A Review on Smart Two-Wheeler Helmet with Safety System Using Internet of Things

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Abstract

At the present time, the number of accidents has enlarged speedily and in country like India per day there are about 204 accidents occurred. Accidents of two-wheeler compose a foremost segment of every accident and it can be true for the reason that two-wheelers like bikes not able to produce as many as security measurements normally incorporated in cars, truks and bus etc. General main rootcost of the two-wheeler accidents happen only when people community not remember to wearing a device helmet and during the driving time feels like sleep condition, alcohol disbursement, many of the drivers doesn't know heavy vehicles like Loory and buses approaching into very closer to their two wheelers, contravention of two wheelers in traffic rules and regulations. Let's overcome the above situations; our important objective is to develop an intelligent system device that can successfully facilitate in avoidance of every kind of problems. Suppose any of the above stated situations occurs, at that moment how system device identify and represents the commanders and community, and finally the stated situation be able to taken care of straight away without any further delay. A smart intelligent helmet system is a defending head covering used by rider for making bike riding safer than earlier. This is finished by incorporating sophisticated features like detecting the usage of helmet by the rider, connected Bluetooth module in helmet. In order to maintain the temperature inside the helmet device we need to include CPU fan module inside the device. RF based helmet prevents road accidents and identify whether people community is not using a component helmet or used. Main responsibility of the system is to detect accidents by vibration sensors, accelerometers and also with the help of modules global positioning system and global system for mobile commnicaiton module. A wireless communication device used to discover the accident area site location and likewise notifying the two-wheeler drived people's relatives and short message text information passed to the positioned hospitals.

Keywords:
Two-Wheeler, Smart Helmet, RF, GPS and GSM, Internet of Things.

1. Introduction

The two major important area of day to day life is safety and security. At the moment the circumstance that we come across in many cases of two-wheeler road accidents leads to human deaths and rigorous injuries to community. The enlarged usage of two wheels has led to augmented confusion on the roads. This kind of augmented confusion has led to many accidents. As per World health organization global status report taken from almost all the countries, that illustrate the global wide road accidents death about 1.25 million per year. The report also clearly indicates low-income countries affected badly, because of the maximum road traffic fatality. This artifact always speaks an assortment of strategy and a variety of methodgies normally used to help in removing two-wheeler accidents and representing them without delay to stay away from safety measures. The major target of the system is to make sure safety and security of the two-wheeler community in road accidents. Based on the report illustrated by NCAER, the population of second-class community in our country India is 267 million. Such second-class community people not able to buy a car like a four-wheeler because of their very poor income resources. We basically know that Four-wheeler Company always provides many parameters resembling the secure and protection of the motorist like Airbags and seat belts etc, but unfortunately in two wheelers, we need to use exterior component like helmet as an added device of safety measures. Two-wheeler accidents could take place because of youngsters with age limit between thirteen to twenty years and this particular high speed performance period of youngsters   drives their two wheels with extremely uncontrolled and irritation driving. In India, breaking the traffic rules and laws by the community also greater than before over the history of 10 years. Recent days the Internet of Things (IoT) is play the vital role and the interconnection of exclusively particular embedded computing devices. This kind of technique, indicate a number of advantages like high performance, user friendly etc. Data communication as well as voice wirelessed communication especially make the most of the electromagnetic wave communication for several decades. We know that signal of radio frequency is always compared with wavelength, and both are related to proportianl interms of inverse. Here we choose the frequency that is between 30 kilohertz to 300 GHz as the oscillation rate and otherthan that we have a quantity of free frequency bands used in the field of applications like remote controlling component and in general most eye-catching frequency band is 434 MHz. From the report ninety percent of the two-wheeler community died in accidents illustrated by the organization of Online National Electronic and Injury Surveillance System, and only ten percentages of peoples secured and

retain their lifes with the help of wearing the two-wheeler helmet device. This can be projected to sensible these issues and by ensue that during his/her driving at all the time two wheeler community use their helmet.

2. Device objectives

- To gain knowledge and comprehend of operational standard of different type sensors and methodologies that assist constructing the device for secure two-wheeler rides. A variety of sensors like accelerometer and alcohol identifying sensor, pressure calculation sensor, vibration indicator sensor etc. can be helped to develop the intelligent device.
- To analyze and design a intelligent method for the safety of the two wheeler driver.
- To identify whether the two-wheeler rider is wearing the helmet or not wearing the helmet.
- To confirm whether two-wheeler rider has consumed alcohol or not consumed.
- To update text information to hospitals in case of accidents.

3. Literature review

Special approaches and lot of different technologies were analysed in the route of literature survey. StamosKatsigiannis, Rhys Willis &NaeemRamzan (2019) describe a virtual reality system that mainly focued on a smart exercise two-wheeler bike. They use computer for the purpose of signal transmission from a motionless exercise two wheelers and submerge the bikers to virtual situation with the help of head mounted device display. They also explained the outcome and correspondence between sickness of simulators and quality representation of the system. Sayanee Nanda, Harshada Joshi &SmitaKhairnar (2018) mainly focus on two-wheeler accident avoiding and identification using internet of things based smart device. They indicate that accidents of two-wheeler compose a foremost segment of every accident and it can be true for the reason that two-wheelers like bikes not able to produce as many as security measurements normally incorporated in cars, truks and bus etc. In this projected mechanism of radio frequency identification tag verify the ten users so that others not abel to start the two-wheeler because of this reason possibilities of theft almost not happened. Divyasudha N, Arulmozhivarman P &Rajkumar E (2019) described the emergent smart helmet device with modern trends was analysed and studied. They also explained this intelligent helmet system prevent harmful dealing with the mining for secure the employees of the mining factory and also Internet of Things express the addresses for avoiding

collisions when rear huge trucks and buses very close the motor bike.

Jesudoss A, Vybhavi R &Anusha B (2019) present a Design of Smart Helmet for Accident Avoidance system. They uses the infrared sensors for the verification of wearing helmet and also gas identification sensor identify the consumtion of alcohol with help of breath of the two wheeler riders. Durga K Prasad Gudavalli, Bh.Sudha Rani &C.Vidyasagar (2017) describe the Helmet Operated Smart E-Bike. They represent a good solution for two wheelers by two ways, first one dealing with ignition switch lock based security and second one dealing with two wheeler engine safety system with reder and tags using RFID so the overall system creates the society with accident free place. RashmiVashisth et al (2017) describe the investigation and construction of Smart Helmet device. They represent different outlook with synchronization of sections like helmet and two-wheeler bike and also control the speed of two-wheeler riders by using the piezo electric buzzer based speed detection and inorder to increase the visibiltity fog sensor used. Shikha Gupta et al (2019) propose the smart helmet device using the construction of alcohol and crash identification by special sensors. They also aimed to provide stability control for two wheelers by means of electronic devices and the overall system uses a microcontroller ATMega332u4 and modules GSM and GPS provide a secure two-wheeler travel. The new noval accident identification using Internet of Things system proposed by Md. AtiqurRahman, S.M Ahsanuzzaman&IshmanRahman (2020). They explained the purpose of automobile and motorcycle is the one type of automobile which is highly used as well as most unsafe for human community and this was constructed by relay, Bluetooth and 3-axis accelerometer which senses the strike or collapse. ApoorvaSaumya et al (2020) has been describe the concern by Machine Learning based Surveillance System for Detection of Bike Riders without Helmet and Triple Rides. They also explain the important model YOLO which is always unfailing method to differentiate with helmet or without helmet of the rider and also identify the two wheeler members using binary image based on vertical projection.

Driver's safety is the most important factor which is done by smart biking system with the help of sensor and microcontroller was designed by S. J. Swathi, Shubham Raj &D.Devaraj (2019). They describe a concept based on authenticate password of the two wheeler riders so others rider not able to sart the motor cycle because of the password technique this system more suitable for safer and reduce the accident rate. Megha H.N &R.H.Goudar (2017) present a Next Generation Intelligent Traffic Management System and analysis for Smart Cities. They describe effective control system for traffic with use of surveillance video. The application analyse the data of image/video footage which can locate individuals who are disrupting the

activity rules. A framework is proposed called intelligent traffic management system for the way diversion in one or the other way represents the congestion of traffic and discovers general population who are breaking the rules and regulations of traffic. The new novel Real Time Automatic Detection of Motorcyclists With and Without a Safety Helmet proposed by Valanukonda Lakshmi Padmini, G. Krishna Kishore &PonnuruDurgamalleswarao (2020). They propose a investigate method work called OpenCV library it helps the traffic policeman by traffic observation footage in real time. They also explained the linearSVC machine learing algorithm and it helps to traffic official for observing the safety helmet monitor and produces very good accuracy of 87.6%. DangetiAnuPreetham et al (2017) was describing the safety for motorcycle riders using advanced RISC architecture based smart helmet. They also explained the further safety and security obtained by support vector mechines face detection algorithm and also uses 8-bit microcontroller connected with personal computer for detection purpose.

Smart and Assistive Driving Headgear was designed by SreehariKarthikeyan et al (2018). They developed unique headgear to improve the protection of the two-wheeler rider and this unique headgear always placed in heads and doing some special functions for example essential notifications of call and navigations. Motorcycles used by our country India is approximately 3 crore 70 lakhs which is very high compared to other automobiles so that percentage rate of accident also very high because of safety parameters. To reduce the rate of percentage of accidents Nataraja N et al (2018) propose a smart helmet system for two-wheeler automobiles. Dinesh singh C, Vishnu and Krishna mohan C (2016) describe a traffic monitoring system in smart city by the concept of visual big data analytics. They explained the traffic control concept in real time which in need of very large amont of videos or images to indicate the motorcycle community violating the rules and regulations of traffic. They also develop a structure identifying the motorcycle riders without helmet with the help of visual big data analytics.

4. Device and description

Arduino Uno and Raspberry is the most frequently used microcontroller and microprocessor which requires GSM as well as GPRS for internet connection and to send text message to the rider's relatives and shortest hospital. Detailed description of system used is given below.

4.1 Flow Repersentation

Two-wheeler safety system control flow diagram as shown in figure 1. First and important step in the design process is the person worn helmet r not wearing helmet. Supose the person not wearing helmet the person do not let start the two wheeler engine. This is the initial stage of the design, and the person wear the helmet the system remove the relay from ignition switch. After that the second phase of the design initiated. During the second phase we do two things, first check wether accident has occurred or not and also check the threshold value based on the distance between the two vecihels. In case of any accident has occurred then send message to nearest hospitals as well as riders relatives. While distance is less than the threshold value then alart driver by setting off thebuzzer and alarm.
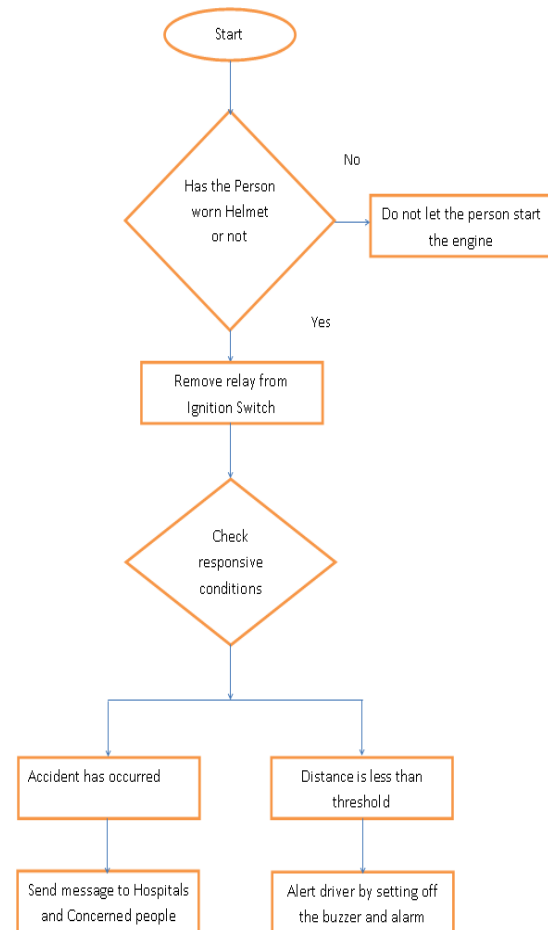

Figure 1. Control flow diagram of generalized safety system

5. Two-wheeler safety system

Block diagram of generalized two-wheeler safety system is shown in figure 2. The projected intelligent smart helmet device constructed with radio frequency transmitter and receiver stages. This radio frequency transmission module uses Amplitude Shift Keying and then this module particularly uses a ardinuo microcontroller that collect the serial input and through the section of RF these signal frequencies transmitted. The radio frequency receiver module positioned at the further end receives the transmitted frequency signals. The data pin of device collects the data in shape of frequency signal from the respective **receiver module.** The collected data established by the receiver module gives better noise immunity because this is for all time in a determined form and finally with the help of microcontroller or decoder used to decode the signals. The projected smart helmet connected with transmitter and then two-wheeler ignition switch constructed with the receiver. During the driving of two wheelers from one palce to other place, we expect the bike automatically bring to a halt in case of driver clears the helmet. Rectifier unit is used to convert the AC voltage into DC voltage and again the regulator is used to provide a constant DC voltage needed for circuits. With the help of pressure calculation sensor and also vibration identification, we are accomplished to become aware of accidents. We use the general positioning system to establish the position of the accident and use of glopal system for mobile communication device to communicate that short text message to the authorized numbers of family member from person's personal phone.
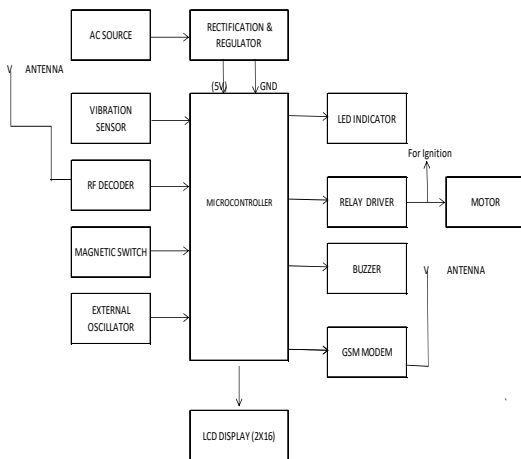

Figure 2. Block diagram of two-wheeler safety system

6. Results and discussion

Nitin Agarwal & Anshul Kumar Singh (2015) describes the statistical data of traffic rules breakers illustrated in table 1. Based on the statistical data set inspection as well as examination, we are in the position to need a intelligent smart system that provide secured safety system primarily constructed with special types of sensors, arudino based microcontrollers, sections of RF etc., compared with conventional system that gives us an superior positin. The designed two-wheeler smart helmet system helps to keep away from accidents by checking a variety of circumstances such as traffic rule brake identification, wearing helmet verification, driving license validity verification, algocal finding of two wheelers and several other factors. Our important objective is to decrease the head based injuires from two-wheeler accidents because of high risk factor for life achived by the proposed smart helmet device implemented smart two-wheeler E-Bike. Safety for two-wheeler engine and ignition switch lock security system is the two key solutions projected in the helmet section as mandatory factor for smart helmet.

Table 1. Statistical data for traffic rules breakers

Traffic Rules breakers	Two Wheeler Rider	Four Wheeler Rider
Traffic signal	2,20,859	1,46,945
Drunken Drive	36,727	17,237

7. CONCLUSION

A detailed go thorough learning on a mixture of different components of helmet circuits is obtainable in an effective manner. The technologies projected under every group has been finished and presented here in a successful manner. In order to figure out, an immense lesson was complete the growth of helmet circuits in all dimensions as well as right through the time, smart helmet system circuits has been evolved. Experiments and new technology components has been proposed and tested. Smart helmet circuit significant information was noted and a smart device that creates talented outcome of the results in prevents accidents by monitoring various conditions. We observed that same information applied on a quantity of cases, various algorithms creates entirely different results. The foremost complexity faced by helmet system is choosing a suitable conceptual algorithm that would superior suit the accident free and lighter version. A uncomplicated readily

obtainable well known Arduino uno nothing but microcontroller always choosed by scientist, educators and researches for use of smart design. The final outcome of the literature is safe and secure travel between source to destination.

Developed smart helmet system is a valuable answer to numerous troubles. Compulsory condition to start a two-wheeler bike was wearing the component helmet and also human being clear head which in turn reducing the probability of road accidents. The proposed smart helmet device maintenance the two-wheeler driver and create safer roads because it acts as a virtual policeman. The device Smart helmet using radio frequency is price valuable and beneficial methodologies. The smart helmet device method ensures the security of the two-wheeler rider by wearing the component of helmet. Adjacent located hospital, road transport officers, and members available in their family are being conveyed regarding two wheeler accidents. Automatic documentation, identification, and statement the accident immediately with very high accuracy has been done with the help of accident detection algortihm.

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