

**Program: ESE 4009\_2**

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**Group# 2**

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**Project Proposal**

**Project Title:** GSM and GPS Based Ambulance Tracking with Health Monitoring System  
**Description of the latest similar system:** Basic idea of the project is to track an ambulance and health details to the hospital. Project is mainly divided into three parts first is collecting the health details of the patient, second one is tracking down the ambulance that is carrying the patient and last one is the sending details over to the hospital. Parameters of health are heartbeat, temperature. So, the values of the sensors are recorded and sent to the hospital number by the help of GSM. It is very helpful as hospital staff get details about the patient in advance so that they can be prepared in advance. GPS is used to record the values of latitude and longitudes of the vehicle and by this means the vehicle can be easily traced and approximate time that is needed to reach to the hospital

Figure 1 Block Diagram

ARDUINO

Wi-Fi module

GSM module

GPS module

LCD display

Blood pressure sensor

Heart beat sensor

Buzzer

Temperature sensor

Accelerometer

Settings key

**Hardware Components:**

The listed hardware components are used in this system and are explained below:

**GSM modem:** GSM stands for Global System for Mobile Communication. It is a hardware device that uses the GSM mobile telephone technology to provide a data link to a remote network. It accepts a SIM card and mainly works as mobile phone. Now, the GSM in this project is used to send all the patient’s information that is temperature and heartbeat, to the doctor with the help of text message. The microcontroller used in the project is connected with GSM modem to perform serial communication, so as the text message will be sent.



Figure 2: GSM modem

**GPS modem:** GPS stands for Global Positioning System. Here, it is used to provide longitude and latitude of the ambulance. It received data from the satellite and transmitted it to the serial port of the microcontroller. The patient’s location is tracked, and variations are given to the microcontroller.

**Arduino:** This is the processing unit of the system. Every sensor is connected to this device. Readings and information retrieved from these sensors is feed into the processor and this information is basically in the form of analogy signal. After the data is processed by the Arduino it is then converted into the digital form and sent to the display. This processor unit is used for:

For latitude and longitude reading from GPS modem.

For heartbeat reading.

For displaying the reading.

For sending the SMS from GSM modem.

For turning on the buzzer if any reading exceeds the threshold values.

**Heartbeat Sensor:** Heartbeat sensor is used in this project to determine the heartbeat of the patient. The sensor works on the principle that blood in the human body pumps with every heartbeat. As the heartbeat sensor consists of two devices Red LED and LDR. LDR is a light dependent resistor that is a passive electronic component, basically a resistor which has a resistance that varies depending of the light intensity. So, the patient needs to place his finger in between these two components and the red light will be reflected from patient’s finger to LDR. The blood will pump with every heartbeat. And this results in the fluctuations in the light intensity.

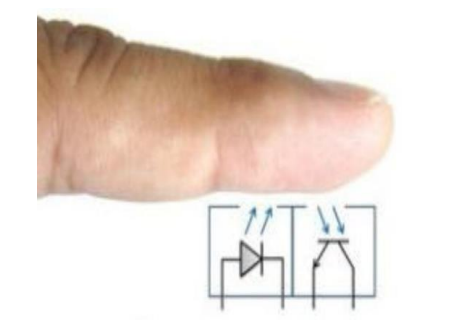


Figure 3 Heartbeat Sensor Principle

**Temperature Sensor:** In this project we have used the temperature sensor to measure the temperature of the patient. It is an analogy type of sensor that will always monitor the variations on the temperature of the patient. It gives variable output voltage as per the variations in the temperature received as per the temperature sensed.

**Buzzer:** In theproject,we are setting a threshold value to give indication. As the parameter, temperature or heartbeat crossing a threshold value the buzzer will be activated or will be turned ON. This is quite helpful as the doctors will be alert before the patient arrived to the hospital, and the doctors will be well prepared to handle the situation.

**Blood pressure sensor:** A potentiometer is a manually adjustable variable resistor with 3 terminals. Two terminals are connected to both ends of a resistive element, and the third terminal connects to a sliding contact, called a wiper, moving over the resistive element. The position of the wiper determines the output voltage of the potentiometer. The potentiometer essentially functions as a variable voltage divider. The resistive element be two resistors in series (potentiometer resistance), where the wiper position determines the resistance ratio of the first resistor to the second resistor.

**Advantages:**

1. With help of this project, the live location of the ambulance is easily tracked because GPS system is included in the Circuitry.
2. Doctor will be well aware about the patient’s health before the patient arrival, as the temperature and heartbeat will be measured by the respective sensors used in the project and will be immediately send to the doctor.
3. With the help of this project, patient life can be saved.

**Limitations:**

1. Microcontroller, which is known as the heart of any project, As the controller listed above is easy to use but still lacks in processing speed as compared to the latest microcontrollers available in the market.
2. Less sensors have been used.
3. ESP8266 is a single core processor that slows down the speed as number of sensors increases.

**References:**

http://www.ijera.com/papers/vol9no6/Series-3/G0906033640.pdf

<https://www.ijert.org/research/design-gps-and-gsm-based-ambulance-tracking-with-health-monitoring-system-IJERTCONV4IS11009.pdf>

**Solution 1:**

**Block Diagram:**

Power Supply

Sweat sensor

Beagle bone

black

Temperature sensor

GPS module

Heart rate

sensor

ESP 8266

Blood oxygen sensor

GSM module

Accelerometer

Medical center

LCD 16\*2

As per the limitation of the existing project, Arduino Uno is used as a main microcontroller, we are replacing it with the Beagle Bone Wireless.It is a 32-bit processing device with the fast-processing speed as compared to Arduino uno. Beagle bone Black is a low-cost hardware device that work as a mini computer and comes with in-built Debian. It supports many operating systems like LINUX, cloud 9 and many more.

**Use of various peripherals such as touch screens, cameras, microphones and speakers, GPIOs, timers, GPS modules, Bluetooth, Wi-Fi, and ADC/DACs?**

* For this project, we are using various sensors, and to connect these sensors with the microcontroller, GPIO (General Purpose Input Output) pins are used.
* GPS module is also used in this project to determine the longitude and latitude of an ambulance, so that it can be tracked.
* Beagle bone Black will be used as a main microcontroller, As the WI-FI module ESP32 is used to establish a relation with the IOT.

**Use of I2C, SPI, RS232/RS-485, IrDA infrared, JTAG, USB, Bluetooth, IEEE 802.11 Wi-Fi\_\_\_33, IEEE 802.3 Ethernet, CAN and GPS protocols and systems?**

* All the devices connected the main controller will be capable of doing the digital communication.
* Adafruit io cloud will be used to store the data in real-time.
* The connection to the beagle bone black will be through the SSH (Secure Shell).

**Use of pre-emptive versus cooperative scheduler operation; tick rate and time slicing; critical code; fixed, dynamic and hybrid task priority allocation; application-specific considerations; power management tactics; semaphores, mutexes and queues; debugging strategies; performance estimation?**

* It would be our best try to reduce the power consumption so pre-emptive scheduler will be usable.
* A very fast performance is expected as processing will be done by Beagle bone Black.
* Usage of several sensor to monitor health condition
* Implementation of Alerting and Tracking System
* Realtime update on IoT Server
* GSM module for sending SMS

**Hardware and Software Requirements:**

**Hardware Requirement:**

* Beagle bone Black: Main microcontroller
* 5V Power Adapter
* USB Cables
* ESP32
* Temperature Sensor
* Heartrate Sensor
* Accelerometer
* Blood pressure Sensor
* Skin Sweat Sensor
* GPS Module
* GSM Module
* 16x2 LCD
* Jumper Wires
* Multimeter
* Soldering Kit
* Breadboard
* Laptop Device
* SD card

**Software Requirement:**

* **Coding:** Coding will be mainly done using C/C++ programming language. GCC Compiler will be used for code compilation.
* **Internet connectivity:** WIFI will be the preferable mode for Internet Connection.
* **PCB designing:** PCB Designing will be done on EasyEDA Software.
* **Assembler:** GNU Assembler will be used which is default assembler for GCC Compiler.
* **Linux OS:** Beagle bone black support LINUX operating system. And we are using Linux to flash latest image of Debian as per the requirement of the project. Usually, Beagle bone devices come with pre-installed Debian images but we have to update it to meet our requirement.
* **Adafruit io:** It is an open-source Internet of Things. It is used to display, respond, interact with projects data. Mainly, it keeps the data private and secure and can be download at any time. Data can be stored in any form like charts, graphs etc. It is available free forever. If we have adafruit IO account for free, the rate data is 30 data points per minute.
* GNU **NANO** is a small and easy to use friendly text editor. This text editor totally supports the Beagle bone black. We can easily write the program and save it using the specific extension for example if we are making a txt file, we can save it with .txt extension. And lastly, we can make it executable using GCC command.
* **ECLIPSE:** Eclipse is an integrated development environment used in computer programming. It contains a base workspace and an extensible plug-in system for customizing the environment.
* **GCC:** The GNU Compiler Collection is a compiler system produced by the GNU Project supporting various programming languages. GCC is a key component of the GNU toolchain and the standard compiler for most projects related to GNU and Linux, including the Linux kernel.

**References:**

[**https://www.espressif.com/en/products/socs/esp32**](https://www.espressif.com/en/products/socs/esp32)

<https://beagleboard.org/black>

<https://io.adafruit.com/api/docs/#client-libraries>

<https://io.adafruit.com/>

<https://www.ijert.org/research/design-gps-and-gsm-based-ambulance-tracking-with-health-monitoring-system-IJERTCONV4IS11009.pdf>

 http://www.ijera.com/papers/vol9no6/Series-3/G0906033640.pdf

**Solution 2:**

**Block Diagram:**

Sweat sensor

Power supply

GPS Module

Beagle bone

Black

Temperature sensor

Heart rate sensor

Blood oxygen sensor

Accelerometer

ESP 32

GSM module

LCD 16\*2

Medical center

As in the existing project there is ESP8266 WIFI module is used to build a relation with the cloud service, and IOT service used is: Thing Speak. It is an open-source Internet of Things application and API used to store and retrieve data using the HTTP (Hypertext Transfer Protocol) and MQTT (Message Queuing Telemetry Transport). It is used to store and retrieve data. As the ESP8266 is a single core processor and is used for interfacing and WIFI. As the main device (Arduino) is quite busy because all the connections are being done with it. So, it effects the speed of whole project. So, we will be going to replace WIFI-module 8266 with the ESP 32 as it has a dual core processor and works with the double speed as compared to the ESP 8266. We will use the ESP32 WIFI module to perform interfacing with the main device microcontroller that is Beagle Bone Black. Interfacing like UART between the BBB and GSM module to make the transmission receiving possible.

**References:**

[**https://www.espressif.com/en/products/socs/esp32**](https://www.espressif.com/en/products/socs/esp32)

<https://makeradvisor.com/esp32-vs-esp8266/>

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