SMART HELMET USING ARM CONTROLLER FOR ACCIDENT DETECTION

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Abstract: Our body is designed in such a way that it can stand small impacts upon a fall. But in this age of speed, the falls are generally grave and their impacts big. Not wearing a helmet, just because one rides a two-wheeler at slow speeds is no justification. A fall from a two-wheeler even at such slower speeds can cause head injuries. Without taking proper first aid and treatment on time there are possibilities for someone to lose their valuable life. This leads to the development of the Smart Helmet. The Smart Helmet will have an accelerometer, GPS and a GSM. It is provided with a switch too. The readings of the accelerometer will be noted while a normal driving. In case if the person wearing the helmet met up with an accident then the readings from the accelerometer varies rapidly. Then a message will be send to the Doctor / ambulance and the family members along with the GPS's location. So that they can reach there on time and the person can get an immediate care and treatment.If the helmet falls by accident (say it slipped from the table), we can't send a message in such situations. So the person have to press the switch within few seconds (say 10s) in order to stop the message.

Keywords- GPS and GSM

I. INTRODUCTION

Smart Helmet for Motorcyclist is a project undertaken to increase the rate of road safety among motorcyclists. The idea is obtained after knowing that the increasing number of fatal road accidents over the years is cause for concern among motorcyclists. In India more than 37 million people are using two wheelers, since usage is high, accident percentage of two wheelers are also high compared to four wheelers. Motorcycles have high rate of fatal accidents than cars or trucks and buses.
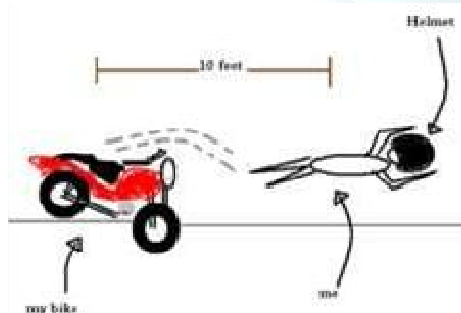
The idea of developing this project comes from social responsibility towards the society. This project aims for accident avoidance, safety and security of bike rider. The main intention of this project is to warn the rider about the Accident/Danger zones and to find the accident spot at any place and intimating it to ambulance and family members through the GPS and GSM networks.

The main aims of an accident avoidance system are to avoid a loss of life and provide a safety mechanism for the driver. Motorcyclist will be alarmed when he enters Accident/Danger zones. This is found to be useful at night or when the rider is drowsy or tired, by this accident can be prevented. Whenever any accident occurs MEMS sensor detects and sends mechanical force to ARM7, Also GSM technology is used to inform the family members in case of an accident. By using GPS, we will get particular location where accident occurs, and then GSM sends message to ambulance and family members. As the bikers in our country are increasing, the road mishaps are also increasing day by day, due to which many deaths occur, most of them are caused due to most common negligence of not wearing the helmets, also many deaths occur due to lack of prompt medical attention needed by the injured person. This motivates us to think about making a system which ensures the safety of biker, also to get proper and prompt medical attention, after meeting with an accident. The project aims at the security and safety of the bikers against road accidents.

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, helmet hit the ground, these sensors sense and gives to the ARM7 Processor, 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 and family members.

A. Objective

The objectives of this project are

I. To design the circuit that can improve the safety of motorcyclists.

II. To develop a Smart safety helmet for complete Rider, And to design a smart helmet with features like road hazard warnings.

III. To gain knowledge on circuit designing and structure.

B.Problem statement

Now-a-days, it became very difficult to know that an accident has occurred and to locate the position where it has happened, also many deaths occur due to lack of prompt medical attention needed by the injured person, if person met with an accident, no one is there to help him, Simply leaving or ignoring the person he may die, In such situation, informing to ambulance and family members through mobile to rescue him for an extent. The project aims at the security and safety of the bikers against road accidents, also to get proper and prompt medical attention, after meeting with an accident. In India more than 37 million people are using two wheelers. Since usage is high, accident percentage of two wheelers are also high compared to four wheelers. Motorcycles have high rate of fatal accidents than cars or trucks and buses.

GPS and GSM makes the usage for intimation regarding an accident and identification of place, if Motorcyclist met with an accident it gives an information about location where he is met with an accident through GSM module to mobile numbers of family members, so have chosen GSM technology to give the information by sending SMS, using GSM module which has SIM card slot to place the SIM and send SMS. Sending SMS alone can't help the driver, if we send and an SMS saying that accident had occurred where the ambulance will come without knowing the location of the accident.
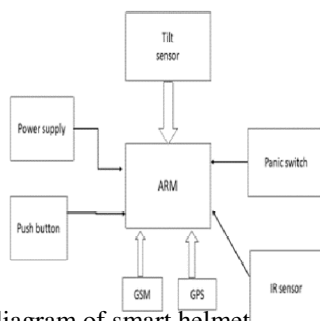
II. BLOCK DIAGRAM

Figure1:Block diagram of smart helmet

III. METHODOLOGY

A.ARM:

The ARM is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based On Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro programmed Complex Instruction Set Computers (CISC). This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core.

B. GSM modem:

A GSM modem is a wireless modem that works with a GSM wireless network. The GSM modem is having internal TCP/IP stack to enable you to connect with internet .It is suitable for SMS, voice as well as DATA transfer application in M2M interface, attending incoming calls etc., through simple AT commands. A GSM modem doesn't have a keypad and display to interact with. It just accepts certain commands through a serial interface and acknowledges for those. These commands are called as AT commands. There are lists of AT commands to instruct the modem to perform its functions.Every command starts with "AT". That's why they are called as AT commands. AT stands for attention. In our project, the program waits for the mobile number to be entered through the keyboard. When a ten digit mobile number is provided, the program instructs the modem to send the text message using a sequence of AT commands.

C. GPS:

Global Positioning System (GPS) satellite broadcast signal from space that GPS receivers, use to provide three-dimension location (latitude, longitude, and altitude) plus precise time. GPS receivers provides reliable positioning, navigation, and timing services to worldwide users on a continuous basis in all weather, day and night, anywhere on or near the Earth.

GPS GR87 is a highly integrated smart GPS module with a ceramic GPS patch antenna. The antenna is connected to the module via an LNA. The module is with 51 channel acquisition engine and 14 channel track engine, which be capable of receiving signals from up to 65 GPS satellites and transferring them into the precise position and timing information that can be read over either UART port or RS232 serial port. Small size and high-end GPS functionality are at low power consumption.

D.Tilt sensor:

Tilt sensors are devices that produce an electrical signal that varies with an angular movement. These sensors are used to measure slope and tilt within a limited range of motion. Sometimes, the tilt sensors are referred to as inclinometers because the sensors just generate a signal but inclinometers generate both readout and a signal. These sensors consist of a rolling ball with a conductive plate beneath them. When the sensor gets power, the rolling ball falls to the bottom of the sensor to form an electrical connection. When the sensor is tilted, the rolling ball doesn't fall to the bottom so that the current cannot flow the two end terminals of the sensor.

E.SMPS:

A switched-mode power supply (switching-mode power supply, switch-mode power supply, switched power supply, SMPS, or switcher) is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently. Like other power supplies, an SMPS transfers power from a DC or AC source (often mains power) to DC loads. Unlike a linear power supply, the pass transistor of a switching-mode supply continually switches between low- dissipation, full-on and full-off states, and spends very little time in the high dissipation transitions, which minimizes wasted energy. Ideally, a switched-mode power supply dissipates no power. Voltage regulation is achieved by varying the ratio of on-to-off time. In contrast, a linear power supply regulates the output voltage by continually dissipating power in the pass transistor. This higher power conversion efficiency is an important advantage of a switched-mode power supply. Switched-mode power supplies may also be substantially smaller and lighter than a linear supply due to the smaller transformer size and weight.

E.IR Sensor

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion.These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor.The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, The resistances and these output voltages, change in proportion to the magnitude of the IR light received.

F.LPC812:

The LPC81x are an ARM Cortex-M0+ based, low- cost 32-bit MCU family operating at CPU frequencies of up to 30 MHz. The LPC81x support up to 16 kB of flash memory and 4 kB of SRAM.The peripheral complement of the LPC81x includes a CRC engine, one I²C-bus interface, up to three USARTs, up to two SPI interfaces, one multi-rate timer, self wake-up timer, and state-configurable timer, one comparator, function-configurable I/O ports through a switch matrix, an input pattern match engine, and up to 18 general-purpose I/O pins. ARM Cortex-M0+ processor, running at frequencies of up to 30 MHz with single-cycle multiplier and fast single-cycle I/O port.

IV. RESULTS

A. Warning of Accident/Danger zones:
We are placing a danger Zone indicator circuit in the places where there is a chance of accident which continuously transmits signal

Whenever a person riding a bike enters the Accident Zone receiver communicates with the transmitter which is placed near accident Zone. Receiver senses the presence of danger zone.

B. For Accident Detection and Reporting:

Vibration sensors are placed in different places of Helmet where the probability of hitting is more which are connected to ARM7. Whenever the driver met with an accident the vibration sensors are going to senses more vibration, then they are going to interrupt the ARM controller .To avoid the false detection another sensor is used . Controller checks sensor reading also .if both sensors readings are true than the controller takes coordinates value from GPS module. Then sends a alert message to the driver family members using GSM module.
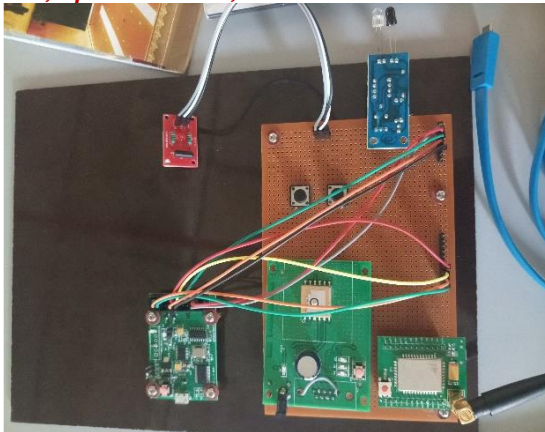
Figure 2:Smart Helmet using ARM

Figure 3:Message sent to family members Phone Number.

V.CONCLUSION

To improve the safety of motorcyclists. To develop Smart safety helmet for complete Rider, And to design a smarthelmet with features like road hazard warnings. To study and understand the concept of Transmitter and Receiver circuit in implementing the project. The above design satisfies all the objectives of the paper.

VI. FUTURE SCOPE

It could be implemented in all the helmets to save the life of human and it could be extended to know the dangerous roads,bridges by installing zone indicators in such areas.

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