Implementation of Smart Helmet

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***Abstract*:- There was a survey till 31 Mar 2015, Which clear tells that there are total of 154.3 million two wheelers are there in India, considering only the registered and renewed vehicle in to consideration, as the density of the two wheelers increases, there the main risk factor is to provide the safety to the riders.70% of the accidents reported are subjected to two wheelers and out 3 accidents in India 2accidents involve two wheelers as a victims, accidents of two wheelers are because of high density roads, heavy traffic, rash or negligence driving, drunk & Drive and a Sleepy riding, many times even after the accidents, accidents will not be reported properly or even the medical aid or assistance will not be available to the riders because of poor or no communication of the accidents, which leads to many number of the death in the recent years.**

In this paper we are developing an IoT product called Smart helmet, which comprises of to units, motor unit and helmet unit, Helmet unit consists of the alcohol and Eye blink sensor, Alcohol Sensor will not allow rider to take on bike after drinking alcohol and eye blink sensor raises the alarm in sleeping conditions. Motor unit is able to communicate with the care takers with messages and GPS helps the system to track the location of the bike in case of the accidents, also this system act as accident prevention and detection system.

Keywords: Smart Helmet, IoT, GSM, GPS, Sensors, Accidents, Smart Helmet, Prevention

I. INTRODUCTION

The monitoring of physiological signals using wearable devices is increasingly becoming a prerequisite for the assessment of the state of body and mind in natural environments. This has been facilitated by small-scale analogue and digital integrated circuit technology, together with on-chip processing power for dealing with movement induced artifacts in bio potentials, which are present when performing daily activities. Physiological signals recorded in real life tend to be notoriously weak and with a low signal to- noise ratio (SNR). To this end, an amplifier with a high common mode rejection ratio is required; such high quality bio-appliers are typically integrated into the analogue front end of large stationary devices. Because of the many leads and electrodes required, such devices are well suited for clinical environments, where patients are normally stationary (except e.g. for cardiac stress tests), so that the noise level is relatively low.

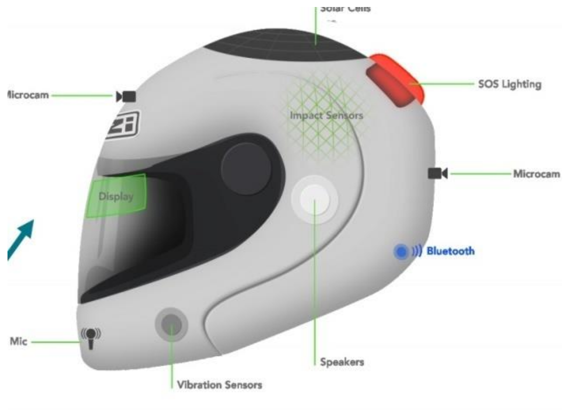


Fig.1 Smart helmet

Objectives

Objective of this Project is to design an intelligent or smart helmet, which act as a Security system and also a monitoring system for the two wheeler and its rider, This embedded system is consists of the Sensors network with Communication modules, which helps to stop the drive or not to allow the driving at the critical or abnormal situations, also we are intended to set the accident detection system.

II. LITERATURE SURVEY

Smart Helmet with Sensors for Accident Prevention**[1]** The impact when a motorcyclist involves in a high speed accident without wearing a helmet is very dangerous and can cause fatality. Wearing a helmet can reduce shock from the impact and may save a life. There are many countries enforcing a regulation that requires the motorcycle's rider to wear a helmet when riding on their motorcycle, Malaysia is an example. With this reason, this project is specially developed as to improve the safety of the motorcycle's rider. Motorcyclist will be alarmed when the speed limit is exceeded. A Force Sensing Resistor (FSR) and BLDC Fan are used for detection of the rider's head and detection of motorcycle's speed respectively. A 315 MHz Radio Frequency Module as wireless link which able to communicate between transmitter circuit and receiver circuit. PIC16F84a is a microcontroller to control the entire component in the system. Only when the rider buckled the helmet then only the motorcycle's engine will start. A LED will flash if the motor speed exceeds 100 km/hour.
Keywords-Microcontroller PIC16F844a, 315 MHz Radio Frequency Module, Force Sensing Resistance, BLDC Fan, 5VRelay, LM311 and IC 555.

Smart Helmets for Automatic Control of Headlamps [2] Intelligent Safety Helmet for Motorcyclist is a project undertaken to increase the rate of road safety

among motorcyclists. There are many countries enforcing regulations to wear a helmet while riding. India is an example. The idea is obtained after knowing that the increasing number of fatal road accidents over the years is cause for concern among motorcyclists. This project is designed to introduce automatic autonomous headlight technology for the safety of motorcyclist. Here, we focus on intelligent headlamps that react according to the rider's facial movement. It makes use of accelerometer and other sensors to direct small electric motors built into the headlight casing to turn the headlights accordingly.
Keywords- Smart helmets, Headlamps, Accelerometer, RF transmitter, RF receiver, Servo motor

A Smart Safety Helmet using IMU and EEG sensors for worker fatigue detection[3] It is known that head gesture and brain activity can reflect some human behaviors related to a risk of accident when using machine-tools. The research presented in this paper aims at reducing the risk of injury and thus increase worker safety. Instead of using camera, this paper presents a Smart Safety Helmet (SSH) in order to track the head gestures and the brain activity of the worker to recognize anomalous behavior. Information extracted from SSH is used for computing risk of an accident (a safety level) for preventing and reducing injuries or accidents. The SSH system is an inexpensive, non-intrusive, noninvasive, and non-vision based system, which consists of an Inertial Measurement Unit (IMU) and dry EEG electrodes. Adaptec device, such as vibrotactile motor, is integrated to the helmet in order to alert the operator when computed risk level reaches a threshold. Once the risk level of accident breaks the threshold, a signal will be sent wirelessly to stop the relevant machine tool or process.
Key words — Safety; Head motion recognition; IMU; EEG; accident avoidance; human machine interaction

Helmet-Mounted Smart Array Antenna [4] Introduction With the advent of wireless telecommunications, efforts to develop personnel-carried personal communications equipment are being very vigorously pursued. For the personal antenna needed in this application, the area around the skull is a prime location and the future of a head-mount antenna has been envisioned. For firefighters, forest rangers, border patrols, and military personnel, the helmet provides a natural platform on which a head-mount antenna can be realized. However, the continually varying skeletal position associated with the movements of the individual, as well as propagation interferences including multipath fading and man-made interferences, makes it desirable to design a "smart" antenna with pattern-diversity to compensate for these problems. In this paper, we present a preliminary design, with measured data, for a smart helmet-mounted antenna that has these performance features.

Low-Power Low-Profile Multifunction Helmet-Mounted Smart Array Antenna[5] The development of a smart low-profile helmet-mounted antenna with pattern diversity has been previously reported by the authors. This smart antenna array virtually ensures stable reception despite problems such as the continually varying skeletal position associated with the movements of the individual, as well as propagation interferences, even for locations which are "dead spots" for conventional antennas However, with the extremely limited space and battery power available, on the helmet, it is necessary that the antenna be multifunction and the power consumption be minimal. In this paper, we present a design for an advanced smart helmet-mounted antenna which employs low-power CMOS control devices and innovative antenna technology for reduction (patents pending). This smart array uses pattern diversity to mitigate the effects of multipath fading and the soldier changing skeletal orientation. In the past, smart antenna techniques have generally been applied to base-station antennas only. By taking advantage of a unique low-cost, low-power, pattern diversity switching mechanism, as well as the recent rapid decline in component and device costs and size, we believe we have made one of the first practical portable smart antenna systems.

III. METHODOLOGY

We are presenting an system consists of two modules, one in Helmet and other one in vehicle, helmet unit comprises of Alcohol and Crush Sensor, alcohol sensor will not allow rider to take the bike and Crush Sensor identifies the accident detections, we are also using the eye blink sensor, which identifies the sleeping nature of the driver in the earliest and triggers a siren to awake in, in negligent cases, it will stop the bike.

Two wheeler consists of the GPS, GSM and Motor driver unit, GSM for communication, GSM for the Location tracking and MOTOR Driver unit is to monitoring the engine. Both the units are connected via RF Transmitter and Receiver.

The proposed system aims at recognizing the user head gesture and mental states in order to estimate the risk level of accident in an industrial facility. To achieve such purpose, it is essential to differentiate the risky head motion and mental state from the safe ones and detect situation while a worker need immediate assistance. This section describes the experiment hypothesis, the strategy for head gesture measurement, and then the risk level logic.

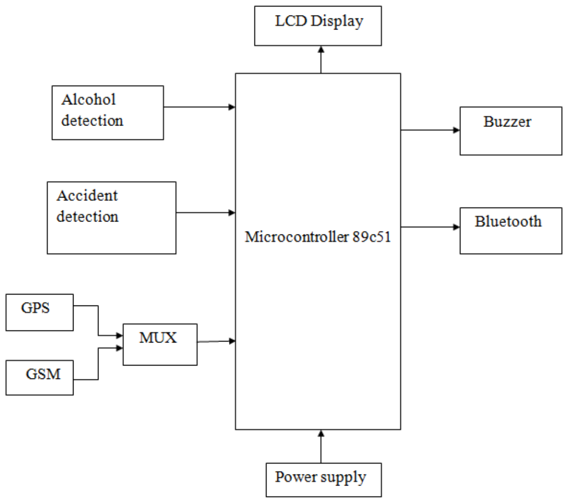
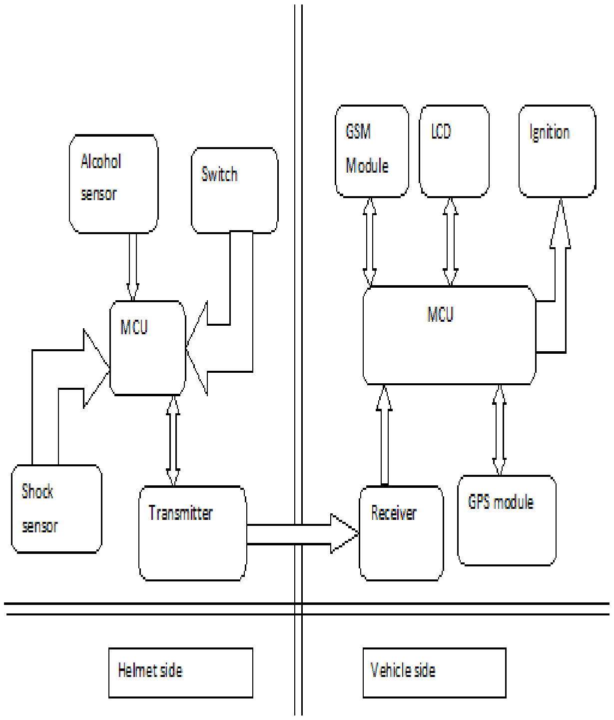


Fig.2 Proposed block diagram

This paper involves measure and controls the eye blink &alcohol content using IR sensor & alcohol detector. The IR transmitter is used to transmit the infrared rays in our eye. The IR receiver is used to receive the reflected infrared rays of eye. If the eye is
closed means the output of IR receiver is high otherwise the IR receiver output is low. This to know the eye is closing or opening position. Alcohol detector detects the content of alcohol in the breath and thus it attempts to clamp down alcoholics. This system uses microcontroller, LCD display, alcohol detector, GSM and buzzer. The output of the sensor is directly proportional to the content of alcohol consumed. This output is given to logic circuit to indicate the alarm.

This paper involves controlling accident due to unconscious through Eye blink & alcohol detector. Here one eye blink sensor and alcohol detector is fixed in vehicle where if anybody loses conscious and indicate through alarm, LCD and GSM. The circuit has an alcohol sensor. This sensor measures the content of alcohol from the breath of drunken people. Output of the sensor is directly proportional to the alcohol content. When the alcohol molecules in the air meet the electrode that is between alumina and tin dioxide in the sensor, ethanol burns into acetic acid then more current is produced.. The output of the sensors is in the analog nature which should be converted into digital format. This is done by the analog to digital converter of the microcontroller unit. The microcontroller controls the entire circuit,
The LCD displays the message, GSM sends message and buzzer produces alarm. The working conditions and various constraints were properly studied before carrying out further steps.



Helmet side:

This module consists of various sensors and a transmitter Circuitry. Two sensors have been used, namely alcohol sensor and shock sensor. Alcohol sensor has been used to detect the alcohol concentration. The alcohol sensor will be placed near the mouth of the rider, inside the helmet. The shock sensor will be used for collision detection. The shock sensor will sense the change in X and Y co-ordinates and accordingly determine the impact of the accident. A toggle switch is used to check whether the helmet is worn or not. An RF transmitter which can transmit data up to3 KHz from any microprocessor/controller or standard Encode IC has been used. The RF transmitter transmits the data from the microcontroller on the helmet side to the receiver on the vehicle side.

Vehicle side:

This module consists of a LCD, GSM module, RF receiver, MCU, ignition switch and GPS module. The RF receiver receives the data and sends it to the microcontroller for further Processing. In the advent of an accident, the GPS module will acquire the co-ordinates of the accident site. These co-ordinates are sent via the GSM module to a pre saved number. The ignition status is controlled by the microcontroller depending on various conditions such as wearing of helmet, alcohol concentration level.

Logic Flow of the System:

When a user approaches a vehicle with the proposed system installed and tries to turn on the vehicle ignition, the vehicle module communicates with the helmet module to check if the helmet has been worn by the user. The helmet module checks if the sensing switch has been activated. If activated, it means the helmet has been worn and hence sends a corresponding signal to the vehicle module. Along with the activation of the switch, the helmet module also checks if the user has consumed alcohol and sends a corresponding signal to the vehicle module.

The vehicle module, on receiving a correct combination of signals from the helmet module, proceeds to activating the electrical system of the vehicle accordingly.

CONCLUSION

We have conducted a proof-of-concept study to demonstrate that electrodes mounted to the inside of a motorcycle helmet can reliably record cardiac and neural activity, together with respiration via a phenomenon called the respiratory sinus arrhythmia (RSA). The proposed recording setup has been shown to be very convenient, as it requires only the application of a saline solution to the soft electrodes embedded into the helmet lining. Recording of physiological signals has been conducted both at rest and while moving (walking and cycling). To deal with such noisy real-world scenarios, we have developed a signal processing approach based on matched-_altering and an adaptive weighting function for R-peak prediction across multiple channels. This has resulted in values for the sensitivity and positive productivity parameters close to 100% at rest and over 90% during movement. The proposed recording of neural and cardiac activity from multiple locations has enabled accurate recordings even when some channels do not exhibit good skin-electrode contacts. Another advantage of the proposed approach is that the developed signal processing algorithms do not require a priori knowledge of any parameters (for instance an approximate heart rate threshold amplitude for R-waves), thus reinforcing the real world nature of the proposed smart helmet recording.

REFERENCES

[1] Smart Helmet with Sensors for Accident Prevention Mohd Khairul Afiq Mohd Rasli, Nina Korlina Madzhi, Juliana Johari Faculty of Electrical Engineering Universiti Teknologi MARA 40450 Shah Alam Selangor, MALAYSIA
[2] Smart Helmets for Automatic Control of Headlamps Muthiah M1, Aswin Natesh V2, Sathiendran R K3 Undergraduate Student, Dept. of Electrical and Electronics Engineering1.2, Director3 Sri Venkateswara College of Engineering1.2, Arobot3 Chennai, Tamil Nadu, India
[3] A Smart Safety Helmet using IMU and EEG sensors for worker fatigue detection Ping Li, Ramy Meziane, Martin J.-D. Otis, Hassan Ezzaidi, REPARTI Center, University of Quebec at Chicoutimi Chicoutimi, Canada
[4] Helmet-Mounted Smart Array Antenna
[5] Low-Power Low-Profile Multifunction Helmet-Mounted Smart Array Antenna J. K. Tillery', G. T. Thompson, and J. J. H. Wang Wang Electro-Opt0 Corporation