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Intelligent Armour

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Abstract: *Nowadays almost all countries are making the use of helmets mandatory and cracking down strictly on drunken driving. But still in many places, the rules are being violated. In order to overcome this problem, a system named "Intelligent Helmet" is proposed in this paper. A smart helmet is a special idea which makes motorcycle driving safer. The proposed system describes the interaction between modules mounted on the vehicle and helmet to ensure the vehicle can be started only when the user is wearing a helmet and is not under the influence of alcohol. Another feature of the proposed system is the ability to detect an accident and send the corresponding geographical coordinates of the accident spot to predefined numbers using a GPS and GSM system respectively. It also has the safety zone indication where the rider is alerted if any vehicle comes too close to him. After giving an overview of the system, the paper describes the system architecture, specific components used, logic flow employed and benefits of the system. This proposed system aims at making safety the norm and not a choice.*

Keywords: *MSP 430, Nano Arduino, Alcohol sensor, Vibration sensor, IR sensor, GSM, GPS*

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I Introduction

According to the road accidents survey done by Times of India, the country recorded at least 4,80,652 accidents in 2016, leading to 1,50,785 deaths. The data reveals that at least 17 deaths occurred in road accidents in 55 accidents every hour. Motorcycles have the high rate of fatal accidents than cars or trucks and buses. Certain reasons are responsible for it such as drivers fault, bad road, drink and drive, and the mistake from another person on road. These reasons led to the accident which results in body damage. Out of all the cases, the most severe case is of head injury, which most of the times lead to body paralysis and sometimes death. So in order to minimize the head injuries we came up with an idea that is INTELLIGENT ARMOUR. Data from the National Highway Traffic Safety Administration (2008) indicate 698 bikers were killed and 44,000 were injured in 2007 and 15% of those killed and 29% of those injured were under the age of 18. These data also show the 18 to 21 year age group had the highest fatality and injury rates, with fatality rates 46% and injury rates 162% more than the average rate for all bikers [1]

The working of this smart helmet is very simple, vibration 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 [2]

An accident is an unexpected and unintended event. The avoidance of Traffic Rule and carelessness of driver are the major factors for occurrence of Vehicle accidents which cause harm to human being as well the environment. Nowadays most of the countries are making it mandatory to wear helmet and avoid drunken driving. But still the rules are being violated. In order to overcome this problem, A GSM Based Smart-Helmet can be introduced as an intelligent system, which checks whether the person is wearing the helmet and has a non- alcoholic breath before driving. If any of these conditions are not met, the bike does not start and a message is sent to the concerned person. A transmitter on Smart-Helmet generates a signal on the basis of two mentioned conditions with the help of a switch and an alcohol sensor and then sends it to the receiver on the bike through the RF transmitter. Now, the receiver decodes the signal and the microcontroller, according to decoded signal, takes the required action. In case alcohol is detected the GSM module attached to the receiving unit sends message to a registered mobile number [3].

The smart helmet will be different in many ways. It will be technically advanced and electronically controlled. The system design will be such that without wearing the helmet the rider cannot start two wheelers. The helmet will be connected to vehicle key ignition systems which will be electronically controlled. The smart helmet will be having proximity sensor fitted inside it, which will act as our switch for on/off ignition and further with wireless connection the helmet sensor circuit will be connected to the vehicle ignition system. If the rider is wearing the helmet he will be able to crank the engine and could propel, where as in case if helmet is not there then vehicle will cannot start. This will surely reduce the no of fatalities on road and hence giving a safer drive.[4]

According to a recent report on the road accidents that occur in India, 80.5 percent are that of two wheelers. The section 129 of the motor vehicles act, 1988 makes mandatory for a person driving two wheelers to wear a helmet. Technology which has conquered almost everything in this age has not made any impact when it comes to helmets. So we ability to prevent the rider from Commuting without wearing a helmet. The system also provides Emergency features during mishaps, Location tracking and alcohol sensing ability. [5]

A smart helmet is a type of protective headgear used by the rider which makes bike driving safer than before. The main purpose of this smart helmet to provide safety for rider . This implement by using advance feature like alcohol detection, accident identification, location tracking, use as a hands free device, solar powered, fall detection. This makes not only smart helmet but also feature of smart bike. Its compulsory to wear helmet, without helmet ignition switch cannot ON. A RF Module as wireless link which able to communicate between transmitter and receiver. If rider getting drunk it gets automatically ignition switch is locked, and send message automatically to their register number with their current location. So when accident occurs, it will send message by GSM to register numbers with their current location by GPS module. It can use to receive call while driving. The distinctive utility of project is fall detection, if the bike rider fall from bike it will send message automatically**.** [6]

II System Model

This Intelligent Armour is good design in such a manner that, if the rider doesn't wear the helmet, the helmet detects it and sends the signals not to turn on the ignition system. Similarly the helmet detects if the rider has consumed the alcohol or not. If the helmet senses any alcohol, again the ignition will not turn on. Another feature of this Intelligent Armour is that, it detects any obstacles or any vehicles when it comes nearer to the personal vehicle. This feature is found to be useful during the night, when the rider is drowsy and night vision is poor. The most important feature of this project is to provide the medical services as early as possible in order to save most of the lives. This is achieved by using an vibration sensor, GPS & GSM modules. The accident when detected from the vibration sensor, GPS location is obtained and GSM is employed to send the message to the Ambulance, Police Station and family members.

III Intelligent Armour

HELMET UNIT

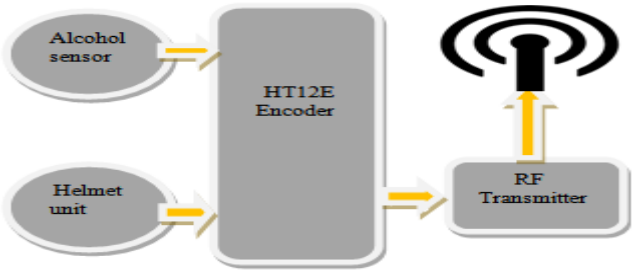


Fig.1 Block diagram of Helmet Unit

The Helmet unit consists of mainly Alcohol Sensor, STX882 ASK Transmitter, HT12E RF Encoder, LIPO Battery, Boost Converter Circuit, Limit Switch. The limit switch in helmet unit is used to see that the rider is wearing helmet. The limit switch is connected to the Vcc of the Encoder and other end of the limit switch is connected to the data pin of encoder which acts as switch. The alcohol senser is used to assure that the rider has not consumed alcohol. The main pin of alcohol sensor sen or sig pin is connected to the another analog digital pin of the encoder if the rider has consumed alcohol and worn helmet then alcohol sensor senses the alcohol and sends the signal to the encoder through the sig pin. This alcohol sensor is suitable for detecting alcohol concentration on your breath, just like your common breath analyser. It has sensitivity and fats response

time. Sensor provides an analog resistive output based on alcohol concentration. The drive circuit is very simple all it needs is one resistor. A simple interface could be 0-3.3v ADC.

The Vcc of transmitter is connected to the Vcc of encoder. The Dout of encoder and Data of transmitter are shorted. All the 8 analog pins of the encoder are grounded,a nd all the ground pins are connected to this ground.There are two oscillators in encoder which are connected by the 1M resistor. The 3.7V LIPO battery is connected to the booster circuit which is used to increase the voltage to 5V. We are using LIPO battery charger to charge the battery.Here we have used a transistor which can be used to convert output of transmitter as input to the alcohol sensor.

VEHICLE UNIT

VEHICLE UNIT

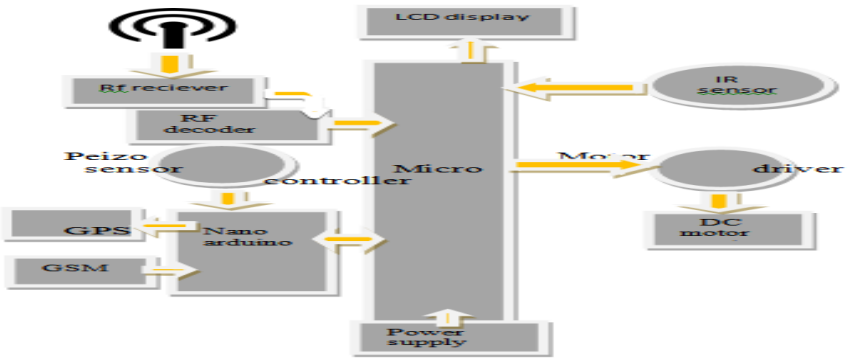


Fig.2 Block diagram of Vehicle Unit

The Bike unit consits of mainly MSP430 Microcontroller, GPS module, GSM modem, Piezo vibration sensor, 16X2 LCD display, Decoder, Receiver, Motor driver, 12V D.C motor, Nano arduino,Regulator. Nano arduino is used to connect the gps and gsm modules, both Vcc are shorted and connecte to 5V supply from arduino. The transmitter pin of GPS module is connected to transmitter pin of arduino and the receiver from the GSM modem is connected to the receiver pin of arduino. The 16X2 lcd is connected to the microcontroller. The lcd is provided with 5v supply, and serial control line pin is also connected to the microcontroller. The vibration sensor pin VIB is connected to the data pin of the nano arduino, and the suply for this sensor is 3.3V from the motor driver circuit. T he all analog pins of the decoder are shorted and connected to ground. The digital pins of decoder d1,d2 are connected to the microcontroller data pins.

Microcontrollers are embedded inside some other device so that they can control the features and actions of the product. Another name for microcontroller, therefore, is embedded controller. MSP430 has six operating modes, each with different power requirements. The MSP430 can be used for low powered embedded devices. The current drawn in idle mode can be less than 1 µA. The top CPU speed is 25 MHz there are, however, limitations that preclude its use in more complex embedded systems.

A GPS device can retrieve from the GPS system location and time information in all weather conditions, anywhere on or near the Earth. The orbits are arranged so that at anytime, anywhere on Earth, there are at least four satellites "visible" in the sky. A GPS receiver's job is to locate four or more of these satellites, figure out the distance to each, and use this information to deduce its own location.

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. These modules are preferred over seven segments and other multi segment LEDs. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.The command register stores the command instructions given to the LCD.

1) MSP 430 Microcontroller

The general definition of a microcontroller is a computer present in a single integrated circuit which is dedicated to perform one task and execute one specific application. It contains memory, programmable input/output peripherals as well a processor.

Microcontrollers are embedded inside some other device so that they can control the features and actions of the product. Another name for microcontroller, therefore, is embedded controller.

The MSP (mixed signal processor) 430 is a 16-bit microcontroller that has a number of special features not commonly available with other microcontrollers. Complete system on-a-chip which includes LCD control, ADC, I/O ports, ROM, RAM, basic timer, watchdog timer, UART, etc. It consumes low power i.e. (4.2 nW per

instruction). Works at High speed of 300 ns per instruction at 3.3 MHz clock, in register and register addressing mode. It has seven addressing modes for the source operand and four addressing modes for the destination operand.MSP 430 has a 16-bit RISC architecture. It is specifically designed for ultra low power applications.

The CPU consists of an instruction decoder, arithmetic logic unit, and a register file (group of registers). The instruction decoder is responsible for translating the numeric program instructions into processor actions; the arithmetic logic unit carries out additions, subtractions, logical operations and so on.

The registers are numbered R0 to R15. The first 4 of these (R0 to R3) have special designation, the remainder, R4 to R15 are for general purpose.

MSP430 has six operating modes, each with different power requirements. The MSP430 can be used for low powered embedded devices. The current drawn in idle mode can be less than 1 µA. The top CPU speed is 25 MHz there are, however, limitations that preclude its use in more complex embedded systems. The MSP430 does not have an external memory bus, so it is limited to on-chip memory (up to 512 KB flash memory and 66 KBRAM) which may be too small for applications that require large buffers or data tables. Also, although it has a DMA controller, it is very difficult to use it to move data off the chip due to a lack of a DMA output strobe. There are six general generations of MSP430 processors. In order of development, they were the '3xx generation, the '1xx generation, the '4xx generation, the '2xx generation, the '5xx generation, and the '6xx generation.

2) Alcohol sensor

The sensing element detects the alcohol content from the breath of the driver continuously and amplifies it to give a switching pulse output .it detects the alcohol content continuously to sense the drivers drunken state and alerts the driver. An alcohol sensor detects the attentiveness of alcohol gas in the air and an analog voltage is an output reading. The sensor can activate at temperatures ranging from -10 to 50° C with a power supply is less than 150 Ma to 5V. The sensing range is from 0.04 mg/L to 4 mg/L, which is suitable for breathalyzers. The alcohol sensor **(**MQ3) is efficient among all the other sensors with fast response, high sensitivity, stable life and a simple drive circuit.

3) Vibration sensor

A piezoelectric sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, temperature, strain or force by converting them to an electrical charge.

4) IR sensor

An infrared sensor circuit is one of the basic and popular sensor module in an electronic device. This sensor is analogous to human's visionary senses. Fixing the sensor in front of driver seat so that the sensor monitors the eye movement of the driver periodically. If the eye lid of driver is not showing any change for a period, the caution will be given to the driver. This sensor should be fixed in such a way that it shall sense the eye movement when the driver bends or sets erect. Consider an event called "blink", for which the set of operations will be followed. Eyeballs are monitored with their white colour using sensor if colour other than white such as black or beige or other shades of brown are
Sensed for more than 15 seconds then a high signal is given from sensor to the Arduino to automatically park the vehicle.

The blinking of eye is necessary in this project, since it is used to drive the device and to operate events. Eye blink detection must be done. Time greater than the human eye blinking time then consider an event called "blink", for which the set of operations will be followed. Eyeballs are monitored with their white colour using sensor if colour other than white such as black or beige or other shades of brown are sensed for more than 15 seconds then a high signal is given from sensor to the Arduino to automatically park the vehicle.

5) Motor driver

The most commonly used motor driver IC's are from the L293 series such as L293D, L293NE, etc. These ICs are designed to control 2 DC motors simultaneously. L293D consist of two Hbridge. H-bridge is the simplest circuit for controlling a low current rated motor**.**

6) GSM

GSM (Global System for Mobile communication) is a digital mobile telephony system that is widely used in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band**.**

7) GPS

GPS makes it possible to precisely identify locations on the earth by measuring distance from the satellites. GPS allows you to record or create locations from places on the earth and help you navigate to and from those places.

8) LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. These modules are preferred over seven segments and other multi segment LEDs. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

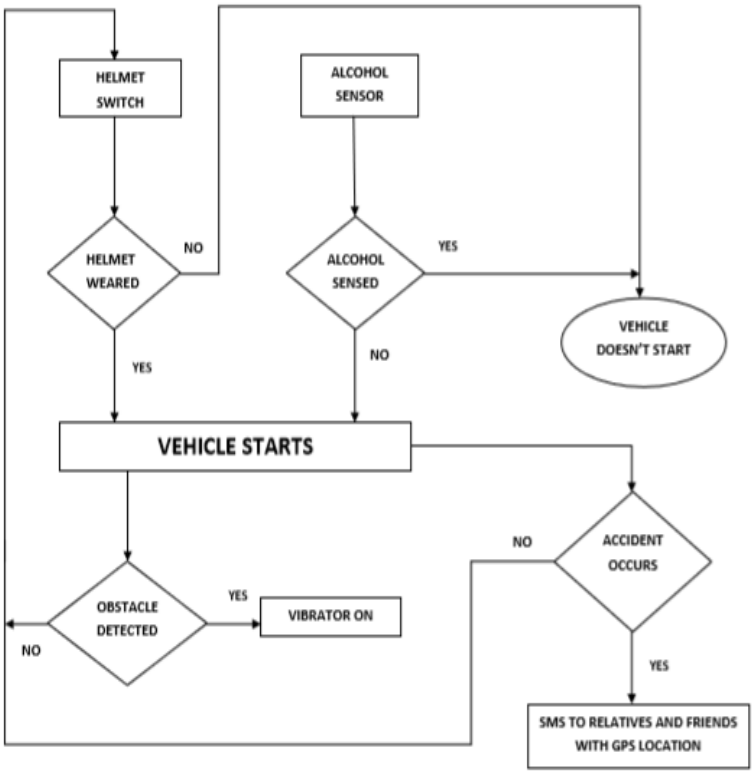
9) NANO Arduino

The Arduino Nano is very much similar to the Arduino UNO. They use the same Processor and hence they both can share the same program. One big difference between both is the size UNO is twice as big as Nano and hence occupies more space on your project. Also Nano is breadboard friendly while Uno is not. To program a Uno you need Regular USB cable whereas for Nano you will need a mini USB cable.

10) DC Supply

An (electrical) adapter or adaptor is a device that converts attributes of one electrical device or system to those of an otherwise incompatible device or system. Some modify power or signal attributes, while others merely adapt the physical form of one electrical connector to another. A DC connector (or DC plug, for one common type of connector) is an electrical connector for supplying direct current (DC) power. Compared to domestic AC power plugs and sockets, DC connectors have many more standard types that are not interchangeable. The dimensions and arrangement of DC connectors can be chosen to prevent accidental interconnection of incompatible sources and loads.

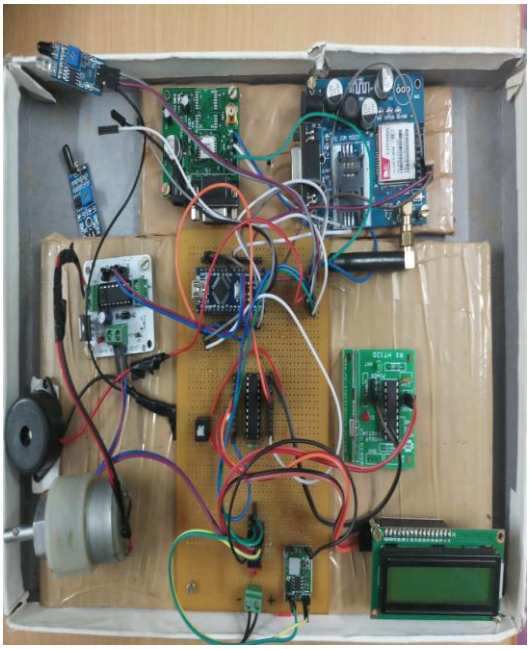
IV Flow Chart



V Work Description

Auto ignition off on alcoholic detection that is Alcohol consumption is verified at starting process of the vehicle, if driver is drunk then the vehicle doesn't allow the driver to start the vehicle. If alcohol content is sensed in driver's breath while the vehicle is on drive the vehicle is automatically parked on to the left end of the road If the driver is drowsy, an eye blink sensor implemented using IR sensor is used to sense the blink count and is compared with normal eye blink count and upon abnormal blink movement, the speed of the vehicle is controlled automatically to park the vehicle to left end of the road. Immediate tracking of accidents: If any accident occurs then a piezoelectric sensor detects it and short message service along with location will be sent to predefined numbers. Pulse rate sensors are used to constantly monitor the driver's pulse rate and if driver's pulse is found to have abnormal rate then automatically park the vehicle to the left end of the road and intimate through short message service using GSM along with the latitude and longitude location by using GPS.

VI Experimental Result



VII Conculsion

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VIII Future Scope

As we know, the motor cycles riders are now less concerned about their safety while riding, then the creation of this helmet safety rates can be increased and rate of road accidents can be reduced In future this system can be enhanced by implementing vehicle tracking system that can avoid theft of vehicles. Further, vehicle to vehicle communications can be established using the implemented RF, GSM,GPS modules so that the vehicle position can be detected and hence avoiding the collision. We can implement various bioelectric sensors on the helmet to measure various activity. We can use small camera for the recording the drivers activity. It can be used for passing message from the one vehicle to another vehicle by using wireless transmitter. This module can be further implemented in cars by replacing the helmet by seat belt. Power consumption can be reduced.

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