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Embedded Based Smart Helmet for Bike Rider's Safety

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ABSTRACT

An Embedded based smart helmet is a special idea which makes motorcycle driving safer than ever before and they are implemented by using GSM and GPS technology. 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 for microcontroller board. So when the rider crashes and the helmet hit the ground ,they sense and gives the signal to the microcontroller board, then it extracts GPS data using the GPS module that is interfaced to the microcontroller. When the data exceeds minimum stress limit, the GSM module automatically sends the message to ambulance or family members.

Keywords : GSM, GPS, SMS, RF Transmitter And Receiver, Object Sensor, Atmega 162V

I. INTRODUCTION

The thought of developing this project comes to do some good things towards out society. The two wheeler accidents are increasing day by day and leads to loss of many lives. According to a survey ,there are around 1214 accidents occurring due to bike crashes everyday in India alone and two wheeler accounts for 25% of deaths due to road accidents. The reasons for this may be many such as no proper driving knowledge, no fitness or maintenance of bike , fast riding of bike, drunken and drive etc. Sometimes the person injured may or may not be directly responsible for the accident, it may be fault of rider, but at the end of the day, it's both the drivers involved in the accidents who is going to suffer. If accidents are one issue that we look at, lack of treatment in proper time is another reason for deaths. According to one survey, nearly half of the injured people that are involved in accidents die due to lack of treatment in proper time. The many reasons for this such as late arrival of ambulance, no persons at place where the accident occur to give information to the ambulance or parents.

This is a situation which we observe in our day to day life, a thought of finding some solution to resolve this problem come up with this idea of giving the information about accident as soon as possible and in time because after all time matters a lot, if everything is done in time, at least we can save half the lives that are lost due to bike accidents.

Considering three major factors for avoiding the accident causes such as

- Make wearing the helmet compulsory.
- Avoid drunk and drive.
- If person meets an accident and there is no one to help him and simply leaving or ignoring the person ,he may die. In such situation, informing to ambulance or family members of the persons those who are involved in the accident through mobile phones to rescue him becomes important.

The idea of this work is to give information about the rider wearing the helmet or not, whether the rider has met with an accident or not and it gives an information about location of accident place through GSM module to mobile numbers family members.,

II. METHODS AND MATERIAL

LITERATURE SURVEY

Smart Helmet Using Arduino

This is a report about a smart helmet which makes motorcycle driving safer than before. The aim of this

project is to give information at accident to ambulance N family members. This is implemented using Arduino. This smart helmet was implemented by placing vibrations sensors in different places of helmet where the probability of hitting is more which are connected to arguing board. When the date exceeds minimum stress limit then the GSM module sends message to family members automatically.

Smart Helmet for Indian Bike Rider

This paper presents the smart helmet that makes sure that the rider cannot start the bike without wearing it. This helmet replaces the cable connections for wirelessly switching on a bike, so that the bike would not start without both the key and the helmet. A LED indicator is used to demonstrate the working of the model. The system is a simple telemetry system, which is activated with the help of a pressure that is applied to the inner side of the helmet when the rider wears it. The framework model uses a DPDT electromechanical relay and hence there is some time lag in wearing the helmet and switching on the circuit.

Smart Helmet Using GSM & GPS Technology for Accident Detection and Reporting System

A smart helmet is an innovative concept which makes motorcycle driving safer than before. The mechanism of this smart helmet is very simple, vibration sensors are placed in different sections of helmet where the chances 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 provide it to the microcontroller board, then controller extract GPS data using the GPS module that is integrated to it. When the data goes below the minimum stress limit then GSM module automatically sends alerting message to ambulance or family members.

Alcohol Detection Using Smart Helmet System

The system automatically checks whether the person is wearing the helmet and has non- alcoholic breath while driving. There is a transmitter at the helmet and a receiver at the bike. There is a switch used to sure the wearing of helmet on the head. The data to be transferred is coded with RF encoder and transmitted through radio frequency transmitter. The receiver at the bike collects the data and decodes it through RF decoder. MCU controls the function of relay and thus the ignition; it controls the engine through a relay and a relay interfacing circuit.

III. RESEARCH METHODOLOGY

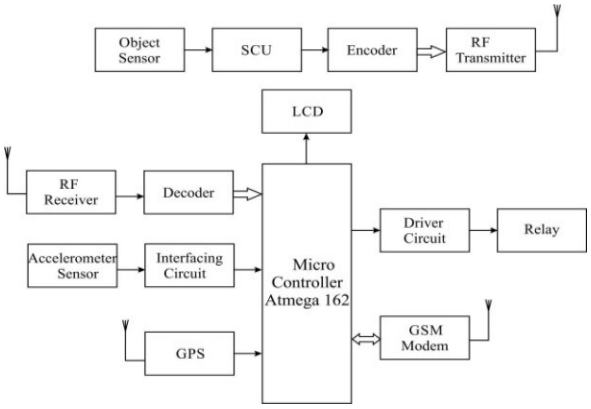

Figure 1. Block Diagram

As shown in the block diagram, we have used following components in our project:

- ✓ Microcontroller
- ✓ LCD
- ✓ GSM
- ✓ GPS
- ✓ Accelerometer
- ✓ Object sensor
- ✓ RF transmitter and receiver
- ✓ Relay

The working of the project is as follows:

We use object sensor to detect whether the user has worn the helmet or not. If the object sensor detects that the person has worn the helmet only then the bike will be turn ON otherwise it will remain OFF. We use RF transmitter and receiver between helmet and bike.

We use accelerometer sensor so that if accident occurs then we will get a message on the registered mobile indicating the location of the bike where the accident took place using GPS module. GPS module will get the latitude and longitude values from the satellite and forward it to the microcontroller. The microcontroller then processes this value to the GSM and hence it is received on the desired mobile.

Component Description

The details of the components which have been used are given below

Atmega 162 V

The ATmega162 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega162 achieves throughputs approaching 1 MIPS per MHz allowing the system designer to optimize power consumption versus processing speed.

PINOUT OF ATMEGA162V:

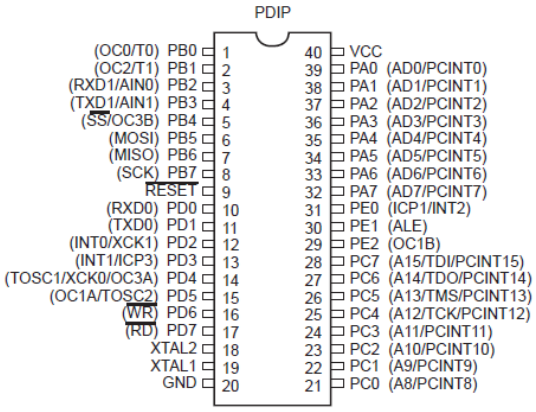

Figure 2. Pin diagram of ATMEGA162V

LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

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.

Pin Diagram

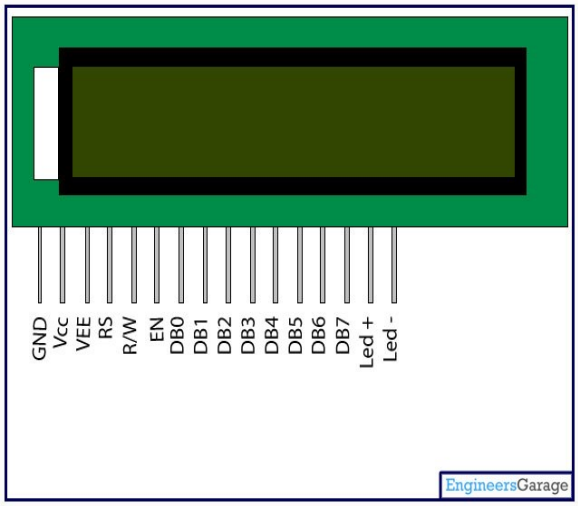

Figure 3. Liquid Crystal Display

GSM

Circuit Diagram:

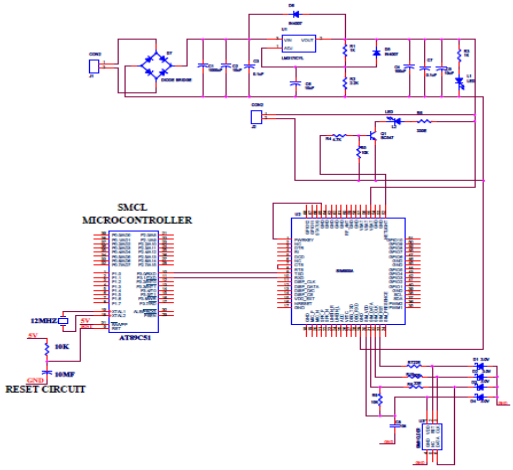

Figure 4. Circuit diagram of GSM

This is a plug and play GSM Modem with a simple to interface serial interface. Use it to send SMS, make and receive calls, and do other GSM operations by controlling it through simple AT commands from micro controllers and computers. It uses the highly popular SIM900 module for all its operations. It comes with a standard RS232 interface which can be used to easily interface the modem to micro controllers and computers.

The modem consists of all the required external circuitry required to start experimenting with the SIM900 module like the power regulation, external antenna, SIM Holder, etc.

GPS

Figure 4. The GPS Module

This is a third generation POT (Patch Antenna On Top) GPS module. This POT GPS receiver providing a solution that high position and speed accuracy performances as well as high sensitivity and tracking capabilities in urban conditions & provides standard NMEA0183 strings in "raw" mode for any microcontroller. The module provides current time, date, latitude, longitude, speed, altitude and travel direction / heading among other data, and can be used in a host of applications, including navigation, tracking systems, fleet management, mapping and robotics.

This is a standalone GPS Module and requires no external components except power supply decoupling capacitors. It is built with internal RTC Back up battery. It can be directly connected to Microcontroller's USART. The module is having option for connecting external active antenna if necessary.

The GPS chipsets inside the module are designed by MediaTek Inc., which is the world's leading digital media solution provider and largest fab-less IC company in Taiwan. The module can support up to 51 channels. The GPS solution enables small form factor devices. They deliver major advancements in GPS performances, accuracy, integration, computing power and flexibility. They are designed to simplify the embedded system integration process.

OBJECT SENSOR

Figure 5. The object Sensor

This is a multipurpose infrared sensor which can be used for obstacle sensing, color detection(between basic contrasting colors), fire detection, line sensing, etc and also as an encoder sensor. The sensor provides a digital and an analog output. The sensor outputs a logic one(+5V) at the digital output when an object is placed in front of the sensor and a logic zero(0V), when there is no object in front of the sensor. An onboard LED is used to indicate the presence of an object. The sensor outputs an analog voltage between 0V and 5V, corresponding the distance between the sensor and the object at the analog output. The analog output can be hooked to an ADC to get the approximate distance of the object from the sensor.

IR sensors are highly susceptible to ambient light and the IR sensor on this sensor is suitably covered to reduce effect of ambient light on the sensor. The sensor has a maximum range of around 40-50 cm indoors and around 15-20 cm outdoors. For better ambient light immunity,

RELAY

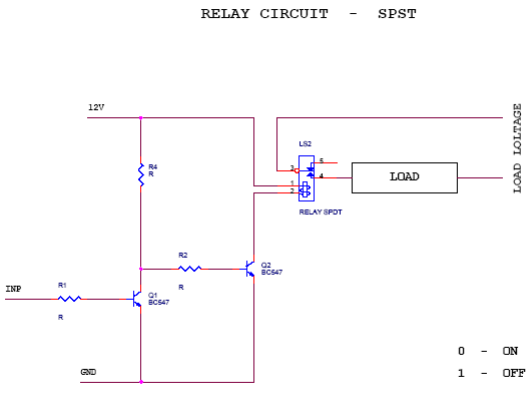

Figure 6. Circuit diagram of relay

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches. Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical.

The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification.

Figure 7. The typical relay being used

Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. Most relays are designed for PCB mounting but you can solder wires directly to the pins providing you take care to avoid melting the plastic case of the relay. The animated picture shows a working relay with its coil and switch contacts. You can see a lever on the left being attracted by magnetism when the coil is switched on. This lever moves the switch contacts. There is one set of contacts (SPDT) in the foreground and another behind them, making the relay DPDT.

IV. CONCLUSIONS

Thus we can conclude that we have been able to design a smart helmet system which is expected to save a lots of innocent lives and reduce death rates that are caused due to bike crashes . The system presents itself like a virtual traffic inspector , who will check from time to time whether the helmet is on or not. In case the biker meets with an accident it will be possible for the family members to trace the biker and they may be in a better position to arrange the medical help there by reducing the chances of fatalities

V. ACKNOWLEDGEMENT

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