Accident Prevention System Using Smart Helmets with Sensors

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Abstract

In the present scenario, because of development in population and expanding number of vehicles out and about, danger of accidents is high. Thousands lose their lives in vehicle accidents. A significant reason for the fatalities happen because of the fact that either the individual was not wearing a helmet, and he was unable to be admitted to a medical clinic early, or on the grounds that he was riding while alcoholic. So endeavors ought to be made to maintain a strategic distance from accidents and to limit their outcomes. A portion of the reviewed papers identified with smart helmet with driver behavior investigation to be examined in this survey paper. In the new period smart helmet is a special thought which makes motor cycle driving more secure than previous. By concentrating every one of these papers, we get a thought that all the frameworks contain fundamental highlights like auto start with the assistance of helmet wearing status, liquor substance and accident location. Primary target of keen protective cap is to give a methods and contraption to recognizing and revealing accidents. So there is a need to make brilliant smart helmets utilizing IOT.

Keywords: Internet of Things (IoT), Smart Helmet, Sensor, alcohol Sensing;

1. Introduction

Riding a motorcycle gives riders a feeling of freedom on the open roads. Be that as it may, there are not kidding threats engaged with riding without a helmet. A motorcycle doesn't give the basic assurance that a vehicle does to guard drivers in case of a accident. Motorcyclists need to avoid potential risk to secure their body. The most significant spot to begin is by securing the head. The head and mind is generally helpless against injury in a motorcycle accident. Drivers and travelers wearing helmets increment their possibility of endurance altogether over non-helmet wearers. In 2012, the National Highway Traffic Safety Administration assessed 1,699 lives were spared in light of the fact that people wore helmets. From 2008 to 2010, there were 14,283 motorcyclist fatalities in the United States, and 6,057 (42%) of the individuals who passed on were not wearing helmets.

It is significant for motorcyclists to comprehend the dangers of riding without a helmet. Riders who don't wear helmets are in danger of enduring an awful mind injury on the off chance that they are in a accident.

Without insurance, the head is powerless against a horrible effect in a accident in any event, when going at low speeds.

Every year almost 1.2 million individuals pass on because of road accidents, and millions more are harmed or impaired (1). In some low-salary and center pay nations, where cruisers and bikes are basic methods for transport, users of bikes make up a huge extent of those.

Why are head protectors required?

Bike and bike riders are at an expanded danger of being engaged with an accident. This is on the grounds that they frequently share the traffic space with quick moving vehicles, transports and trucks, and furthermore on the grounds that they are less obvious. Likewise, their absence of physical insurance makes them especially powerless against being harmed in the event that they are associated with a crash.

Head wounds are a main source of death and inability

Wounds to the head and neck are the primary driver of death, extreme injury and handicap among clients of cruisers and bikes. In European nations, head wounds add to around 75% of passings among mechanized bike users; in a few low-pay and center pay nations head wounds are assessed to represent up to 88% of such fatalities (6). The social expenses of head wounds for survivors, their families and networks are high, to a limited extent since they often require specific or long haul care. Head wounds likewise bring about a lot higher clinical expenses than

some other sort of injury (9), with the end goal that these wounds apply a high cost for a nation's medical services expenses and its economy.
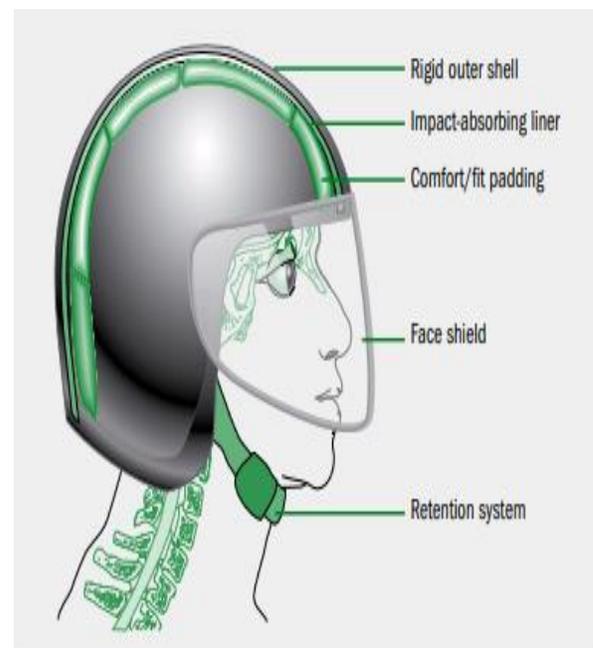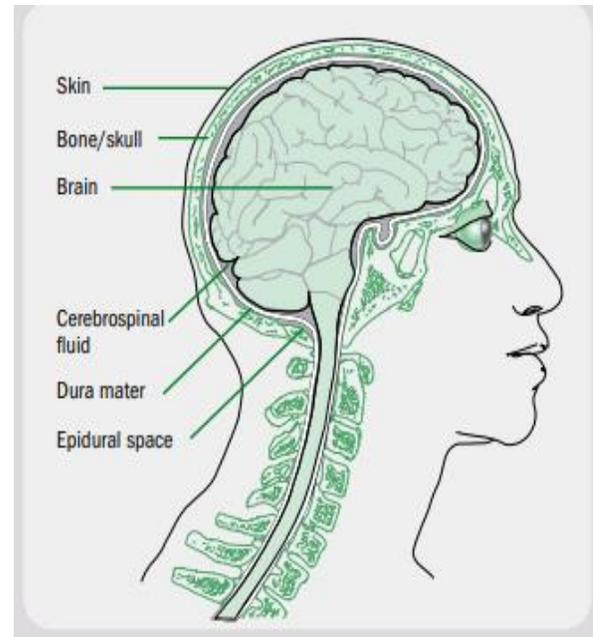
All around the world, there is an upward pattern in the number and utilization of bikes and bikes, both for transport and recreational purposes. In reality, the greater part of the development in the quantity of

vehicles on the world's Roads originates from an expanding utilization of mechanized bikes. Asian nations, specifically, are relied upon to encounter a
more number of bikes on roads than any other nations in the world.
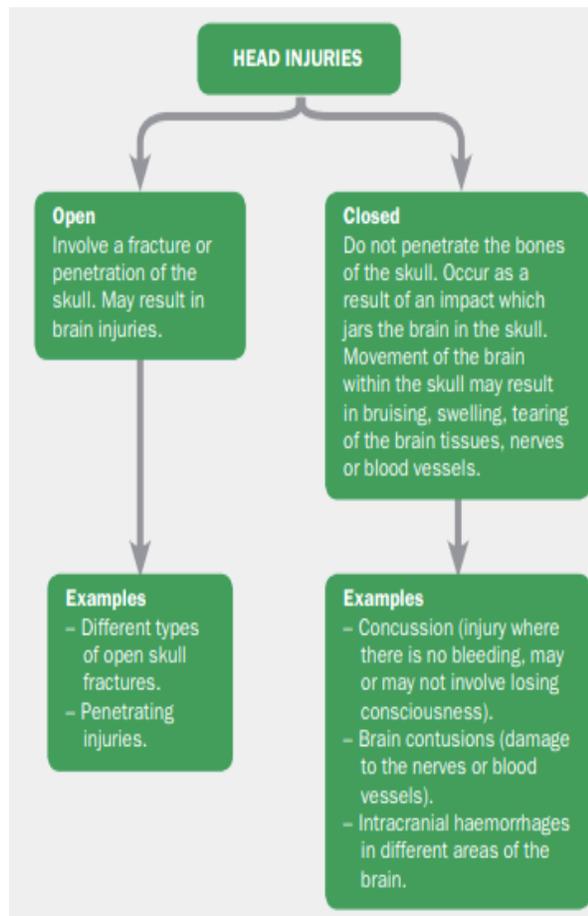
2. Literature Survey

Smart Helmet and Intelligent Bike System

The primary goal of this paper is to construct a good framework which is incorporated with the smart helmet and smart bicycle to diminish the likelihood of bike accidents and smashed drive cases. The flex sensor checks if the individual wearing the cap or not. Liquor sensors distinguish the alcoholic substance in riders' breath. On the off chance that the rider isn't wearing the head protector or then again if there is any liquor content found in rider's breath, the motor cycle stays off. The motor cycle will begin until the rider wears the protective cap and on the off chance that there is no alcoholic substance present. When the rider crashes, smart helmet hits the round, sensors recognize the movement and inclines of helmet what's more, reports the event of a accident. It sends data of the relating area to relatives of the rider and crisis contact number.

Smart Helmet for Accident Detection using Sensors

In the present time, because of development in populace and expanding number of vehicles out and about, danger of accidents is high. Thousands lose their lives in vehicle accidents in light of deferred crisis clinical administrations. In emergency clinic, now and then required blood for certain blood bunches isn't accessible as expected. Consequently, endeavors are made to stay away from them by limiting their outcomes. Our principle thought process is to maintain a strategic distance from the deferral in help after accidents. Keen protective cap is associated with a cell phone by means of Bluetooth. The microcontroller in the shrewd head protector is
used to monitor related data of all boundaries with respect to accidents. Effect sensor is utilized to recognize the vibrations of the effect on the protective cap because of accident and accelerometer distinguishes

abrupt changes in the X, Y what's more, Z tomahawks. At the point when accidents occur, GPS is utilized to distinguish the current area of the rider and with assistance of Bluetooth innovation, related data is shipped off crisis contacts and close by emergency clinic through the android application.

Smart helmet with sensors for accident prevention

The effect when a motorcyclist includes in a rapid accident without wearing a head protector is risky and can cause casualty. Wearing a cap can diminish stun from the effect and may spare a daily existence. There are numerous nations upholding a guideline that requires the bike's rider to wear a protective cap when riding on their bike, Malaysia is a model. With this explanation, this task is exceptionally evolved as to improve the security of the cruiser's rider. Motorcyclist will be frightened when as far as possible is surpassed. A Force Sensing Resistor (FSR) and BLDC Fan are utilized for discovery of the rider's head and recognition of cruiser's speed separately. A 315 MHz Radio Frequency Module as remote connection which ready to impart between transmitter circuit and collector circuit. PIC16F84a is a microcontroller to control the whole segment in the framework. Just when the rider clasped the cap then just the bike's motor will turn over. A LED will streak if the engine speed surpasses 100 km/hour.

**Smart Helmet: Smart Solution for Bike Riders and Alcohol Detection**

An accident is a surprising, strange, unintended outer activity which happens specifically time and spot. Thoughtlessness of the driver is the central point for accident. The administration has made principles that rider should obligatory wear the helmet and not devour liquor and drive. Still the riders don't comply with the principles. These accidents are caused because of carelessness of the rider. Not wearing the helmet causes the rider with head wounds which may prompt passing of the rider. So as to defeat this clever framework, savvy helmet is proposed, it identifies the helmet and furthermore the liquor present in rider's breath. This framework has a couple of transmitter and beneficiary, the transmitter is set in the helmet and the collector is put at the bicycle start. There are various sensors to guarantee the helmet is on the head. These vibration sensors are put in helmet where the likelihood of hitting is more. A liquor sensor is set close to mouth of the rider. The liquor sensor identifies the presence of liquor in rider's breath. The information of the identification of helmet and liquor is coded with RF encoder and afterward sent through radio recurrence transmitter. The beneficiary at the bicycle gets the information and the information is decoded utilizing RF decoder. The consequence of quality of helmet and the liquor identification is examined on the advanced cell. The proposed framework will be intended to the point that in the event that one of the two conditions are abused, at that point likewise the bicycle won't start. The bicycle will begin just if the two conditions are followed. This brilliant helmet will push the rider to necessary wear helmet and

confine drive under the influence condition. MCU controls the capacity of hand-off and the start, it control the motor through a transfer and a hand-off interfacing circuit.

3. Methodology

The smart helmet framework fundamentally comprises of 2 modules; helmet module and the bike module. Helmet contains switches which are associated with a microcontroller unit. Sensors like liquor sensor, speed sensor and a RFID tag are put on the helmet. The bike module comprises of an accelerometer, RF decoder microcontroller unit, hand-off, GPS module and
an IOT framework.

Helmet unit: Two switches are put on the helmet. One of the switch is set on the focal point of the internal surface of the helmet and next one is put on the helmet clasp. It checks the situation of the helmet constantly and send the helmet status to the microcontroller and afterward to the RF transmitter. The switches turned ON just when the rider wearing the helmet on his head appropriately. Subsequently the best possible situation of the helmet guaranteed by these two switches. The liquor sensor utilized in this part detects the liquor substance of the rider's breath. The speed sensor of the bike is recorded by utilizing a Hall Effect sensor. The comparator checks the information put away by the liquor sensor and the speed sensor and offered it to the RF encoder. On the off chance that the rider has a drunkard breath, at that point the bike start turns over in any case motor stays OFF.
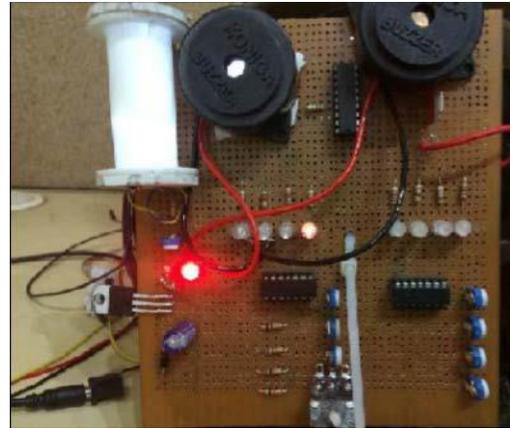
Helmet unit

Bike unit: The fundamental undertaking of this segment is to get the helmet position information by the bike unit through a RF collector also, send information to the microcontroller on the bike unit. At the point when the sent sign from helmet unit is gotten by the bike unit, at that point the vehicle start framework will be turned ON. On the off chance that a mishap happens, at that point the tilt point of the vehicle is estimated by utilizing an accelerometer. The GPS module put in the bike distinguish the vehicle area. The mishap status is ship off predefined people utilizing GSM. Every one of these sensors and boundaries are constrained by utilizing microcontroller and hence sign in to the worker. A WIFI module is introduced in the bike which is utilized for the web association and for detecting all these information through MCU.

For sign in measure, http convention is utilized. Raspberry pi3 module is additionally utilized in this segment. An approved individual can get to the information from anyplace whenever on the planet through web which helps the following of the helmet and rider status. All the information detected by MCU can got to by the traffic specialists and along these lines they can classified and rate the riders utilizing their driving status by utilizing an application. Python language is utilized for fabricate the application. Consequently the traffic authority can caution or screen the riders by utilizing the rider statuses.

Modes of communication

A. GSM
B. VANET
C. WIFI
D. BLUETOOTH
E. RFID
F. ZIGBEE

GSM (Global System for Mobile communication): GSM is worldwide framework for versatile communication which is generally utilized for impart through versatile. GSM utilizes TDMA (Time Division Multiple Access), GSM and CDMA (Code Division Multiple Access).GSM pack the information and digitized. At that point the information send through a channel with other streams. The channel fundamentally utilizes two floods of client information and each have a schedule opening itself. The GSM works at the recurrence band of 900 MHz or 1800 MHz .

The GSM has 4 sections and each parts cooperate with a capacity.

1. Base station subsystem (BSS)
2. Organization exchanging subsystem (NSS)
3. The activity and backing subsystem (OSS)
4. The portable itself

VANET: VANET is Vehicular Ad-hoc Network which is utilized for Vehicle to vehicle communication with various purposes. It is organizing of vehicles which moving at rapid. The fundamental design is that it improves the street security. The VANET presented by utilizing the standards of MANET (Mobile Ad-hoc Network). MANET is a remote network utilized for trading the information to the area of vehicles. VANET is additionally utilized for entomb vehicular communication (IVC). Sensors are fitted in the vehicle. The sensors utilized in the vehicle interface with the sensors of other vehicle or interface with framework. So as to convey between the vehicles, the vehicle in the ground structures an Ad-hoc network.

WIFI (Wireless Fidelity)

WIFI gives network availability by utilizing radio waves. A remote connector is utilized build up an association with make hotspots and the remote switch. It is a world well known remote systems administration innovation utilizes radio wave to give high speed web and organization association and dependent.

Bluetooth: It is a remote communication which can be utilized for sending the information between two gadgets. It is Individual Area Network (PAN) which has a recurrence of 2.45 GHz. Its truly range normally under 10 m (33 ft). Bluetooth can be utilized in PCs, advanced cell, gaming reassures, sound gadgets.

RFID: RFID is Radio Frequency Identification Technology is utilized for observing and distinguishes the items exclusively. RFID can screen the article during moving stage. RFID innovation for the most part utilized rather than bar-coding framework. Utilizing RFID innovation we can undoubtedly distinguish the item. RFID comprise of 2 parts.

1. RFID tag: Tag comprises of a chip and a receiving wire. Chip holds the data about the item and receiving wire .gives the communication between the recipients.

2. RFID per user: It peruses the RFID label subtleties utilizing RFID receiving wire which is worked inside the RFID tag.

ZIGBEE: ZIGBEE is a remote organization used to make an individual region organization (PAN). It is a low force organization essentially utilized for home robotization, traffic the board and little activities with low force and low information rate. The physical scope of ZIGBEE is 10-20 meters. It is easier and more affordable organization. ZIGBEE resembles Bluetooth gadget. It can send information in significant distance utilizing network organization.

The following sensors are used in the smart helmet to reduce the accidents and to protect the rider.

Alcohol Sensor: Alcohol sensor distinguishes the presents of alcohol in breath. This sensor can initiate at a temperature goes from 10 to 50 degree. Force gracefully will be under 150 mv to 5v. This sensor is primarily utilized for traffic police presently days. MQ-6 is one of the renowned sorts of alcohol sensor which is reasonable for breath analyzer. It is utilized to checking the grouping of alcohol in an example and essentially utilized by traffic police.

Corridor Effect sensor: Hall Effect sensor is utilized to quantify the greatness of an attractive field. Yield voltage is legitimately relative to the attractive field. This sensors are utilized for closeness sensing, Positioning, Speed discovery and current sensing application.

Accelerometer: Acceleration forces are estimated by utilizing the accelerometer. It is utilized by numerous cell phones sense development or vibrations. It measure the adjustment in speed or speed separated by time. By utilizing accelerometer, the client can be resolved whether an item is move to tough or whether fall over, or if tit inclines, its fly on a level plane or descending.

Force Sensing Resistor: They are likewise called force touchy resistor and now and then called FSR. It is a material utilized for change the opposition when a force, mechanical pressure or weight applied.

Vibration sensor: Vibration sensor is otherwise called piezoelectric sensors which are adaptable gadgets and it is utilized for estimating purposes. These sensors measure the progressions with speeding up, temperature, force, weight or strain by changes to electrical charge. This sensor estimates amount and capacitance for choosing aromas of air.

Bioelectric sensor: This sensor is utilized for screen the body bioelectric information and it include finger like equal projections considerably. It structures dielectric substrate.

Gravity sensor: The gravity sensor is accustomed to estimating the impact of speeding up in earth's gravity. It is gotten from accelerometer. In the event that a gadget having gravity sensor held up, the gravity pull of earth is same as the gravity increasing speed source. The tilt point of the can be determined by utilizing this sensor. Little body inclines were antiquated gravity sensors and id tie to a wire associated with any gadget.

Temperature sensor: It is a gadget, typically an obstruction temperature identifier. The temperature information of a specific source are gathered and along these lines secret it into reasonable for an eyewitness or a gadget. Temperature sensors having the applications like clinical gadgets, HV and AC framework ecological controls, and substance taking care of and car
in the engine observing and controlling frameworks. Thermometer is the most

ordinarily utilized temperature sensor and is utilized for estimating the temperature of solids, fluids and gases.

Weight sensor: Pressure sensor is utilized for the weight estimation of fluids or gases. It is expressed as far as force per unit territory and is the force needed to preventing a liquid from extending. It goes about as a transducer and produce signal, is electrical. It by implication gauges the factors, for example, speed, height, gas or liquid stream and water level. Weight sensors are otherwise called pressure markers, manometers, pressure transducers, pressure senders, piezometers and weight transmitters. It can fluctuate definitely in execution, plan, and innovation, cost and application appropriateness. For catching rapid changes in pressure, various kinds of weight sensors are planned.

IR sensor: It is an electronic gadget and it recognizes and estimating the infrared radiation of the general climate. William Herschel found this sensor in 1800 and he saw that while estimating the temperature of each tone of light which is isolated by a crystal, the temperature past the red light was most elevated. The frequency of the IR is longer than that of obvious light. It is imperceptible to natural eye. Infrared radiation can be emitted by whatever discharge
heat.

4. **Limitations of Existing System**
Naturally four wheeler segments incorporated various safety features like ABS, Air bag and automated guidance

system over the periods. But in two wheeler segments very little has been done to protect the two wheeler drivers by various manufactures. There were prototypes proposed with more features causing more components to be implanted on the helmet which can lead to add more weight to the helmet and also more cost involved in developing it. There was no discussion on the protection of human head when it exposed to severe accident which results in electronics are being embedded to the human head. There was no prototype available or designed with solar energy as power source to the smart helmet.

5. Proposed Methodology & Design

IoT based Smart Helmet is a cost effective assistive technology to provide security and safety of the biker against road accidents. The proposed IoT based helmet that prevents road accident and detects alcohol consumption and this will be able to track the biker and sends GPS coordinates periodically to pre-defined number. Also, it detects crash and will be able to send notification to the predefined number and also the nearby police station. This system consists of micro controller, position sensor, Alcohol sensor, piezoelectric sensor, RF Transmitter, IOT Modem, GPS receiver, Power supply & Solar panel.

6. Result

The above shown diagram represents proposed architecture of the transmitter using RF communication. Proposed sensors like Alcohol is connected to the 12 GPIO pin of the RPI. Positional sensor pins are connected to the 13,15 and 23 GPIO pins of raspberry-pi. Positional sensor is used to detect the inclination angle with respect to land. Piezo sensor is connected to 7th pi of RPI to detect pressure applied on that object. As usual, GPS transmitter pin is connected to the receiver pin of the RPI for latitude and longitude acquisition. Final decision will be taken by calibrating all sensors outputs in RPI unit. Yielded output will be transferred to receiver kit through RF transmitter using HT12E encoder IC. Encoder is is connected to the 29, 31, 32, 33 pins of RPI.

Fig: Transmitter of proposed technique

Fig: receiver side kit for proposed technique

Above shown figure represents receiver kit of proposed method. Here RF receiver output is connected to the HT12D decoder Receiver. Decoder pin D0 is connected to the shown motor through relay module.

Finally, proposed results shows an efficient implementation of smart helmet system.

7. Conclusion

By reviewing all the papers, we came to know and conclude that the smart helmet system should be very effective and essential for providing safety for the biker. By using the sensors like alcohol sensor, flex sensor, accelerometer, temperature sensor, pressure sensor, IR sensor, gravity sensor, bioelectric sensor, LDR, Speed sensor, force sensing resistor, the smart helmet provide a better security to the rider. The sensors are used along with the microcontrollers such as ZIGBEE, Arduino, PIC microcontroller and also uses the technologies like GSM and GPS in the intelligent smart helmet system. This idea will contribute more secure and safe developing India. Just take one step forward by the society that is wearing the smart helmet while driving the bike.

References

[1]. Intelligent Smart Helmet System: A Review Anjali Baburaj1 , Thasni V.T2 , Reshma N.S3 , Yadhu Krishnan P4 , Deepak K.N International Journal of Advanced Research in Computer and Communication Engineering Vol. 9, Issue 1, January 2020

[2]. Dominik Dorr ¨ 1 , David Grabengiesser2 and Frank Gauterin1 2014,"Online Driving Style Recognition using Fuzzy Logic"- IEEE 17th International Conference on Intelligent Transportation Systems (ITSC) October 8-11, 2014. Qingdao, China.

[3]. Elias C. Eze, Sijing Zhang and Enjie Liu, "Vehicular Ad Hoc Networks (VANETs): Current State, Challenges, Potentials and Way Forward" - Centre for Wireless Research, Institute for Research in Applicable Computing (IRAC), Department of Computer Science and Technology, University of Bedfordshire, Luton, LU1 3JU, England,2014

[4]. Manjesh N,Prof. Sudarshan Raj ,"SMART HELMET USING GSM & GPS TECHNOLOGY FOR ACCIDENT DETECTION AND REPORTING SYSTEM"- International Journal of Electrical and Electronics Research ISSN 2348-6988 Vol. 2, Issue 4, pp: (122-127), Month: October - December 2014, Research Publish Journals.

[5]. Albert Daimary, Meghna Goswami and Ratul Kumar Baruah ."A Low Power Intelligent Helmet System,2017". Department of Electronics & Communication Engineering Tezpur University Tezpur, Assam, India .

[6]. Rashmi Vashisth, Sanchit Gupta, Aditya Jain, Sarthak Gupta, Sahil, Prashant Rana.,"Implementation and analysis of smart helmet"-4th IEEE International Conference on Signal Processing,

Computing and Control (ISPCC 2k17), Sep21-23, 2017, Solan, India.

[7]. Yang Xing, Chen Lv, Member," Identification and Analysis of Driver Postures for In-Vehicle Driving Activities and Secondary Tasks Recognition",- IEEE, Zhaozhong Zhang, Huaji Wang, Xiaoxiang Na, Dongpu Cao , Member, IEEE, Efstathios Velenis, and Fei-Yue Wang, Fellow, IEEE

[8]. Seelam Vasavi Sai Viswanada Prabhu Deva Kumar, Shyam Akashe, Vikram Kumar, "Advanced control of switching ignition using smart helmet"

[9]. Prajitha Prasad,Reshma Mohan Lekshmi Raj,Sreelakshmi, S,Divya R Pillai,"Smart helmet and intelligent bike system:"

[10]. Manish Uniyal;Himanshu Rawat ;Manu Srivastava ;Vivek kumar,"IOT based Smart Helmet System with Data Log System"Srivastava,https://ieeexplore.ieee.org/document/8748790

[11]. International Journal of Innovative Research in Science, Engineering and Technology(A High Impact Factor, Monthly, Peer Reviewed Journal)

[12]. Mr.Serhuram rao,Vishnupriya S.M,Mirnalini Y,Padmapriya RS, "The high security smart helmet using internet of things":

[13]. Chitte P.P., Salunke Akshay S., Thorat Aniruddha, N Bhosale,"Smart Helmet & Intelligent Bike System",- International ResearchJournal of Engineering and Technology (IRJET) Volume: 03 Issue: 05, May-2016.

[14]. Nilesh. M. Verulkar1 , Ankita D. Ravankar2 , Chhaya A. Bharambe3 , Namarata P. Kathale4 ,"Smart Helmet: A review"-Department of Electronics & Telecommunication Engineering, Mauli Group of Institutions, College of Engineering and Technology, Shegaon, Maharashtra.

[15]. Muhammad Qasim Khan and Sukhan Lee ," A Comprehensive Survey of Driving Monitoring and Assistance Systems" Department of Electrical and Computer Engineering, Intelligent Systems Research Institute, Sungkyunkwan University, Suwon 440-746, Korea; qasim@skku.edu

[16]. G. Sasikala , Kiran Padol , Aniket A. Katekar and Surender Dhanasekaran, "Safeguarding of Motorcyclists Through Helmet Recognition", 2015 International Conference on Smart Technologies and Management for Computing, Communication, Controls, Energy and Materials (ICSTM),

[17]. "Konnect : An Internet of Things(IoT) based Smart Helmet for Accident Detection and Notification", Sreenithy Chandran, Sneha Chandrasekar, Edna Elizabeth N Department of Electronics & Communication Engineering Sri Sivasubramaniya Nadar College of Engineering

[18]. Muthiah M1, Aswin Natesh V2, Sathiendran R K3, "Smart Helmets for Automatic Control of Headlamps ",2015 International Conference on Smart Sensors and Systems (IC-SSS)