due to road accidents in the year 2016 and 2017. The highest number of persons killed in road accidents is more in the year 2016 than compared to 2017. In India Tamil Nadu has recorded the highest death (16,157) in the year 2017 than compared to other states. In a year more than 4,80,652 accidents have been recorded in that 1,50,785 died due to road accidents.

Table1:Total number of Road Accidents in India

State	Persons killed (2016)	Persons killed (2017)	Percentage change
Punjab	5,077	4,278	-15.7
West Bengal	6,944	5,953	-14.3
Gujarat	8,136	7,289	-10.4
Telangana	7,219	6,595	-8.6
Tamil Nadu	17,218	16,157	-6.2
Bihar	4,901	5,429	+10.8
Odisha	4,463	4,790	+7.3
Chhattisgarh	3,908	4,107	+5.1
Uttar Pradesh	19,320	20,142	+4.3
National*	1,50,935	1,46,377	-3.0

Every day a total of 1,317 accidents occur in which 413 people die. In an Hour a total number of accidents are 55 and 17 people die every hour.

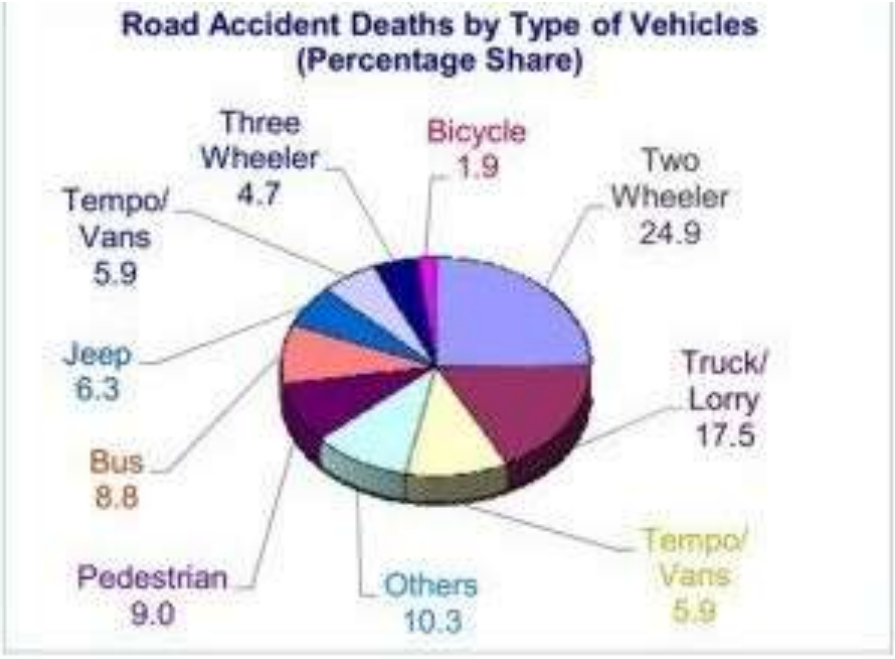

Fig.1:Pie chart gives road accident death by different types of vehicles

Figure 1 gives the detailed information road accidents caused by different types of vehicles with the percentage. A total percent of 24.9 people die due to two-wheeler accidents, 17.5 percent is due to truck/lorry, 1.9 percent is due to bicycle, 4.7 percent is of three wheeler accidents. 5.9 percent is due to tempo/vans. The highest number of deaths caused by road accidents is due to a two-wheeler.

The reports found out that 34.6 percentage deaths occur on national highways, whilst 27.8 percent deaths came about on state highways, even as 37.6 accident deaths occurred on other roads. The foremost purpose of accidents delivered in addition, that speeding is the most important purpose of loss of life, usage of mobile

phones while using a -wheeler and no longer sporting a helmet which is life-saving component while riding a bike.

IV.EXPERIMENTAL SETUP

A proximity sensor is used to check the usage of helmet i.e. if the helmet is being used by the customer if proximity sensor gives the output when the feedback is then given to the raspberry pi zero which turns on the other sensors which are required for the helmet. Once the helmet is worn then comes the critical check for a user which could help him save the life i.e. Alcohol sensor is given the task of verifying that user hasn't consumed alcohol if alcohol content in the breathe is above certain level the bike is switched off and user will be warned of injury for life, then the raspberry pi 3 is switched on which provides the feed of backside of bike in 3.5inch RPi display which could even be used for live feed on YouTube if user wishes to do so. The main feature of helmet is that it is independent and can directly operate without any connection between bike and helmet, as we are using gyroscope sensor MPU6050 which give angle of orientation when a user makes a turn which is used to switch on led indicators situated at the back of helmet depending on direction of turn the user takes and it even be used for stop signalling by measuring de-acceleration of bike given by the same sensor. Solar panels are used to get power from helmet whenever sunshine is available and store in battery which could be used to power up pi and other sensors.

Components used in steps of usage:

1. Proximity sensor
2. Raspberry pi zero
3. Alcohol sensor
4. Raspberry pi 3b
5. Pi display
6. Pi camera
7. gyro-scope
8. Solar panel

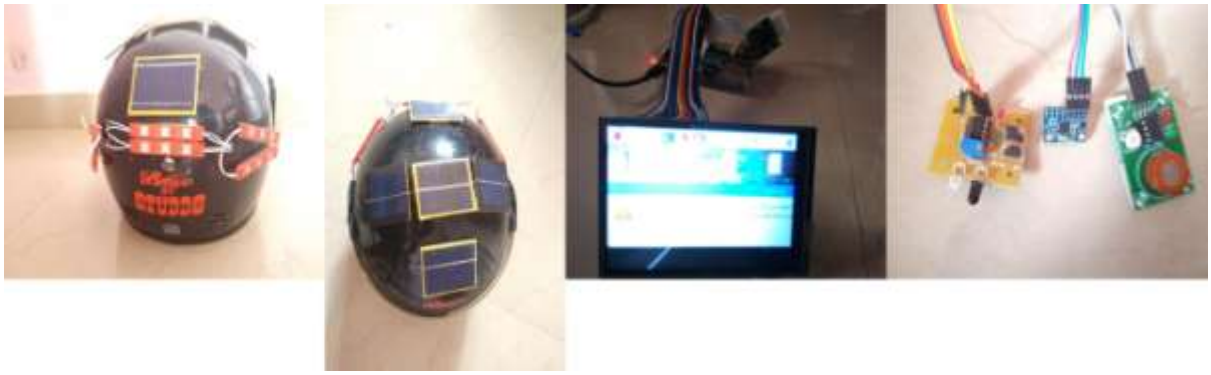

Fig.2: Experimental setup of all components and sensors shown.

Figure 2 shows the experimental setup of the smart helmet with display, solar panels, and all the three sensors attached to it.

V. RESULT

Fig.3: Shows the real time working of the helmet

On observation and usage of helmet in real life scenario we obtained the required performance up to standards which we expected and only issue we found was that the camera we used have a delay in processing the image which could be cope up with help of overclocked raspberry pi instead of normal processing speed of pi which increased performance of Raspberry-pi exponentially in all the scenario.

VI.CONCLUSION AND FUTURE WORK

Smart helmet guarantees the protection of the motorcyclist, with the aid of checking whether or not the rider is carrying the helmet. It also ensures that rider is under the influence of alcohol or not. If he has consumed alcohol the machine will alert the rider. The system additionally helps the motorcyclist to understand the motors approaching behind him. The smart helmet ensures the general safety of the rider so that he can reach his favoured area without any damage to his life. As we have support for the solar panel with the helmet its completely service free. One can live stream the feed from camera to YouTube with having proper speed of internet connectivity.

In future, we will improve the helmet and make even smarter via implementing GPS gadget, which may be used to track the area of the coincidence and address the nearest sanatorium to be had for the assist. We also can use photo processing with camera function for you to alert the rider about the velocity of the vehicle behind him. In addition to this, the helmet must additionally notify the rider approximately the no parking regions.

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