Digital Helmet

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Abstract— A Digital Helmet is a special idea which makes motorcycle driving safer than before. This is implemented using Arduino MEGA 2560. The working of this Digital helmet using Arduino MEGA 2560 is very simple, we place vibration sensors in different places of helmet where the probability of hitting helmet is more which are connected to Arduino MEGA 2560 board. So, when the rider crashes by accident and the helmet hits the ground, the sensors sense and the Arduino MEGA 2560 extract GPS co-ordinates data using the GPS module that is interfaced with Arduino MEGA 2560. When the data exceeds minimum stress limit then GSM module automatically sends Information message containing google map link of Accident spot to ambulance or police or family members very precisely.

Key words: Arduino MEGA 2560, GSM SIM 900A, Microcontroller, GPS SIM28ML, Smart system, Piezo Vibration Sensor (MEAS), ATmega1280, Sensors, Force, Resistance, Motorcycles

I. INTRODUCTION

The thought of developing this digital helmet comes from social responsibility towards the society from us. As we can see many accidents occurring in Society, there is a lot of road kills. Fig-1: shows roadkills caused by various vehicle. According to a survey of Indian Govt. there are approx. around 48 roadkills occurring due to bike crashes or without proper care per day. It means 1,33,122 people died per year due to accident in2015 as per world road statistics as shown in Fig 1.1. The reasons for the road kills may be many such as no proper driving knowledge, no service of the bike, rash driving, drink and drive, no use of helmet or use of duplicate helmet etc. In some cases, the person injured the accident may not be directly responsible for the accident, it may be fault of some other biker, but end of the story it's both the drivers involved in the accidents who is going to suffer as well as his family and society. If road kills are one major issue, lack of treatment in proper time is another reason for accident death. According to the same survey by Indian govt. if 48 accidents occur per day, nearly 24 people die due to lack of treatment in proper time. The reasons for this may again be many like late arrival of ambulance, no person at place of accident to give details to the ambulance or fear of Police case. This is what is running situation in our day to day life in India, a thought of finding some solution to this problem come up with this idea of giving the information about road kills as soon as possible and in TIME….!!!! Because after all time matters a lot, if anything is done in time, at least we can save half the lives that are lost due to bike accidents or bike crashes or road kills.

So, a thought from taking responsibility of society came to our mind and we develop such project "DIGITAL HELMET".
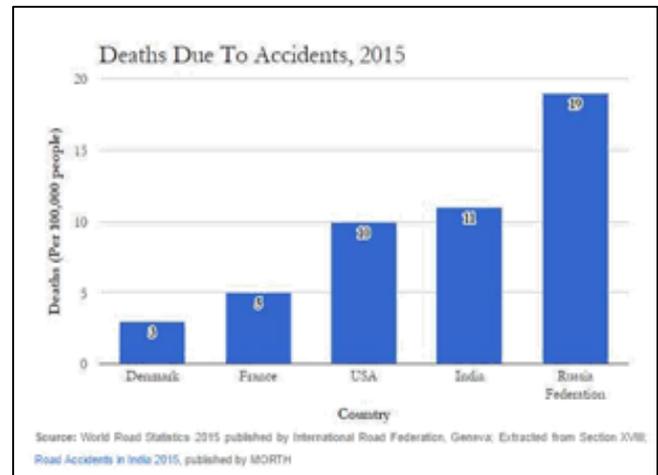

Fig. 1: Death Due to Road Accident in 2015

A. Aim of Project

The objective of our project is to give information to the ambulance and family members about the road kills as soon as possible so that they can take certain possible measures to save the life of the victim who met with an accident.

B. Methodology

The objective of this project is to give information about the road kills to the ambulance and family members, so we have decided to choose GSM technology to give the information of accident by sending SMS and call. We are using GSM module which has SIM card slot to place the SIM and send SMS as well as call.

Sending SMS can't able help the accident victim in case of bigger accident, if we sent an SMS saying that accident had occurred where the ambulance will not come without knowing the location of the road kills. So we include GPS location Link in the SMS which we are sending so that the ambulance will have exact information about where and when the accident has occurred. For this purpose, we must use GPS module to extract the location of the accident, the GPS data will contain the latitude and longitude values along with google map link using which one can find the accurate location of place where accident occur. To run the GPS and GSM module we use Arduino MEGA board which has ATmega328 microcontroller. The Arduino MEGA is a very user friendly device which can be easily interfaced by normal people who has basic knowledge of connection with any sensor module and is very compact in size and cheap.

Now we are clear that the Arduino MEGA will send the SMS using the GSM module by keeping the GPS location and Google Map link in the SMS which is obtained from the GPS(SIM28ML) module. But when should all this have to be done? When accident occurs, how will the Arduino MEGA detect the accident? We use a Piezo vibration sensor which is placed in the helmet. The Piezo

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vibration sensor is placed to detects vibration. When the rider crashes with vehicle in condition with helmet is worn, the helmet hits the road or ground and the Piezo vibration sensor detects the vibrations that are created when the helmet hits the road and then the Arduino MEGA will able to send an SMS containing information about the road kills and location of accident.

II. BLOCK DIAGRAM

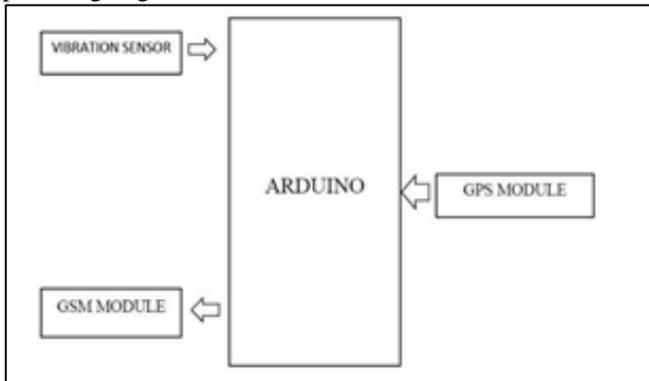Block diagram of this project is as given below on behalf of process going in a manner

Fig. 2: Block Diagram

A. Significance

This project is very useful in our day to day life and adds extra safety while driving. It's like a virtual assistant at the place of accident which sends the details to the ambulance. This is not only useful in bike crashes only but also in car accidents, it can be modified in car accidents by placing this device in the car belt and changing some threshold values of the MEAS sensor. Use of this project widely makes your life secure at crucial times, especially when the accident occurs at an unknown place, where there is no person to notice the accident occur. It helps in the situation when you can't even move your body or hand and in critical position. It automatically sends the information of accident.

B. Flowchart

Flowchart of this project is as given below on behalf of process going in a manner
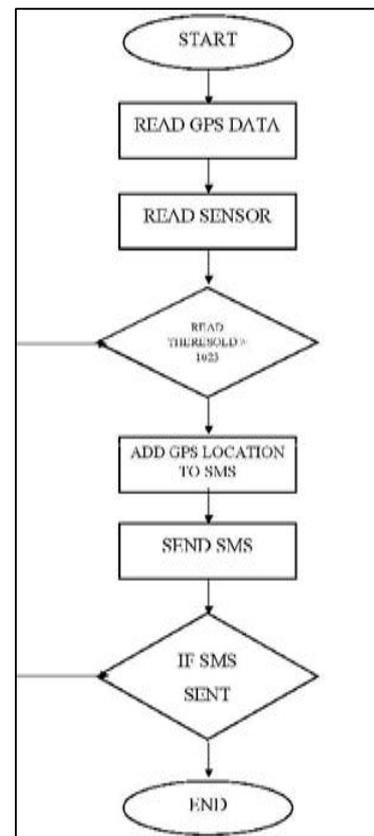

Fig. 3: Flowchart

III. ARDUINO MEGA 2560

The Arduino Mega 2560 is a microcontroller board based on the ATmega1280 chip. It has total 54 digital input/output pins (of which 14 can be used as PWM outputs pins), 16 analog inputs pins, 4 UARTs ports (hardware serial ports), a 16 MHz crystal oscillator inbuilt, a USB connection for programming, a power jack supply, an ICSP header for additional interfacing, and a reset button. It contains everything needed to support the microcontroller board, simply connect it to a computer or laptop with a USB cable or power it with a AC-to-DC adapter (5V) or battery to get started. The Arduino Mega is compatible with almost all shields designed for the Arduino Duemilanove or Diecimila.

The Arduino Mega 2560 has a number of facilities for communicating with a computer or laptop, another Arduino, or other microcontrollers as well. The ATmega1280 chip provides four hardware UARTs for TTL for serial communication. An FTDI FT232RL on the board channels one of these over USB and the FTDI drivers provide a virtual com port to Arduino IDE on the computer or laptop. The Arduino IDE includes a serial monitor which allows simple textual context data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via to the computer or laptop. An Arduino IDE Serial library allows for serial communication on any of the Mega's digital pins to device. The ATmega1280 chip also supports I2C and SPI communication as well.
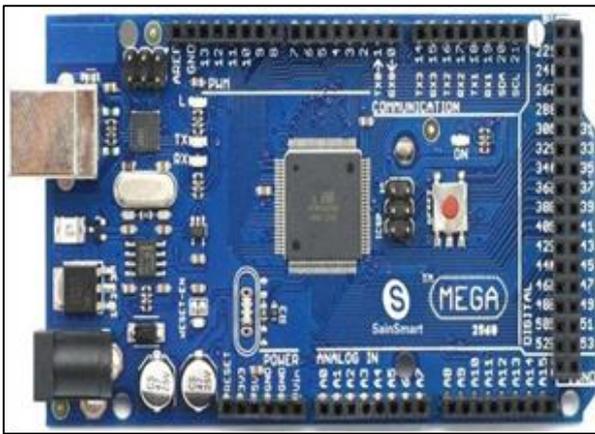
Fig. 4: Arduino Mega 2560

IV. PIEZO VIBRATION SENSOR (MEAS)

The Piezo Vibration sensor (MEAS) Minisense 100 is a low-cost cantilever-type vibration sensor loaded by a mass to give high sensitivity pf sensor at very low frequencies. The pins are designed for easy installation. Horizontal and vertical mounting are offered as well as a small height version of Minisense. The active sensor area is shielded for improved RFI/EMI rejection mode. Rugged, flexible PVDF sensing element withstands high shock overload. Sensor has very excellent linearity and dynamic range, and may be used for detecting either continuous vibration or impacts.

Fig. 5: Piezo Vibration Sensor (MEAS)

V. GPS SIM28ML

The FGPMMOPA6B is an ultra-compact SIM28ML (Patch on Top) GPS Module. This SIM28ML GPS receiver provides a high-quality solution that is high in position and speed accuracy performances, with high sensitivity and tracking capabilities in all conditions. The GPS chipset inside the module is powered by MediaTek Incorporation, the world's leading and innovative digital media solution provider and the largest fab-less IC company in Taiwan. The module can now support up to 68 channels, and is designed for small-form factor device.

It is suitable for every GPS-related application, such as:

Asset Tracking LBS and AVL system Security system

Hand-held device (Mobile) for personal positioning and travel navigation

Fig. 6: GPS Receiver

VI. GSM SIM900A

GSM TTL Modem is built with SIMCOM Make SIM900 Quad-band GSM/GPRS engine, works on many frequencies like 850 MHz, 900 MHz, 1800 MHz and 1900 MHz It is very compact in size and easy to use as plug in GSM Modem. The Modem is designed with function of 3V3/5V TTL interfacing circuitry design, which allows you to directly interface to 5V microcontrollers device as well as 3V3 Microcontrollers. The baud rate can be configurable up to 115200 through AT command channel. Initially Modem is in Auto baud mode. This GSM TTL Modem is having internal TCP/IP stack to allow you to connect with internet via GPRS connection. It is suitable for SMS as well as DATA transfer. The SIM900A modem needed only two wires (Tx, Rx) except Power supply to interface with microcontroller/Host device. Using this SIM900A modem, you will be able to send& Read SMS, connect to internet via GPRS through simple AT commands code.

Fig. 7: GSM SIM900A

VII. APPLICATION

– Useful for Plant Worker.
– Useful for two-wheeler Rider Help to protect life in road kills.
– Number of cases of violated traffic rules can be reduced.
– Help to Save Precious life while roadkills due to lack of treatment at proper time.
– Help for mine workers to get help while accident in mine

VIII. RESULT

Result of this project is as given below on behalf of process going in a manner
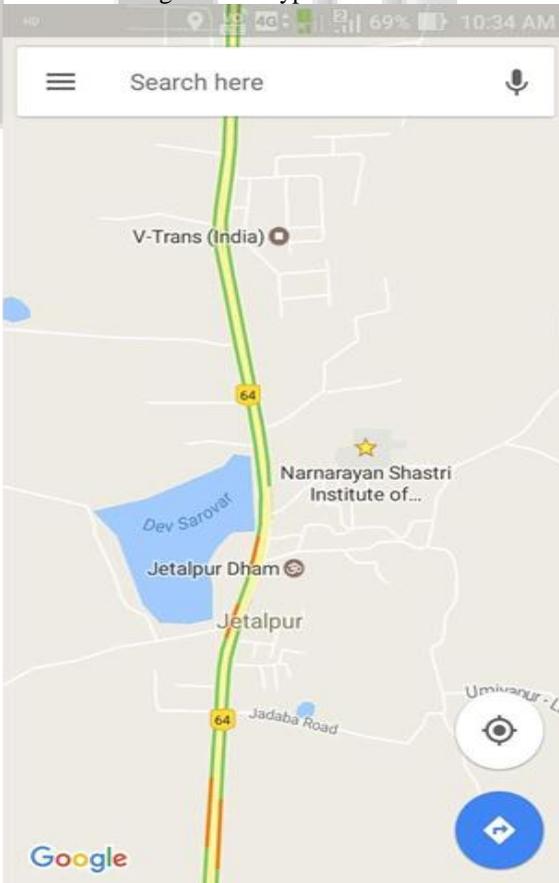

Fig. 8: Prototype of Helmet

Fig. 8: Google Map Shows Accident Spot Precisely

IX. CONCLUSION

As the concluding part of this project, we would like to say that-"Without proper action at a right time, danger awaits us with a larger face." We must act on time when a person is injured. We must take care of person the way it should meant. otherwise, a valuable life might be lost. We need to understand how precious lives of people are and what importance first-aid must carry in saving these most precious lives of human being. If this project imparts this idea in even one person in real life, we would think that the project will be successful.

X. FUTURE SCOPE

In future time if there is a large demand of this type of digital helmets we can manufacture the whole PCB circuit in printed circuit board, so that circuit becomes smaller and can be easily fitted into small helmet. The circuit can also be powered by solar energy so that it uses green energy and does no harm to outer environment. The flexible solar panels can have fixed all along surface of helmet. This type of helmet technology we can be implemented for some combat helmets used by the soldiers working under extreme temperatures.

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