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SAFEMATE USING ARDUINO

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Abstract - **A recent survey showed that the chance of death for motorcyclists are high due to the ignorance of safety precautions. Motorcyclists have high rate of fatal injuries than four wheelers. Our project aims at providing life security to the motorcyclist by sending alert messages. The ARDUINO acts as an Electronic Control Unit (ELU) in this project. The engine will not ignite unless the rider wears a helmet and the motorcyclist should have a non-alcoholic breath. The accelerometer is used to detect the accident possibilities. In order to create a proper communication channel for the victim, GSM and GPS technology has been preferred to inform the ambulance and the relatives about the accident location along with the vital signs of the victim. The helmet is embedded with pulse oximeter sensor which provides the pulse rate and oxygen saturation level. The blood group of the motorcyclist is pre-programmed and this information is also shared to the ambulance, to diagnose the victim's condition.**

Index words - **Accelerometer, Alcohol detector Arduino, GPS, GSM, Pulseoximeter**

I. INTRODUCTION

The US has the world's largest road network followed by China and India. India's road network is considered as the third largest in the world as per a survey in 2012. Although we have largest road network, due to over population in the country there is a lot of congestion in the roads which leads to accident often. An alarming 1,37,000 people die in road accidents every year that is more than the number of people killed in all the wars put together. Death or disability of the head of the family or the head of household is catastrophic, leading to lower living standards and poverty in India. The country loses a startling three percent of its GDP every year due to fatal road accidents in cities and on highways. Road safety can be improved only if we understand the accident,

- Drunk and drive
- Avoiding helmets and safety gears
- Distraction of the rider

Most helmet manufacturers today focuses on adding fancy features like MP3or wireless phone or even a flash light on top of it. But none of these features provides security for the rider. SAFEMATE is a protective helmet which is embedded with the sensors like alcohol detector, pulse rate sensor and oximeter to detect the oxygen saturation level.

II. EXISTING HELMETS

In most of the existing system PIC microcontroller had been used for controlling the system.PIC requires separate power supply, I/O headers etc… and program loading is quite complex. Vibration sensors were used to detect the crash but the vibration sensor is physicallyweek compared to accelerometer.

Table1. Comparison of wireless channels

Feature(s)	IEEE 802.11b	Bluetooth	ZigBee
Power Profile	Hours	Days	Years
Complexity	Very Complex	Complex	Simple
Nodes/Master	32	7	64000
Latency	3 Seconds	10 seconds	30ms – 1s
Range	100 m	10m	70m-300m
Extendibility	Roaming Possible	No	YES
Data Rate	11Mbps	1 Mbps	250Kbps
Security	CCMP/TKIP 128bit/64bit	64 bit, 128 bit	128 bit AES and Application Layer

Most of the existing systems had Bluetooth, IR, RF and RFID tags for communication between the sensor unit and the alerting unit. Bluetooth and

infrared system has a very small coverage area. Using RF is a complex process as there may be a chance of interference between the neighbouring RF channels.RFID tags are quite expensive and embedding the tags to the helmet transmitter and the receiver unit is compulsory which makes the helmet system bulky, complex and expensive.

III. PROPOSED METHOD

Our system consists of two parts (1) helmet part and (2) bike part. The engine is ignited only under two conditions

- A push button is used to detect whether the rider is wearing the helmet
- Alcohol sensor is used to detect non-alcoholic breath of the rider.

If any of the rule is breached, the engine is not turned ON.

A. HELMET UNIT

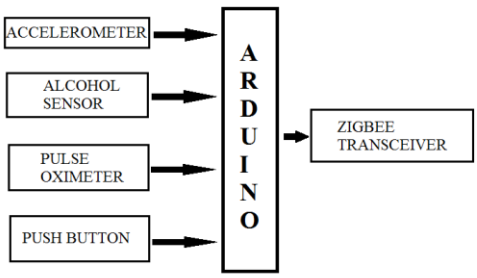

Fig1. Block diagram of helmet unit

The accelerometer in the helmet quickly sends the signal to arduino as soon as the bike crashes with the road. This makes the Arduino to get the pulse rate levels and the oxygen level of the victim. Oxygen saturation levels are checked because, once the victim is taken to the hospital, oxygen levels are calculated depending on which the person's critical state is determined. The blood group of the person is pre-programmed in the Arduino kit while buying the helmet.finaly, the victim's blood group, oxygen level and the pulse rate levels are sent wirelessly to the bike part via Zig bee transceiver.

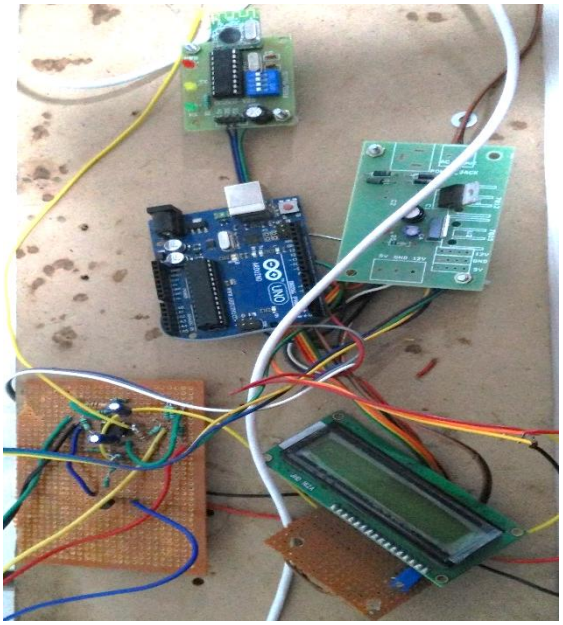

Fig2. Helmet unit

B. BIKE PART

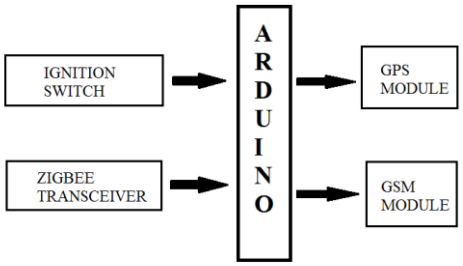

Fig3. Block diagram of bike unit

The bike part consists of the GPS module to track the current location of the victim and the GSM module is used to send message to the pre-defined numbers. On receiving the information from the helmet part the Arduino in the bike part signals the GSM module to send message carrying the information regarding the victim's vital

signs along with the location of the accident.

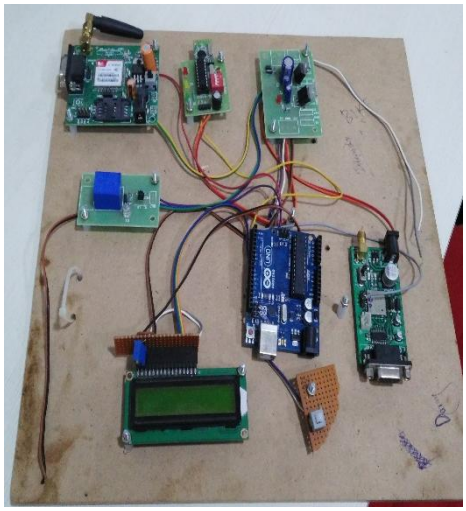

Fig 4. Bike unit

IV IMPLEMENTATION

(I)HARDWARE

The proposed system can be embedded inside the helmet from the helmet manufacturing site. The weight of the helmet will not make any issue as all the components embedded inside the helmet are light in weight.

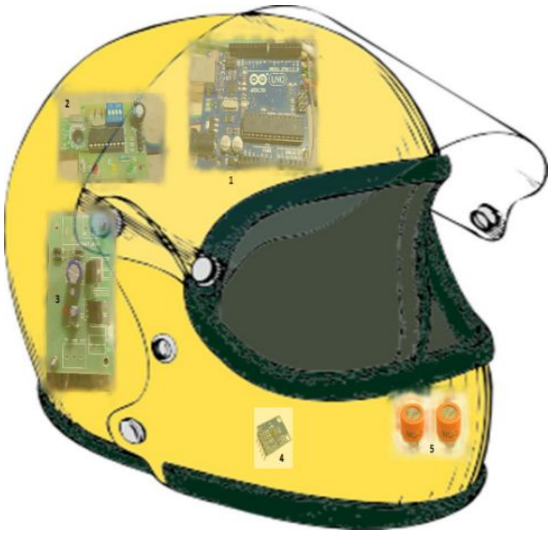

Fig5. Safemate overview

(Note: all the components will be inside the helmet)

Where, 1 – Arduino Uno board

2 - Zig bee transceiver
3 - Power jack
4 - Accelerometer
5 - Alcohol detector

All the above components are embedded inside the helmet, while the pulse oximeter is hung down from the helmet just like the usual mobile headphones.

- WHY PULSE OXIMETER

Oxygen saturation is an important vital sign to be measured. Vital signs include

- Temperature and pressure
- Heart rate
- Pulse rate
- Oxygen saturation level

Once the accident victim is taken to the hospital for treatment, blood oxygen levels are checked for further diagnosis and treatment.

- OXYGEN SATURATION

Simply refers to the available haemoglobin that carries O_2

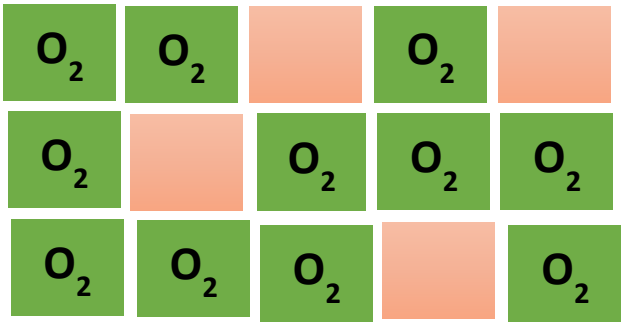

Fig6. Indication of oxygen levels

Here, O_2 - Oxy Hb

- DeoxyHb

Oxygen saturation is important to diagnose.

Table 2.oxygen levels and its effects

Oxygen level	Effects
Below 90%	Results in hypoxemia
Below 80%	Organ failure including heart and brain
Continued low oxygen levels	May lead to respiratory or cardiac arrest

Oxygen saturation can be calculated by,

$$\text{Oxygen saturation} = \frac{\text{Oxygen content}}{\text{Oxygen capacity}} \times 100$$

(II)SOFTWARE

The Arduino board used can be programmed using Arduino IDE. The Arduino language is simply 'c++' language. There is no special Arduino language. It's just c++ with some specific libraries. These library functions can be called to control the hardware.

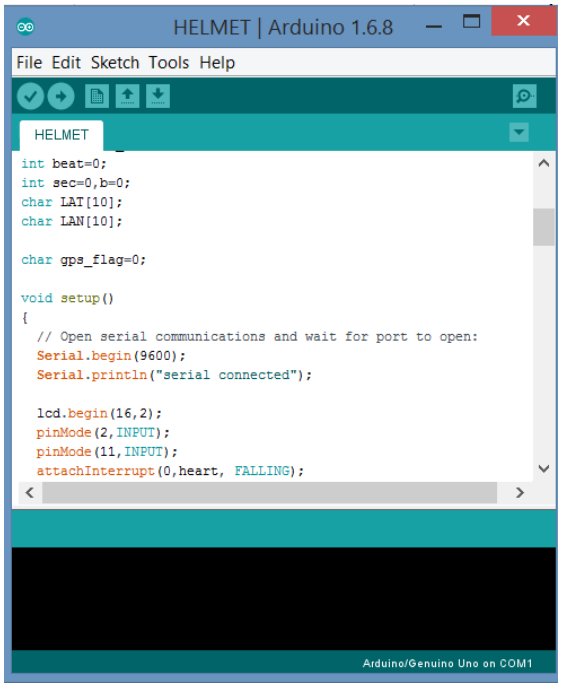

Fig7. Arduino IDE

V.EXPERIMENTAL RESULTS

On testing our project, we found that the safemate provides an added life security for motorcyclist. Safemate effectively checks wearing of helmet and drunk detection, as these are the root cause for many accidents.

Fig8. Alert message for the rider

As soon as the accident occurs accelerometer sends it to the Arduino which makes the engine to turn off.

Fig 9. Prototype of safemate result

Immediately after the accident message is sent to the pre-defined numbers.

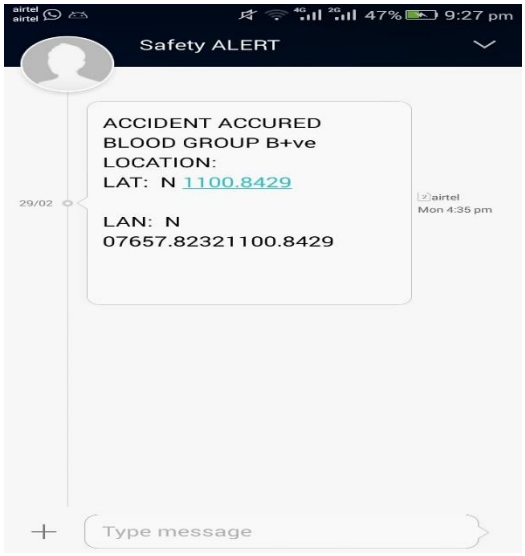

Fig10. Alert message sent along with blood group and the location

VI. CONCLUSION

This system ensures the pre-requisite conditions to ride safely, such as wearing a helmet and not riding under the influence of alcohol, are fulfilled. The accident alert feature arranges for timely help to be provided. The proposed system makes motorcycle driving safer than before.

A. FUTURE SCOPE

- Battery can be made wireless
- Some components can be used to reduce the temperature inside the helmet such as peltier module, heat sink, etc.
- Pulse oximeter can be placed inside the helmet i.e. it can be placed on the ear lobe

VII. ACKNOWLEDGMENTS

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REFERENCES

[1]https://www.arduino.cc/en/Main/Software

[2] http://www.nonin.com/What-is-Pulse-Oximetry

[4] Smart helmet with sensors for accident prevention by mohdkhairulafiqmohdrasli, Nina korlinamadzhi and Juliana johari.

[5] Alcohol detection using helmet system by sudharsanavijayan, vineedtgovind, merin Mathews, simnasurendran and muhammed Sabah.

[7] Zig bee based underground mines parameter monitoring systemfor rescue and protection by pranotianandraosalankar and sheeja s

[8]Safety using road automated wireless communicating smart helmet application by chinmoy Kulkarni, rohit showmanship and mayurtalole.

[9] Intelligent safety helmet for motorcyclist by faezahbintihashim

[9] https://learn.sparkfun.com/tutorials

[11]https://books.google.co.in/books/about
/Design_of_Pulse_Oximeters.html?id=eQh
1DQtvowUC&redir_esc=y

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