IOT Based Healthcare Assistance through ThinkSpeak

Sowmyashree M.S, K.Aishwarya, Saritha I.G, Sahil A, Abhishek B Kalnoor, Rahu S
Telecommunication Engneering, BMSIT&M, Bengaluru, India

Abstract- In this developing era of IOT where in the information provided by objects across network proves to be an asset in various fields, this work is an implementation of the same. Mobility on roads has been subjected to accident occurrences every day which has raised a concern to improvise the availability of healthcare norms. In this system the accident zone detection is done and the location of the vehicle is intimated to the ambulance with help of GSM. The ambulance then rushes to the place with healthcare assistance kit to measure the vital health parameters of the victim. The health measure are sent to the near by hospital using Thing Speak. Apart from that it also provides real time health monitoring through visual graphs representation. Since the condition of the victim can be identified early the patient can be taken directly to the near by hospital with all the required facilities to save the life of victim.

Keywords- Arduino, ArmLPC2148, ESP8266, Think Speak.

I.   INTRODUCTION

Internet of things is becoming a life changer for human beings. It provides a simplified and faster approach to various day to day tasks ranging from home automations to military application. For information exchange in open computing and recognition of data transfer, Internet of things appear to be a great choice. After the age of robots ,IOT has become a new technology for helping humans at the time of need. As introduction of latest technologies aims to serve the user better similarly IOT can also can be observed to provide a better solution for hazardous situation. Road accidents which tops the list of hazardous occurrences calls for an improvisation for bringing heath helps on roads. A system for overall monitoring of the victim has to be provided in order to make sure the person reaches the hospital soon.

Sensors fitted on the vehicle can be used to identify the collision impact during accident and measure the tilt of the vehicle to confirm the occurrence of the accident .Once the accident has been detected by the sensors the GSM module can be used to intimate the ambulance with the GPS coordinates of the accident zone. The ambulance can figure out the place where accident occurred and reach that located area for helping the victim. The healthcare assistance kit presented in the ambulance can provide an accurate measure of the health condition parameters of the victim. Real time health parameters of the victim are being monitored by the hospital. The objects utilized in the ambulance for health measure can comprise of a wireless network which is provided by IOT to exchange data. The hospital is able to retrieve the health parameters of the

victim using an web application known as ThingSpeak which is an application of the IOT cloud data transfer.

II.   LITERATURE REVIEW

In this mechanism it will detect whether the person is wearing helmet or not and check whether the person is over consumed alcohol, the sensors like tilt sensor & impact sensor are used to detect the accident and data are sent to the server through Application Programming interface[1].

Initial process starts with identifying the accident location. The intimation of the accident can be given by Arduino interfaced with GSM to send alert message along with the coordinates provided by GPG[2].

Monitoring the basic health Parameters of patients after the accident within the ambulance with sensors such as heartbeat, MEMS, Blood pressure, temperature etc and sending the same data to the hospital[3].

Proposing a System with help of Internet of Things (IOT) detecting the accidents occurred in the two wheelers using microcontroller and a accelometer and notifying the same to authorized person or to the emergency contact of the rider and creating a plot of accidents occurred in the city for future analysis[4].

Due to the delay of providing Emergency medical services(EMS) there is a high mortality rate in road accidents in our country as there is delay involved in each and every stage of the process starting from reporting an accident to dispatching an ambulance until the victim is handed over to the hospital or to the concerned person. If this delay can be reduced then many lives can be saved to overcome this when an vehicle meets with an accident the module presents in it will automatically send a message to the nearest ambulance to the accident location, with the help of android application the driver takes the shortest path to the hospital without wasting any time[5].

As internet is a platform that leverages the functionality and usefulness of smart object. Smart things or smart objects are the buildings block of IOT. These objects generate great amount of data which can be stored, processed, and formatted into an efficient and seamless useful form. IOT is not only a platform for sensing the data from environment, but also using internet standards to provide services for transfer of information or data. Various technologies are being used in our daily life some of them are Bluetooth, radio frequency identification on which the IOT operates effectively[6].

Using Automatic smart accident detection(ASAD) which is an auto detection system that notifies an emergency contact through a text message when there is an instant change in acceleration, rotation and an impact force on the vehicle is detected by the system, providing the location and time of the accident occurred so that further congestion as well as the passengers can be escorted to the hospital without wasting any time[7].

It identifies the intelligent frame works and report an accidents in city. which included microcontroller based Accident detection unit , it contains GPS & GSM to sense the accident and send the event to the accident detection server. The GPS coordinates and sensor parameters are sent to the Accident detection server through GSM[8].

By knowing the heart rate of the person its sends an alert message along with GPS coordinates to the emergency contact through SMS,E-mail only when the heart rate is reached beyond its range[10].

III.   METHODOLGY
This work constitutes of three segments namely
1. Vehicle unit.
2. Ambulance unit.
3. Hospital unit.

TABLE I.

Components	Specification
Pressure sensor	FSR 402
Tilt sensor	ADXL335
Gsm module	SIM 800A
Pulse rate	SEN-11574
Temperature sensor	LM35
Blood pressure sensor	BPS-BTA
Wifi module	NODE MCU ESP8266

1. Vehicle unit:-
Implementation of this unit facilities the process of detection the accident through sensors fitted on two/four wheelers sensors attached to user Arduino interface along with GSM and GPS. When the sensor an impact Arduino interface with GPS gets the location of the accident spot and forwards it to GSM. The GSM module then sends a message of those coordinates to the ambulance.

Software used:- Arduino IDE provides a text editor to create codes in accordance to the purpose to be fulfilled. The codes can be developed in embedded c and it allows to interface Arduino hardware components to which the program has to be uploaded. The provision of set of AT commands along with the program are also required to establish a connection between the mobile operator and GSM.

Sensors:-
i. Pressure Sensor :- It can also be called piezoelectric pressure sensor which can be used for measuring the impact of force on it by converting them to electric charge. The sensor consists of a pressure sensitive diaphragm which provides a change in resistance when force is applied, the change in resistance is later converted into electric signal.

Fig.1: Pressure Sensor.

ii. Tilt Sensor:- ADXL335 also know as accelerometer is a electromagnetic device used for measuring the acceleration of the vehicle. It measures acceleration only caused due to gravity in g units in x, y and z direction. The tilt is measured using the output of the x ,y and z direction measures. The output signal from this sensor is analog this sensors is analog voltage that is proportional to the acceleration.
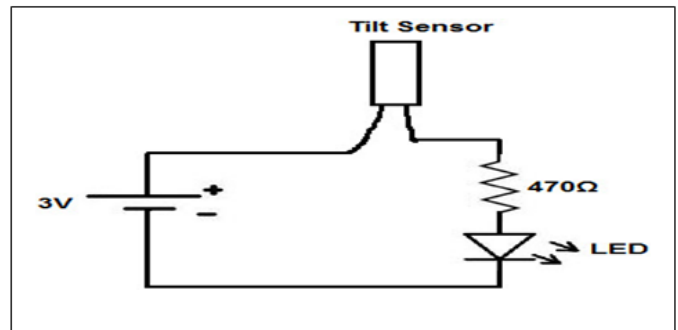

Fig.2:Tilt Sensor.

iii. GSM:- The mobile communication model(GSM) is an open and digital cellular technology used for transferring the data services. It is used to establish a communication link between GPRS and Arduino.

Fig.3: GSM Module.

iv.   GPS:-   The Global positioning system (GPS) module is a device that is used to calculate the geographical position using the information received from the GPS Satellites. This unit is installed in our vehicle unit mainly to provide the position of the accident and to provide the necessary directions to access the accident location. The GPS system can get the location of the accident at any point of time irrespective to change in the weather, temperature and other conditions.

2. Ambulance Unit:-
This unit works to provide the necessary help to the victim after the accident. After reaching to the accident spot it identifies the health condition of the victim by measuring the health parameters using the health care assistance kit. The kit consists of equipments such as pulse sensors, temperature sensors and blood pressure sensors which measures the respective health fields of the victim. These parameters are the transferred to the IOT cloud so that hospital can avail the data of the patient. Hospital can be aware of the condition of the patient before he reaches the hospital so that all necessary arrangements for treatments is made available.

Software Involved:-
i.   ARM LPC2148:- It gives a family of instruction set architecture to the computer processor because of its reduced instruction set architecture(RISC). It required fewer transistors than traditional ones because of the RISC architecture. LPC2148 microcontroller has a 16/32 bit ARM7TDMI-S CPU with embedded trace support and real time simulation combines the microcontroller with embedded flash memory from 33kb to 512kb. The alternative 16-bit thumb mode reduces the code over head significantly in case of critical code size application. Tiny size, power efficiency, inbuilt peripherals makes it suitable and more reliable for end application developing purposes.
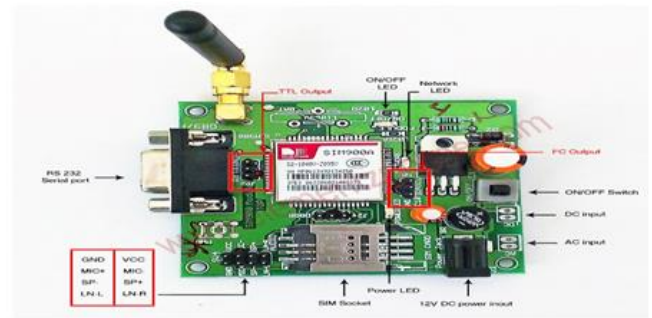

Fig.4: ARM Microcontroller.

ii.   Pulse Sensor:- Pulse sensor is a heart rate sensor which is incorporates live heart rate data to the user. This sensors is plug and play unit. This sensor can be clipped to the finger tip or to the earlobe to measures constant heart rate and plugs the data right into the Arm board. It uses an ambient light sensors, which senses the light which bounces back from LED devices fixed to the sensors. It has amplification and noise cancellation circuit making it fast and easy to obtain pulse reading from the victim.
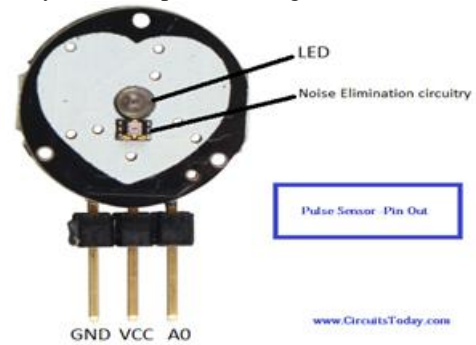

Fig.5: Pulse Sensor

iii.   Temperature Sensors:- Temperature sensor is a device used to measure the hotness or coldness of an object. We are using this sensor to obtain the temperature of the victim. We are making use of precision IC temperature i.e. LM35. It calibrates the temperature value which is digital directly in degree Celsius hence does not require and external analog to digital converter. It produces electrical output value which is directly proportional to temperature.
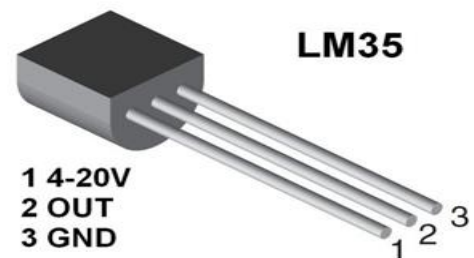

Fig.6: Temperature Sensor.

iv. Blood Pressure Sensor:- BP sensor's main task is to measure the pressure of circulating blood on the walls of blood vessels and produce a digital value corresponding to the BP of the victim. This sensor uses the oscillometric method to calculate the blood pressure. In this technique, the observation of cuff pressure by the sensor are caused by oscillating of blood flow, i.e. the pulse. Blood pressure is recorded as two numbers , the systolic pressure (as the heart beast) over the diastolic pressure(as the heart relaxes between the blast).

Fig.7: BP Sensor.

v. WIFI Module:- The data that is measured using different sensor devices i.e. pulse, blood pressure, and temperature is transferred to the cloud storage, for this purpose a WIFI module is being used. ESP8266 is a system on a chip with integrated TCP/IP protocol stack that can be provided any microcontroller access to WIFI network. This is a system with a powerful enough on-board processing and storage capability that allows it to be integrated with sensors and other applications specific devices through its GPIO with minimal developments up-front and minimal loading during runtime.

Fig.8: ESP 8266(WiFi Module)

3.Hospital Unit:-

i. ThinkSpeak:- ThingSpeak is an open source application of internet of things, it also an application programme interface which helps to store and retrieve data from the objects using basic protocols such as HTTP protocol, etc over the internet or wireless LAN network. This application has integrated support from MATLAB which allows it to analyse and visualize the uploads data and represents them in the graphical way.

IV.   WORKING PRINCIPLE

The working of the whole unit can be explained by using the following flowcharts as shown in Fig. 4.
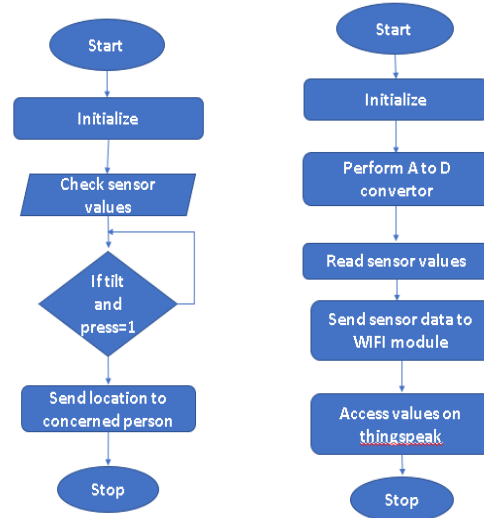

Fig.9: Working of vehicle unit and ambulance unit.

There are two sensors that are fixed to the vehicle, one being the tilt sensor and other being the pressure sensor. The tilt sensor is an analog sensor while the pressure sensor is a digital sensor. The tilt sensor has a threshold range of tilt that is set initially by the programmer,if the tilt crosses the threshold then the sensor is said to send an intimation to the Arduino mentioning about the occurance of the accident.this is the first kind of intimation that can be sent. The pressure sensor can only hold two values i.e. 0 and 1,where 0 represents that there is no force or pressure applied to the sensor and 1 represents that there is a force that is applied on the sensor during the accident. When an accident occurs, the detection can be done in two different intimations that are received from the tilt and pressure sensors.

As soon as the intimation of accident is received by the sensors, the GPS unit which is fixed to the vehicle unit locates the accident by finding the co-ordinates of the accident. These latitude and longitude coordinate values are saved and sent to the ambulance unit or the recipient using the GSM module.The intimation which is sent by the vehicle unit is shown in the Fig. 5. This whole procedure forms the working of the vehicle unit.
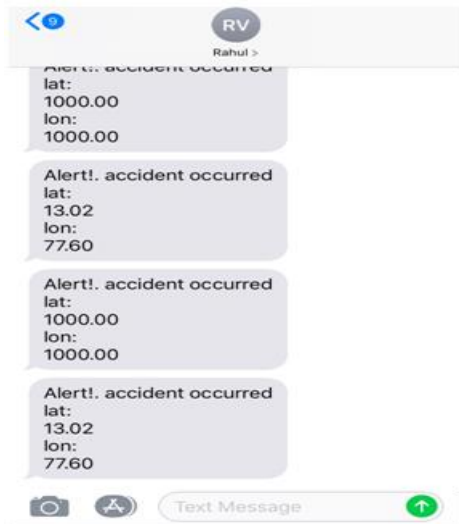
Fig.10: The intimation message from vehicle unit.

The ambulance unit is mainly used to check the vital health parameters of the victim and keep a track of the same before the victim reaches the hospital. The sensors such as BP sensor, Temperature sensor and Pulse rate sensor gives the values of victim's Blood pressure, Body Temperature and heartbeat rate in digital values respectively. These values are uploaded to the cloud using the WiFi module.

The Hospital unit consists of an IOT Application called ThingSpeak. This application is used to retrive the values of the Ambulance unit with respect to time and display all those values in a Graphical format. The advantage of this application is that it can keep the track of victim's information at each interval of time from accident spot till the time the patient reaches the hospital. The variation in the victim's vital health parameters can also be kept track. The different parameters are showcased with respect to time as shown in the Fig. 6, Fig.7 , and Fig. 8.
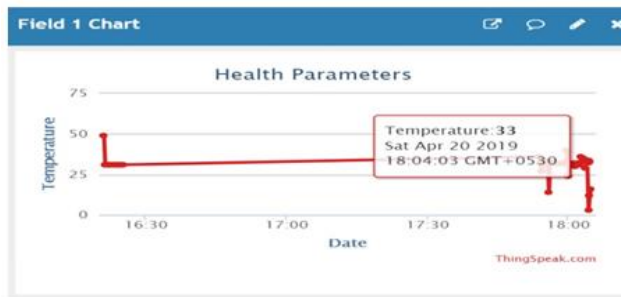
V. RESULTS

Fig.11: Blood Pressure of victim.
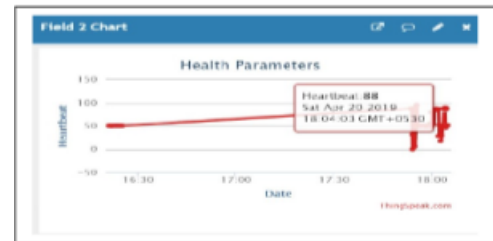

Fig.12: Temperature of victim..

Fig.13: Pulse Rate of victim..

VI.   RESULTS

The Pressure sensor and tilt sensor identifies the event of accident. The Arduino interfaced with GSM and GPS responds to the event and the GPS coordinates of the victim is found. The accident alert intimation along with the GPS coordinates of the victim are then sent to the ambulance in the form of a text message using GSM.

Once the accident alert message has been received by the ambulance it reaches the spot of accident. The pulse rate, temperature and blood pressure of the victim is calibrated using sensors. This data is then sent to the hospital using IOT cloud web application Thing Speak.

The above three graphs provides the respective health condition graph in accordance to the time. This way real time monitoring can be achieved as the hospital is able to observed the graph patterns from the time to time and predict the condition of the victim accordingly.

VII.   CONCLUSION

In this paper we propose a system for providing immediate healthcare assistance to the victim on the event of accident. Once the accident occurrence is detected and the victim has been located an approach for the ambulance to provide health condition of the victim to hospital has been discussed. This work tells how ambulance can be equipped with IOT based healthcare assistance module to transfer the vital health parameters of the victim. These parameters are available at the hospital using ThingSpeak so that real time monitoring of the patient is achieved right from the time victim is in ambulance and even after reaching the hospital. IOT has been used to transfer data over distance efficiently similarly health condition of the victim are sent to the hospital frequently to

avail according health services immediately as soon as patient arrives at the hospital.

VIII.   FUTURE SCOPE

This work provides a prototype which can be used for real system application to provide the road safety and healthcare services management. By implementing a web application which can be hosted by traffic police of each country. The accident zone coordinates can be intimated directly to traffic police server and so the nearest ambulance and hospital can be identified in no time. This way the healthcare services for road hazards can be provide quickly without any delay and hence can bring an overall improvisation services at the time of need.

IX.   REFERENCES

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