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SMART HELMET CONCEPT

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Abstract

The primary goal of a motorcycle helmet is motorcycle safety – to protect the rider's head during impact, thus preventing or reducing head injury and saving the rider's life. Some helmets provide additional conveniences, such as ventilation, face shields, ear protection, intercom. Motorcyclists are at high risk in traffic crashes. A 2018 systematic review examined studies on motorcycle riders who had crashed and looked at helmet use as an intervention. The review concluded that helmets reduce the risk of head injury by around 69% and death by around 42%.Lack of communication to the ambulance and to the relatives of the victims is a major problem. We are trying to solve this problem by making an immediate communication at the accident time to the ambulance, and to their registered relatives numbers. Here we add a force sensor to analyse the impact of the accident, so that it can be sent as signal to the GSM module, this is sent as an instant message by analyzing the frequency of the sensor.The sensors and GSM module is interfaced to the Arduino Mega 2560, which controls the system.There is an additional pulse sensor which displays the pulse of the person on accident time,to know their condition.Thus the pulse rate measured is also sent as a message to the registered numbers not only the pulse but also the victim's accident location is sent as a message to them. This helmet is built in with at-most safety and gives comfort and the battery set up is replaceable.

Keywords: Smart helmet, pulse sensor, vibration or force sensor, Arduino- mega, location,GSM.

Introduction

A smart helmet is a special idea which makes motorcycle driving safer than before. This is implemented using GSM and GPS technology. The working of this smart helmet is very simple, force sensors are placed in different places of helmet where the probability of hitting is more which are connected to microcontroller board. So when the rider crashes and the helmet hit the ground, these sensors sense and gives to the microcontroller board, then controller extract GPS data using the GPS module that is interfaced to it. When the data exceeds minimum stress limit then GSM module automatically sends message to ambulance or family members. It also has a pulse sensor which detects whether the person is critical condition.

Principle

There are two major operation principles in Force-sensing resistors:percolation and quantum tunneling.The heart rate monitoring pulse sensor monitors the pulse of the person. With the help of the signals sensed by these sensors,the data of the victim's health along with the location is shared via GSM module.The overall components interfaced to arduino mega hardware equipped with analog to digital input/output port synchronizes the data by using C++ programming and universal serial bus relays it to the GSM.

Computing

Arduino boards consist of an Atmel 8-bit AVR microcontroller (ATmega8, ATmega168, ATmega328, ATmega1280, ATmega2560) with varying amounts of flash memory, pins, and features. The 32-bit A, based on the Atmel SAM3X8E was introduced in 2012. The boards use single or double-row pins or female headers that facilitate connections for programming and incorporation into other circuits. These may connect with add-on modules termed shields. Multiple and possibly stacked shields may be individually addressable via an I²C serial bus. Most boards include a 5 V linear regulator and a 16 MHz crystal oscillator or ceramic resonator. Some designs, such as the Lily Pad, run at 8 MHz and dispense with the on-board voltage regulator due to specific form-factor restrictions.

Arduino micro controllers are pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory. The default boot-loader of the Arduino UNO is the optiboot bootloader. Boards are loaded with program code via a serial connection to another computer. Some serial Arduino boards contain a level shifter circuit to convert between RS-232 logic levels and transistor-transistor logic (TTL) level signals. Current Arduino boards are programmed via Universal Serial Bus (USB), implemented using USB-to-serial adapter chips such as the FTDI FT232. Some boards, such as later-model Uno boards, substitute the FTDI chip with a separate AVR chip containing USB-to-serial firmware, which is re-programmable via its own ICSP header. Other variants, such as the Arduino Mini and the unofficial Boarduino, use a detachable USB-to-serial adapter board or cable, Bluetooth or other methods. When used with traditional microcontroller tools, instead of the Arduino IDE, standard AVR in-system (ISP) programming is used.

Sensors

Force-sensing resistors are commonly used to create pressure-sensing "buttons" and have applications in many fields, including musical instruments, car occupancy sensors, artificial limbs, and portable electronics like our smart helmet.

A heart rate monitoring (HRM) pulse sensor is a personal monitoring device that allows one to measure/display heart rate in real time or record the heart rate. It is largely used to gather heart rate data after the accident has occurred.

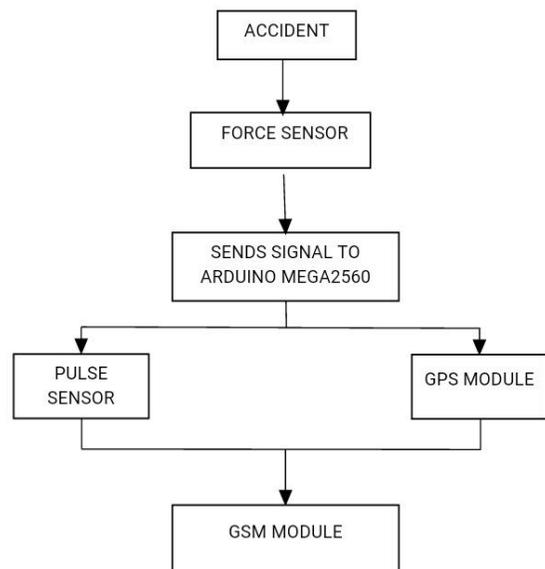


Fig .Intercom of smart helmet

GSM

One of the key features of GSM is the Subscriber Identity module commonly known as a **SIM card**. The SIM is a detachable smart card containing the user's subscription information and phone book. This allows the user to retain his or her information after switching handsets. By using GSM the status of the person is shared via GPS to ambulance.



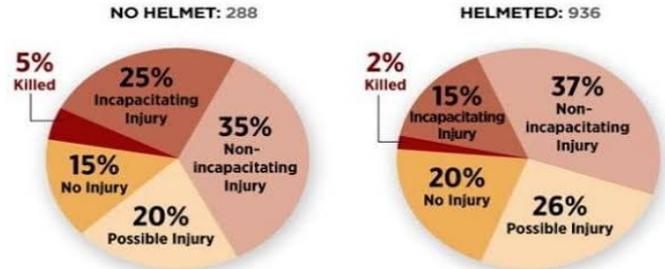
Fig. Smart helmet concept

GPS

The GPS concept is based on time and the known position of GPS specialized satellites. The satellites carry very stable atomic clocks that are synchronized with one another and with the ground clocks. Any drift from time maintained on the ground is corrected daily. In the same manner, the satellite locations are known with great precision. GPS receivers have clocks as well, but they are less stable and less precise. Each GPS satellite continuously transmits a radio signal containing the current time and data about its position. Since the speed of radio waves is constant and independent of the satellite speed, the time delay between when the satellite transmits a signal and the receiver receives it is proportional to the distance from the satellite to the receiver. A GPS receiver monitors multiple satellites and solves equations to determine the precise position of the receiver and its deviation from true time. Thus by using GPS module, the location of the accident spot is immediately shared or forwarded to nearby hospitals as well as registered contacts in the victim's Subscriber Identity Module.

Helmet versus non-helmet injuries

Crash records for the three months since Michigan's helmet ban was lifted show motorcyclists without helmets were more likely to be seriously injured or killed.



Incapacitating injury: Any non-fatal injury which prevents normal activities and generally requires hospitalization.
Non-incapacitating: Any injury not incapacitating but evident to others at the scene.
Possible: No visible injury but complaint of pain or momentary unconsciousness.

SOURCE: MLive Media Group analysis, Michigan State Police Traffic Crash Reporting Section

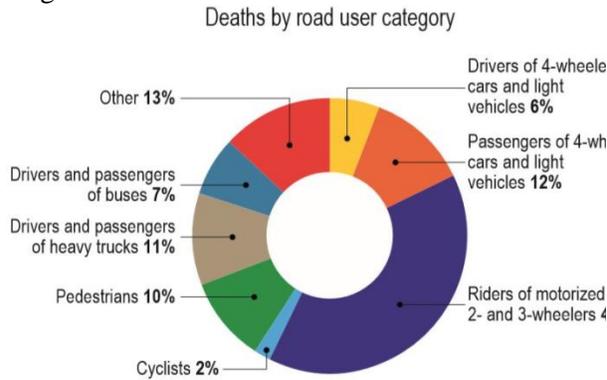
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Accident surveys

According to Times of India about 146,133 people were killed in road accidents in India in the year 2016. Unfortunately about 30% of deaths are caused due to delayed ambulance. In today's scenario the number of accidents per day is increasing exponentially and so is the number of deaths caused by it.

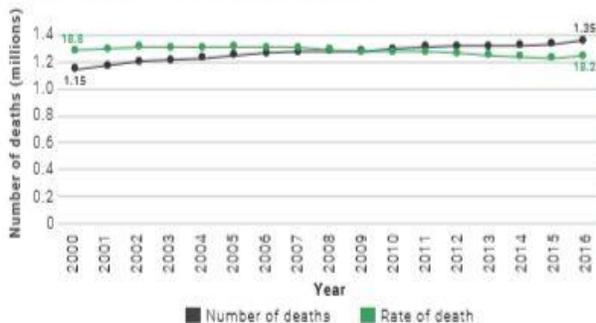
A previous study indicated that the mortality rate after severe head injury (Glasgow coma score ≤ 7) was higher on each of the first 2 days after injury (early deaths) than on any subsequent day (late deaths). The low Glasgow coma scores, high incidence of unreactive pupils, and refractoriness to treatment of patients dying within 48 hours of injury suggested that many such patients had sustained irreversible brain injury. To determine the extent to which events at impact sealed the fate of those dying early deaths after head injury, we compared the pathology of cases of early and late death. Of 2000 patients with head injury admitted to the neurosurgery service during a 6-year period, there were 138 deaths and 56 autopsies. Seventy-two per cent of the patients who died during the first 48 hours after injury had widespread homogenizing necrosis of neurons or direct brain stem injury, considered to represent

irreversible brain damage. Only 19% of those dying later deaths had these pathological changes.



Source: Ministry of Road Transport and Highways, Road Accidents in India 2016

Figure 1: Number and rate of road traffic death per 100,000 population: 2000–2016



Conclusion

The accident surveys shows that head injuries are fatal .This life-threatening situation can be overcome by using smart helmet.Thus smart helmets can be assured to monitor head injuries as well any mishap in the form of accident and ensures life safety by using various technologies like IOT.

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