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An Internet of Things (IoT) based Smart Helmet for Accident Detection and Notification

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Abstract: *The objective of the smart helmet is to detect and report accidents. Various Sensors, Wi-Fi enabled processor, and cloud computing infrastructures are utilised for building of the system. The accident detection system is used to communicate the values of accelerometer to the processor. Then the processor continuously monitors erratic variations. When an accident takes place, all the related details are sent to the emergency contacts. This process is done by utilizing a cloud based service. The location of vehicle is obtained by using the global positioning system. The system is reliable and it does quick delivery of information regarding the accident in real time. It is named as a Connect. Hence, by making use of the ubiquitous connectivity a smart helmet for accident detection is designed.*

Keywords: Accident Detection, Cloud Computing, Hypertext Transfer Protocol, Internet of Things, Sensor, Ubiquitous Sensing.

I. INTRODUCTION

Internet is the most important requirement of today's world. With the help of internet, people can communicate with each other very easily and quickly. We can't say that internet is just connecting people but things can also communicate with other objects. This concept is called as "Internet of Things". In this IoT concept, object has the ability to transfer the data over internet without requiring the human or computer interaction.

Internet of things are currently being used in many fields such as wearable's, home automations, smart appliances, smart agriculture etc where there is a mutual communication between devices and people over a network. The work of the IOT devices is to sense the data and send the data to server by this huge amount of data can be generated. By the generated data we can draw the conclusion by processing and analysing the data obtained. This gives the advantage in real time data reporting from environment. Now a days motorbike accidents are increasing day by day and we can notice numerous loss in lives. We can avoid this by using smart helmet.

Fig. Representation of rate of accidents in two wheeler

From the survey we can know that in India 4 people die every hour because they do not wear helmet. In 2017, more than 48,746 two wheeler user died in road accidents, Incidental 78.3% of them did not wear a helmet. To go through or to solve this, there are two important conditions that should be checked before the bike starts by the smart helmet. First most condition is that we should check whether the rider is using the helmet and not just keeping it. Second to check

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whether the user has consumed alcoholic substance or not by his breath, this can be verified by using sensors. Third if a person meets with an accident, the sensor check the condition of person and bike and send information of location to nearby hospital. If the person has no major injurious then the button is pressed which is present in the bike this indicate that the person condition is good.

The figure gives the picture of rate of accident in two wheelers. The comparison is done between two wheelers, pedestrians, cyclists and the rate of accident is more as represented in graph.

II. PROPOSED SYSTEM

We are developing a smart helmet using the internet of things (IoT) technology, in which we ensure the safety of the bike rider. by avoiding road accidents of the bikers by,

The system detects whether the rider is wearing a helmet or not if he wears then only the vehicle will start.

It detects the amount of alcohol consumed by the rider, if the rider has over drunk, the bike engine will not start.

When the bike rider meets with an accident it detects it and gives the notification to the registered contact with a location.

For the safety of the bike rider, we are using the latest technology IoT, this technology provides the advance techniques for alerting the rider and ensures that rider follows the rules and regulations. For two-wheeler rider, Helmet is the most basic protection device and it is necessary for every bicycle or motorbike riders. But it does not ensure the safety of the rider and the rider won't follow the traffic rules. Most of the people use ordinary helmet just to avoid giving challan to the traffic police, these helmets do not ensure the safety of the driver. So, to overcome these problems we need to use the smart helmet.

III. METHODOLOGY

GPS - Global Positioning System

The Global Positioning System (GPS), originally Navstar GPS, is a satellite-based radio navigation system owned by the United States government and operated by the United States Space Force. It is one of the global navigation satellite systems (GNSS) that provides geolocation and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. Obstacles such as mountains and buildings can block the relatively weak GPS signals. The GPS does not require the user to transmit any data, and it operates independently of any telephonic or internet reception, though these technologies can enhance the usefulness of the GPS positioning information. The GPS provides critical positioning capabilities to military, civil, and commercial users around the world. The United States government created the system, maintains and controls it, and makes it freely accessible to anyone with a GPS receiver.

The GPS project was started by the U.S. Department of Defense in 1973. The first prototype spacecraft was launched in 1978 and the full constellation of 24 satellites became operational in 1993. Originally limited to use by the United States military, civilian use was allowed from the 1980s following an executive order from President Ronald Reagan after the Korean Air Lines Flight 007 incident. Advances in technology and new demands on the existing system have now led to efforts to modernize the GPS and implement the next generation of GPS Block IIIA satellites and the Next Generation Operational Control System (OCX). Announcements from Vice President Al Gore and the Clinton Administration in 1998 initiated these changes, which were authorized by the U.S. Congress in 2000.

During the 1990s, GPS quality was degraded by the United States government in a program called Selective Availability; this was discontinued on May 1, 2000, in accordance with a law signed by President Bill Clinton. The GPS service is controlled by the United States government, which can selectively deny access to the system, as happened to the Indian military in 1999 during the Kargil War, or degrade the service at any time. As a result, several countries have developed or are in the process of setting up other global or regional satellite navigation systems. The Russian Global Navigation Satellite System (GLONASS) was developed contemporaneously with GPS but suffered from incomplete coverage of the globe until the mid-2000s. GLONASS can be added to GPS devices, making more satellites available and enabling positions to be fixed more quickly and accurately, to within two meters (6.6 ft). China's BeiDou Navigation Satellite System began global services in 2018 and finished its full deployment in 2020. There is also the European Union Galileo navigation satellite system and India's NavIC. Japan's Quasi-Zenith Satellite System (QZSS) is a GPS satellite-based

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augmentation system to enhance GPS's accuracy in Asia- Oceania, with satellite navigation independent of GPS scheduled for 2023.

When selective availability was lifted in 2000, GPS had about a five-meter (16 ft) accuracy. GPS receivers that use the L5 band can have much higher accuracy, pinpointing to within 30 centimeters (11.8 in), while high-end users (typically engineering and land surveying applications) are able to have accuracy on several of the bandwidth signals to within two centimeters, and even sub-millimeter accuracy for long-term measurements. Consumer devices, like smartphones, can be as accurate as to within 4.9 m (or better with assistive services like Wi-Fi positioning also enabled). As of May 2021, 16 GPS satellites are broadcasting L5 signals, and the signals are considered pre-operational, scheduled to reach 24 satellites by approximately 2027.

HFP (hand-free profile) :

Handsfree is an adjective describing equipment that can be used without the use of hands (for example via voice commands) or, in a wider sense, equipment that needs only limited use of hands, or for which the controls are positioned so that the hands are able to occupy themselves with another task (such as driving) without needing to hunt far afield for the controls.

Devices that are typically used for hands-free communication use Bluetooth as their wireless technology. They still require a smartphone or other device to initiate a call. These devices include Bluetooth headsets, handsfree car kits (HFCK), and personal navigation devices (PND). Originally introduced as optional features connected by a wire to smartphones or other communication devices, they now generally are available with wireless technology.

Bluetooth handsfree options are now also easily found in any high-end automotive as part of the vehicle's stereo system, or in after-market stereo system units. This option utilizes the vehicle's speakers to transmit the caller's voice in the phone call and have an embedded microphone in the stereo unit itself, the steering wheel, or use a separate wired microphone that can be placed anywhere in the vehicle.

Hands-free mobile phones are obligatory in many countries for use of mobile phones while driving. However, studies have shown that even with a hands-free unit, the added distraction to the driver, and the increase in crash rates, are almost as substantial as when driving and talking on a normal mobile phone.

In the United Kingdom, as of 2003, it is illegal to use a handheld mobile phone while driving. Similar laws have been adopted in many jurisdictions worldwide, and many make provisions for hands-free phone use.

Installation of hands-free devices in the UK is governed by MPT 1362, which is now referred to as FCS 1362. A technical document was created and updated by the Federation of Communication Services.

In Australia, all states have banned the use of a mobile phone while driving unless it is used with a hands-free headset. Since hands free devices replace a phone's own speaker and microphone capability in a phone call, they now also must deal with the same issues that standard mobile phones and land phones deal with. The main acoustic issues are echo cancellation and noise suppression, although there are others as well. There have been many ways developed to cancel echo in phone calls and results range from poor to excellent.

These acoustic technologies must also remove or reduce the noise levels so that the caller is well understood. A person making a call from a handsfree device who is in a busy restaurant or while driving will introduce large levels of noise into the call. This situation is complicated as the software must not only remove the noise around him but must transmit his voice clearly and loudly to whoever is connected to him.

The best software solutions combine both echo cancellation and noise cancellation into a single technology so that the caller has the freedom to use a hands-free device anywhere they please. Having an acoustic solution with only one feature will dramatically reduce its flexibility.

IV. MODELING AND ANALYSIS

The Smart Helmet has two operating modules. i.e. one is The receiver part and one is the transmitter part. The transmitter part is embedded in the helmet itself, but the receiver part is Installed for each specific bike. so wireless Communication is between the two modules. In the transmitter module, the pressure signal is captured by a pressure transducer inside the helmet. The comparator converts the analog signal to a digital signal and feeds the transmitter as a logic level 1 input while

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the transducer provides the output. When the user retrieves the helmet, the output of the transducer is zero, and the input of the transmitter is 0 as a logic level.

Road accidents kill nearly 1.3 million people and injure another 250 million people worldwide each year. According to the 2013 Global Status Report on Road Safety, the total number of road deaths remains unacceptably high at 1.24 million annually. Only 28 countries, which cover 7% of the world's population, have comprehensive road safety legislation on five major risk factors: drunk driving, speeding, motorcycle helmets, seat belts, and child seat failure. It has been decided. To overcome this problem, this smart helmet was introduced. This helps reduce the number of daily accidents and the case fatality rate. In countries where bicycles are common, such as India, many people inadvertently die while wearing a motorcycle helmet. Government agencies have always focused on helmets and seat belts, but the majority of drivers ignore them. Most people use traditional helmets only to prevent charan, which is not done by traffic control police for safety reasons. Therefore, these helmets do not guarantee the safety of the driver. For cyclists, the helmet acts as a basic protective device. However, there is no guarantee that the driver will strictly comply with traffic rules. To overcome this problem, you can use a smart helmet.

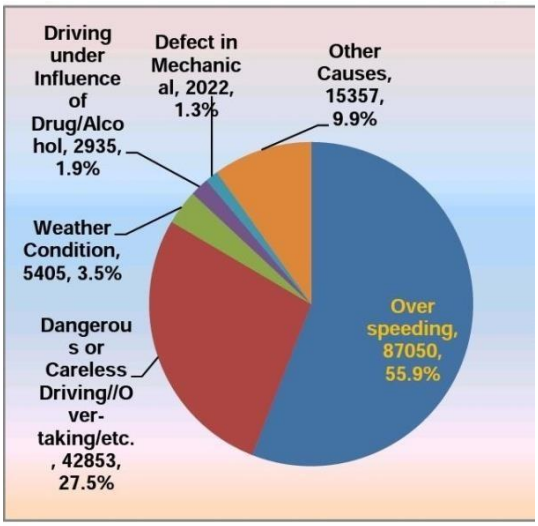

Fig. two wheeler driving

V. RESULT

The two-wheeler Safety System developed with IoT, Smart helmet is very safe and trustworthy. The main aim of this system prevention from injuries when a person wearing this helmet meets with an accident. It avoids Drink and Drive cases. The results can detect the accident and it sends the notification to the registered contact with 90% accurate location so that the guardians will get to know the condition of the person and can able to give the proper medical treatment. The detection of an accident is based upon the results of tilting of a helmet, it matches with the helmet fall value and the threshold value. The results show that the system detected the presence of alcohol in the breath of the rider if the rider is over drunken then bike will not start. This system will process completely based on rider activities.

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FIg. Alcohol Detection message by blynk cloud

VI. CONCLUSION

The system designed provides safety of the riders, in case of accidents it will notify the registered contact and the location of the accident provides a timely safety measure. This also detects the consumption of alcohol and prevents drink and drive cases. This also ensures the person wears the helmet mandatorily.