



# **DEFENSE ASSISTANCE SYSTEM**

## **A PROJECT REPORT**



*Submitted by*

**KARTHIKEYAN N**

**Reg No.:13BEC069**

**KRISHNAKUMAR S**

**Reg No.:13BEC079**

*in partial fulfilment for the award of the degree*

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## **BONAFIDE CERTIFICATE**

Certified that this project report “**DEFENSE ASSISTANCE SYSTEM**” is the bonafide work of **KARTHIKEYAN.N[13BEC069]** and **KRISHNAKUMAR.S[13BEC079]** who carried out the project work under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other project or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

**SIGNATURE**

Dr. K. Paramasivam M.E, Ph.D,

**PROJECT SUPERVISOR**

Department of ECE

Kumaraguru College of Technology

Coimbatore-641049

**SIGNATURE**

Dr. K. Malarvizhi M.E., Ph.D,

**HEAD OF THE DEPARTMENT**

Department of ECE

Kumaraguru College of Technology

Coimbatore- 641049

The candidate with Register No:13BEC069 and 13BEC079 is examined by us in the project

viva-voce examination held on .....

**INTERNAL EXAMINAR**

**EXTERNAL EXAMINAR**

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## **ABSTRACT**

A soldier on a mission is more likely to face many obstacles and hard times. During such situation they should get necessary help. Help may in the form of backup or immediate medical attention. The primary requirement to help is to know the exact location of the soldier. Considering this a design of utility jacket for the soldiers is done. The utility jacket is embedded with sensors, microcontroller and communication device to achieve this goal. The utility jacket is designed to provide immediate first aid by sensing soldier's health vitals and also provides means to track and monitor their location. Microcontroller controls the sensors and communication devices. Jacket consists of temperature sensor to monitor the body temperature of soldier. Cloud server is used to store the soldier's location and health vitals. Android application is used to monitor the data generated from the jacket. Using the application, every soldiers are able to see the position of every other soldiers who are in the same mission. A soldier can manually call for help by using SOS service provided in the application. Every soldiers will be monitored by the base station and backup or medical team will be sent to the location of needy soldier. A soldier can sense nearby soldier if he needs any help. The base station can specify the destination location. The application also includes the geo-fence feature that alerts when the soldier moves from one location to another location. The regions are separated by circle on the map and enemy region is covered by red circle. This helps the soldier to realize in which region they currently are. Hardware module with its android application is experimented and found working correctly. The module will be surely helpful to the defence of the Nation.

# CHAPTER 1

## INTRODUCTION

The Department of Defence Production of the Ministry of Defence is responsible for the indigenous production of equipment used by the Indian Armed Forces. The Government of India has launched Make in India initiative to indigenise manufacturing and reduce dependence on imports, including defence imports and procurement. The defence assistance system is one of the initiative to provide a better defence system to the country so that the soldiers are provided with a better support during the security duty. Basically the health condition of the soldiers are not know until he is checked physically and the base camp is unaware of the location of the soldier accurately. This defence assistance system is aimed at providing the health condition and exact location of the soldier simultaneously to the base camp and alert them when there is an emergency. Hence in monitoring the health condition and location ,the Heartrate sensor, temperature sensor and GSM SIM 808 are employed and the information collected is provided to the Cloud which in turn provides the information to the base camp . This system provides vital help to serve the soldiers better in critical situation and in case of emergency. With the advancement in the technology of Internet of Things these transmission of the data is made possible with ease. The **Internet of things (IoT)** is the inter-networking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings, and other items—embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. This data of the soldier that is collected is also stored in the cloud for future reference and use.

## **CHAPTER 2**

### **LITERATURE SURVEY**

#### **2.1 EXISTING SYSTEM**

In the current system the soldiers are monitor and all the requirements during the mission are provided by the base station. The soldier's health vitals are monitored periodically. In case of medical emergency, the backup team is notified through text message or wireless telecommunication. Soldier's geographical location is specified in the message for the backup team to reach. Soldiers can view the destination on their local device which is specified by the base camp.

#### **2.2 LITERATURE SURVEY**

The author says [11] how the semantic data model is proposed to store and interpret IoT data. Then a resource-based data accessing method (UDA-IoT) is designed to acquire and process IoT data ubiquitously to improve the accessibility to IoT data resources. Finally, we present an IoT-based system for emergency medical services to demonstrate how to collect, integrate, and interoperate IoT data flexibly in order to provide

Support to emergency medical services. The result shows that the resource-based IoT data accessing method is effective in a distributed heterogeneous data environment for supporting data accessing timely and ubiquitously in a cloud and mobile computing platform. It also deals with the activities and roles in medical system, Meta data models and big data.

## **ADVANTAGES**

- It is reliable and flexible.
- It is highly efficient in remote accessing of data.
- Heterogeneous data collection and processing.

## **DISADVANTAGES**

- No live monitoring of patient's data
- High maintenance cost.

In modern health care environment[12], the usage of IoT technologies brings the patients applied to various medical areas (such as real-time monitoring, patient information management, and healthcare management). The body sensor network (BSN) technology is one of the core technologies of IoT developments in healthcare system, where a patient can be monitored using a collection of tiny-powered and lightweight wireless sensor nodes. However, development of this new technology in healthcare applications without considering security makes patient privacy vulnerable. There are lots of security requirements in BSN based modern healthcare system. Subsequently, a secure IoT based healthcare system using BSN, called BSN-Care, which can efficiently accomplish those requirements.

## **ADVANTAGES**

- It provides data security.
- Faster in data processing.

## **DISADVANTAGES**

- No emergency decision support.
- Each patient must be monitored separately that consumes more time.

An efficient vehicle tracking system is designed and implemented for tracking the movement of any vehicle from any location at any time. This system [13] made good use of a popular technology that combines a Smartphone application with a microcontroller. This will be easy to make and inexpensive compared to others. The designed in-vehicle device works using Global Positioning System (GPS) and Global system for mobile communication / General Packet Radio Service (GSM/GPRS) technology that is one of the most common ways for vehicle tracking. The device is embedded inside a vehicle whose position is to be determined and tracked in real-time.. The vehicle tracking system uses the GPS module to get geographic coordinates at regular time intervals. The GSM/GPRS module is used to transmit and update the vehicle location to a database. A Smartphone application is also developed for continuously monitoring the vehicle location. The Google Maps API is used to display the vehicle on the map in the Smartphone application. Thus, users will be able to continuously monitor a moving vehicle on demand using the Smartphone application and determine the distance and time for the vehicle to arrive at a given destination.

### **ADVANTAGES**

- Live monitoring of vehicle position.
- Easy to install and reliable.

### **DISADVANTAGES**

- Difficult of working in rural areas.

## **CHAPTER 3**

### **PROJECT DESCRIPTION**

#### **3.1 Problem Definition**

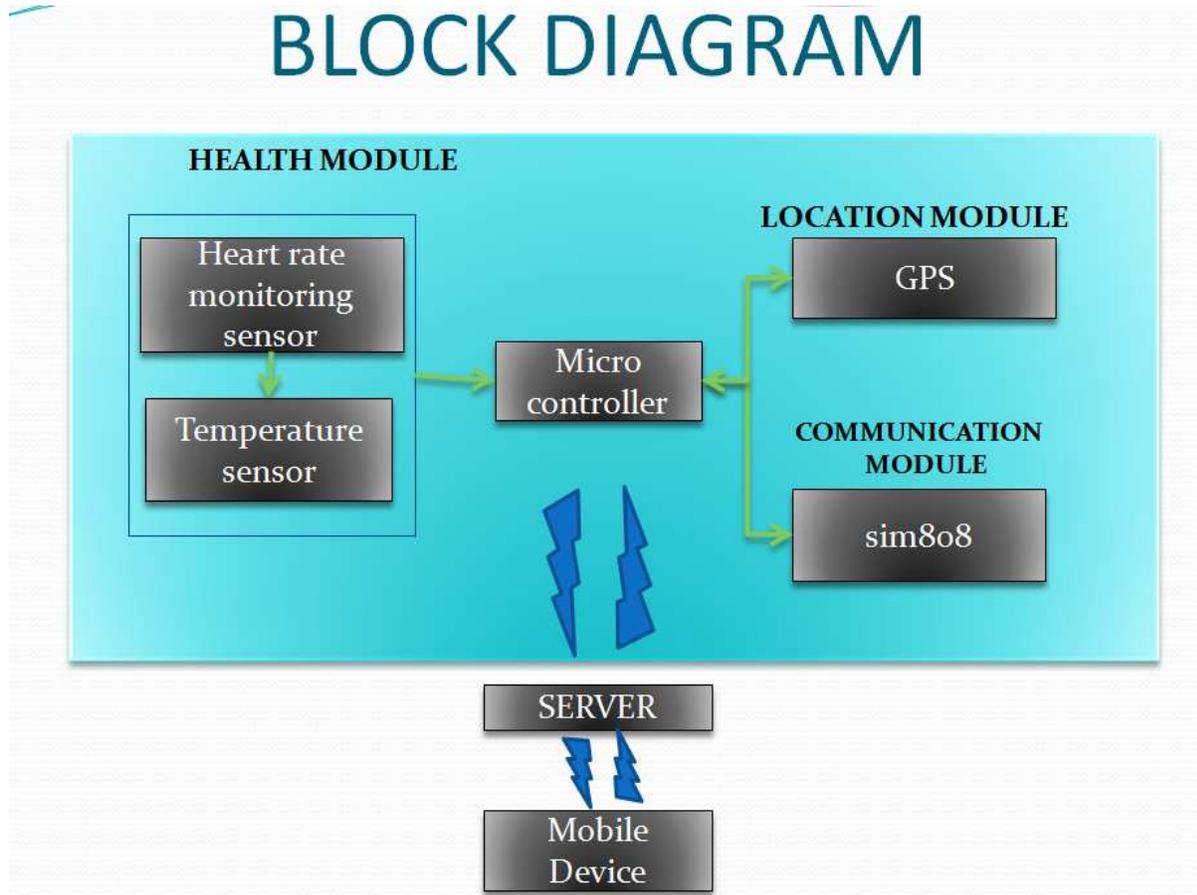
During a mission, soldiers are in life or death situation. Close attention needs to be given for their wellness. Their health vitals need to be monitored periodically. Critical decisions must be taken to ensure the safety of a soldier. In the existing system the tracking of the soldiers health condition are in complex state. In case of medical emergency, the backup team is notified through text message which takes longer time for the backup team to reach the destination and finding the location are more difficult. Local support - Indian Army is fighting a strange war where we have to fight on our own territory. That means lot of local support is required. The support from local populace against army is one of the biggest problems in any operation. No one has our back. The mission head are in the situation to identify the injured and informed to the base station it reduces the effect of the mission.

#### **3.2 Project Description**

Defense Utility jacket system assists the soldiers keep track of each soldier and their health vitals such as heart rate, body temperature. After gathering all the information the details are sent to the base station. In base station each and every soldier's health conditions are monitored. When the soldier's body temperature goes down the normal temperature, an alert message will send to the base station and the medical team will arrive to the soldier's location. The GPS module is used to know every soldiers location. Heating pad is used when the body temperature goes down it will automatically maintain the temperature. When the soldiers enter into the enemy region a warning message will send to the soldier there is an help button. Then all the soldiers will arrive to the soldier location by using their location module. The location detail is send periodically

to the base camp with geographical location of a soldier. A soldier can keep track of other soldiers who are on the same mission. All soldiers contain an app in that their health vitals and locations are displayed. The soldiers will know other soldiers location in the same mission. This application provides graphical interface and helps the observer in the base camp to visualize the soldier's health condition and their location. It will show different region partitions and the data's are stored in the cloud servers.

### 3.3 Block Diagram



**Fig 3.1 Block Diagram for Defense Utility Jacket**

The above block diagram represents the operations or the functions performed by the Defense Utility Jacket. Mini Computer acts as the base of the system where it controls the overall system input, output, operations etc.

### **3.4 Module Description**

There are three modules in the Defense utility jacket which carries out the overall functionality and the operations of solders.

- Health Monitoring
- Position Tracking
- Base Camp

#### **3.4.1 Health Monitoring**

This module continuously monitors the health vitals of the solders such as temperature and pulse rate. Body Sensor Network (BSN) allows the integration of intelligent and uses low-power sensor nodes around human body to monitor body functions and the surrounding environment. This also consists of in-body sensor network allows communication between invasive/implanted devices and base station. Each sensor node is integrated with biosensors such as Temperature, Blood Pressure (BP), etc. These sensors collect the physiological parameters and forward them to a coordinator called Local Processing Unit (LPU), which can be a portable device such as PDA, smart-phone etc. This data's are then transmitted to base station and stored in the cloud platform.

#### **3.4.2 Location Monitoring**

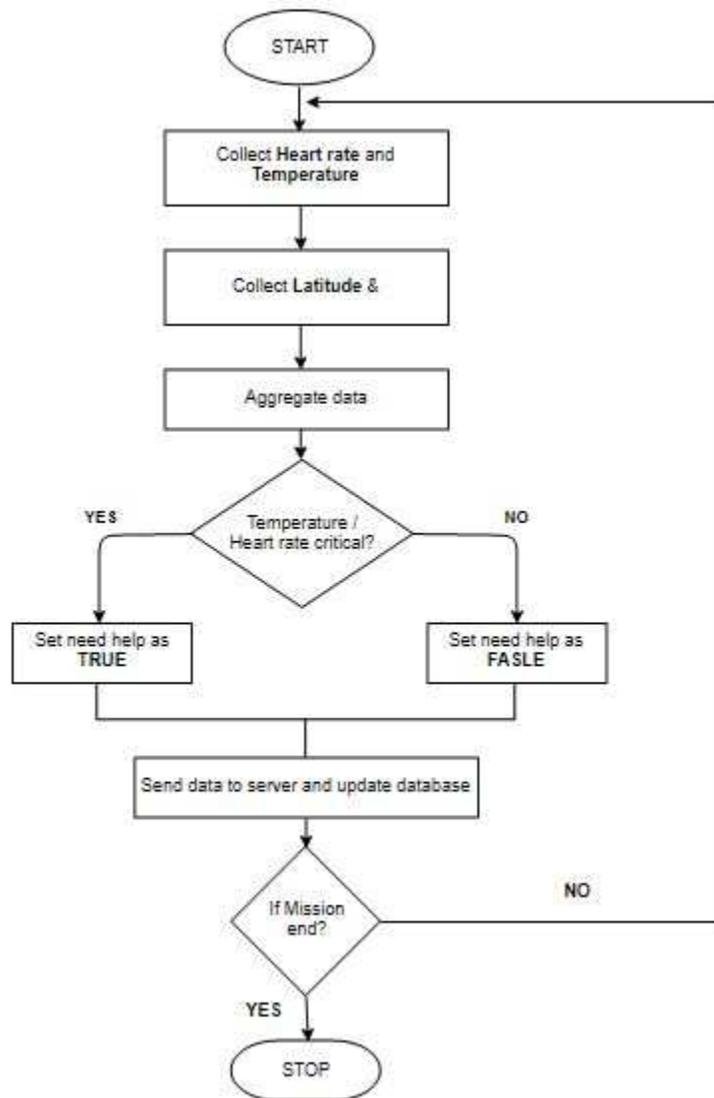
The basic purpose of a location tracking system is to track a specific target or other objects. The tracking device is able to relay information concerning the current location of the solders. This system consists of an electronic device as usually installed in the component and can be used for tracking the position of each solder. This system generates the geographic coordinates and a unique ID from a device in real time using the GPS module. Transmission of a solders location

information and an ID to a web server after a specified time interval using the GSM/GPRS module. Database is designed to store and manage received soldiers location information whenever the location is required, it can be accessed from the database and monitored on Google maps in real-time using a Smartphone application.

### **3.4.3 Base Camp**

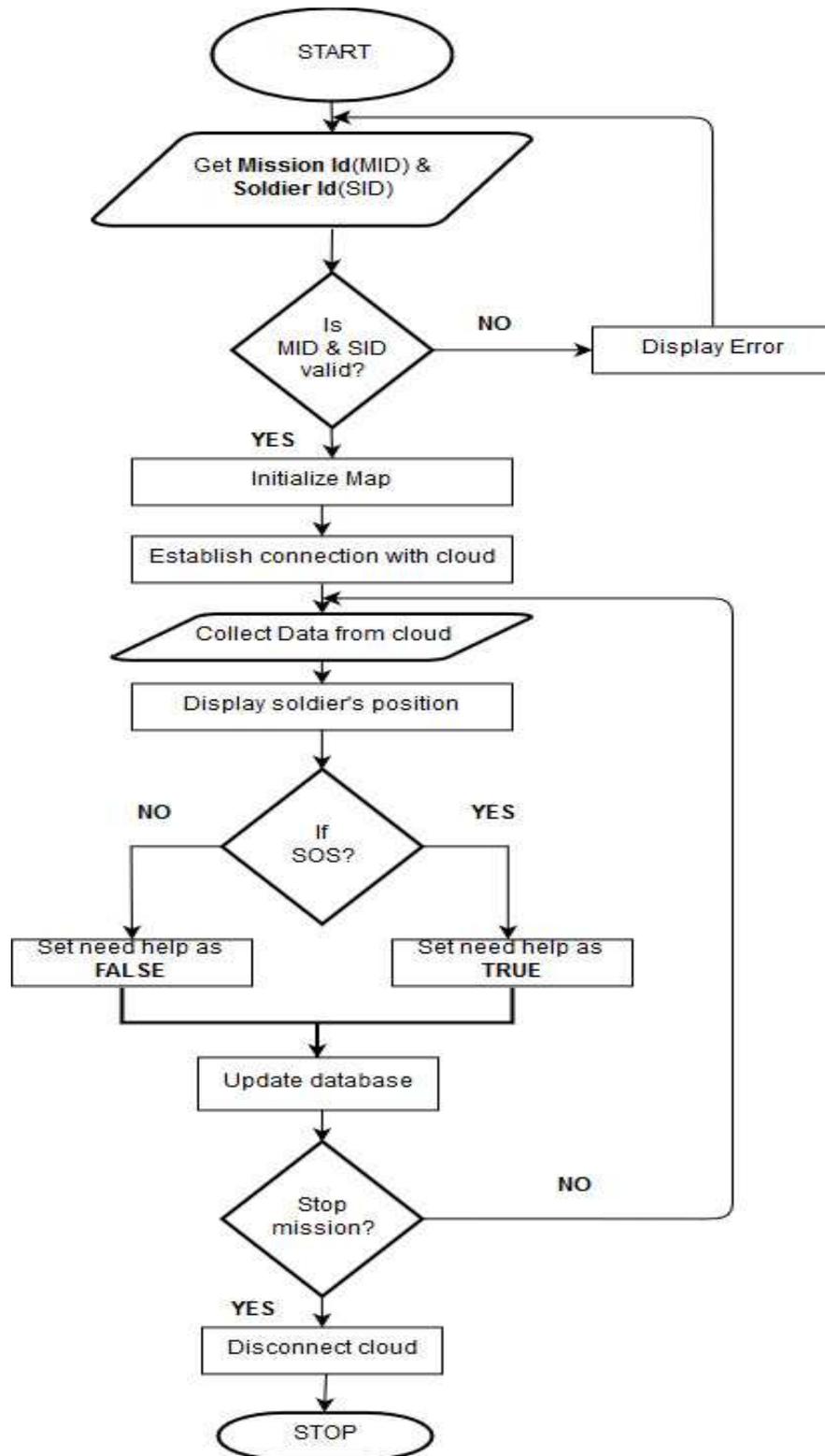
Base Station manages all the inputs and the data received from the remote soldiers. Under processing unit there are Mini Computer, NRF24L01 transceiver, Wi-Fi USB dongle to connect with internet. Base Station consists of the cloud based database which stores all the details of the soldiers location, health condition, etc. The received value is checked based upon the condition and when the critical conditions occurred it sends the backup team to the appropriate location. The base station contains medical team. The medical team will monitors all the soldiers' health condition and their geographical location. When the soldier in a critical situation the medical will arrive to the soldier location for helping and the base station is connected to the soldier's mobile app. The data's are stored in cloud server. By using that server the data's are transfer from soldier to base station by http request.

### 3.5 Flow Diagram



**Fig 3.5.1 Soldier Flow Diagram**

In this soldier flow diagram the heart rate and the temperature is collected using sensors and the latitude and longitude information are then collected from the GPRS, then this data is provided in the decision making section ,and the decision is made whether to provide help to the soldier or not and then the data is stored in the server.



**Fig 3.5.2 Base Camp Flow Diagram**

In the base camp flow diagram, the mission id and the soldier id is provided and checked to get logged in the geo-fence application. Once the login is activated the map is initialised with the location and then the connection with the cloud is established and then the information of the soldier is collected and displayed. This information provides the SOS call if the soldier position is specified in RED, otherwise if it is GREEN the mission is carried on as specified. This is updated in the database and then the decision of carrying on the mission or stopping the mission is taken.

## CHAPTER 4

### HARDWARE DESCRIPTION

#### 4.1 Arduino UNO

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler tool chains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project. Arduino microcontrollers are pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory. The default boot loader of the Arduino UNO is the opti-boot boot loader. Boards are loaded with program code via a serial connection to another computer. Some serial Arduino boards contain a level shifter circuit to convert between RS-232 logic levels and transistor–transistor logic (TTL) level signals. Current Arduino boards are programmed via USB, implemented using USB-to-serial adapter chips such as the FTDI FT232.



**Fig 4.1 Arduino UNO**

## 4.2 89AD LM35 DZ Temperature Sensor

Temperature is the degree of hotness of the body which is a measure of the heat content in the body. Temperature Sensor is used to measure the amount of heat energy or even coldness that is generated by an object or system, allowing us to “sense” or detect any physical change to that temperature producing either an analogue or digital output. The thermostat is a contact type electro-mechanical temperature sensor or switch which basically consists of different metals such as nickel, copper, tungsten or aluminium etc. These metals are bonded together to form a **Bi-metallic strip** which helps in finding the temperature. The different linear expansion rate of the two dissimilar metals produces a mechanical bending movement when the strip is subjected to heat. The bi-metallic strip can be used itself as an electrical switch or as a mechanical way of operating an electrical switch in thermostatic controls and are used extensively to control hot water heating elements in boilers, furnaces, hot water storage tanks as well as in vehicle radiator cooling systems.



**Fig 4.2 89AD LM35 DZ Temperature Sensor**

### 4.3 Pulse Rate Sensor

To measure the heart rate first step is to detect the heart beat/pulse and count the beats per minute. So in order to detect the pulse we will pass the light (using an LED) from one side of the finger and measure the intensity of light received on the other side (using an LDR). Whenever the heart pumps blood more light is absorbed by increased blood cells and we will observe a decrease in the intensity of light received on the LDR. As a result the resistance value of the LDR increases. Unlike the electrocardiogram (ECG) a doctor might use to measure the heart rate. An LED shines through the skin, and an optical sensor examines the light that bounces back. Since blood absorbs more light, fluctuations in light level can be translated into heart rate – a process called photo plethysmography. Using an optical heart rate monitor on the wrist just isn't as accurate as using one on the fingertip or on the chest. The chest-worn models more closely mimic an EKG machine. It requires power supply, DC: 3.6V-6.0V. It works under Baud rate of  $(9600 * N)$  bps,  $N=1-12$  (default 57600bps). It has a file size of 256 bytes.



**Fig 4.3 Pulse rate Sensor**

#### 4.4 GSM Module

It is an ultra-compact and reliable wireless module. The SIM800A is a complete Dual-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM800A delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mmx24mmx3mm, SIM800A can fit in almost all the space requirements in user applications, especially for slim and compact demand of design. It is controlled by AT commands enhanced by SIMCOM.



**Fig. 4.4 GSM Module SIM800**

## **CHAPTER 5**

### **SOFTWARE DESCRIPTION**

#### **5.1 Arduino IDE 1.6.7**

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

#### **Writing Sketches**

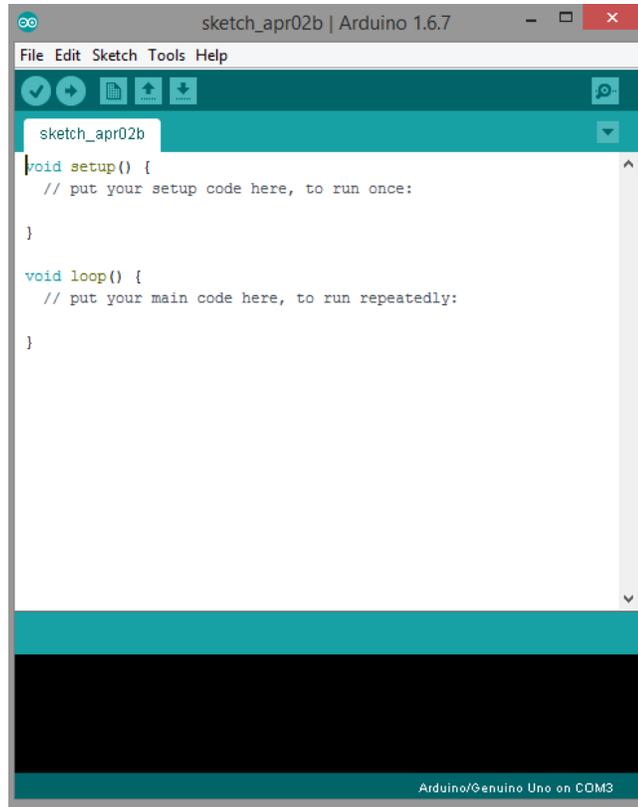
Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension `.ino`. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right-hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

#### **Uploading**

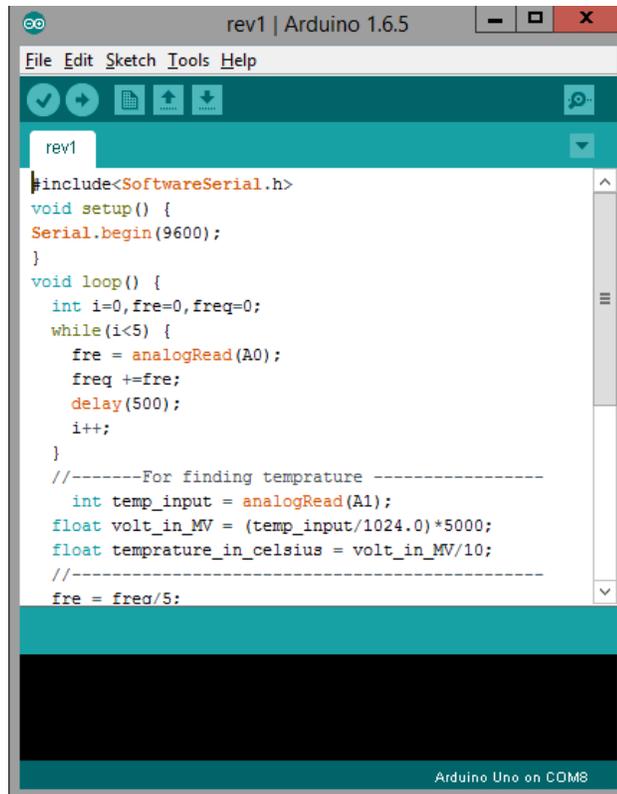
Before uploading the code into the sketch, it is important to select the correct items from the Tools > Board and Tools > Port menus. The boards are described below. On the Mac, the serial port is probably something like `/dev/tty.usbmodem241` (for an Uno or Mega2560 or Leonardo) or `/dev/tty.usbserial-1B1`, or `/dev/tty.USA19QW1b1P1.1` (for a serial board connected with a Key span USB-to-Serial adapter). On Windows, it's probably COM1 or COM2 (for a serial board) or COM4, COM5, COM7, or higher (for a USB board) - to find out, you look for USB serial device in the ports section of the Windows Device Manager. On Linux, it should

be `/dev/ttyACMx`, `/dev/ttyUSBx` or similar. Once you've selected the correct serial port and board, press the upload button in the toolbar or select the Upload item from the File menu. Current Arduino boards will reset automatically and begin the upload. With older boards (pre-Diecimila) that lack auto-reset, you'll need to press the reset button on the board just before starting the upload. On most boards, you'll see the RX and TX LEDs blink as the sketch is uploaded. The Arduino Software (IDE) will display a message when the upload is complete, or show an error.

The program uploading is done using the Arduino bootloader, a small program that has been loaded on to the microcontroller on your board. It allows you to upload code without using any additional hardware. The bootloader is active for a few seconds when the board resets; then it starts whichever sketch was most recently uploaded to the microcontroller. The bootloader will blink the on-board (pin 13) LED when it starts.



**Fig 5.1 New Sketch Screen**



**Fig 5.2 Uploading Sketch**

## CHAPTER 6

### RESULTS

**Table 6.1 EXISTING SYSTEM VS PROPOSED SYSTEM**

<b>S.NO</b>	<b>PARAMETERS</b>	<b>EXISTING SYSTEM</b>	<b>DEFENSE UTILITY JACKET</b>
1	<b>Method</b>	Manual	Automatic
2	<b>Time</b>	More time consuming	Less time consuming
3	<b>Storage</b>	Stored locally	Stored in cloud
4	<b>Communication</b>	wireless	GPRS protocol
5	<b>Data transmission</b>	When required	Every 10 Seconds

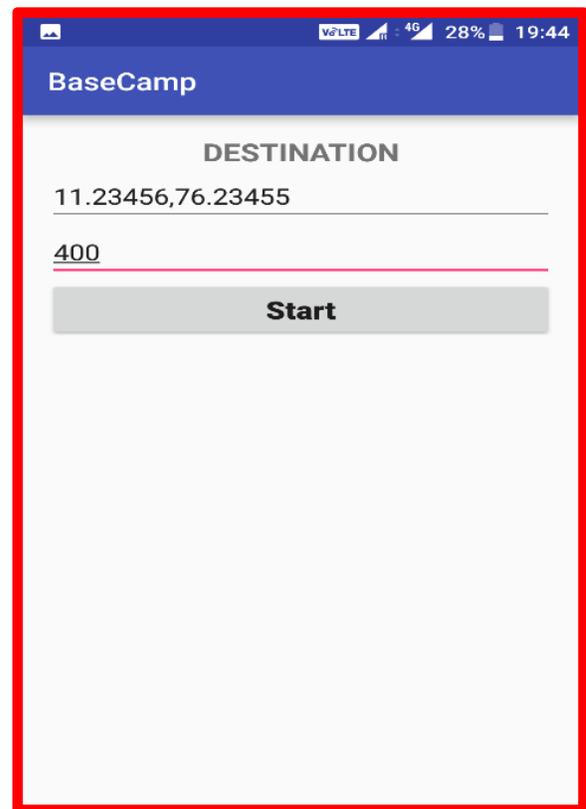
The above table describes the comparison of the existing system and the proposed system. The existing system is not automatic and requires a large amount of manpower. The facility of storing is also not easy since it requires more servers, and also requires large amount of memory. The proposed system is automatic, manpower is eradicated to a greater extent and the storage is based on the memory specified which can stored in cloud and reduces the time consumption.

## SCREENSHOTS

### BASECAMP MISSION CREATE ACTIVITY



**Fig 6.1 Mission Creation**



**Fig 6.2 Destination and Radius**

The base camp mission create activity consists of two activities the mission creation activity and the destination specification activity.

The mission creation activity is used to start a new mission and specify it to the soldiers immediately using the geo-fence application.

The destination and radius is used to specify the exact location of the mission operation and the radius within which the mission has to be carried on

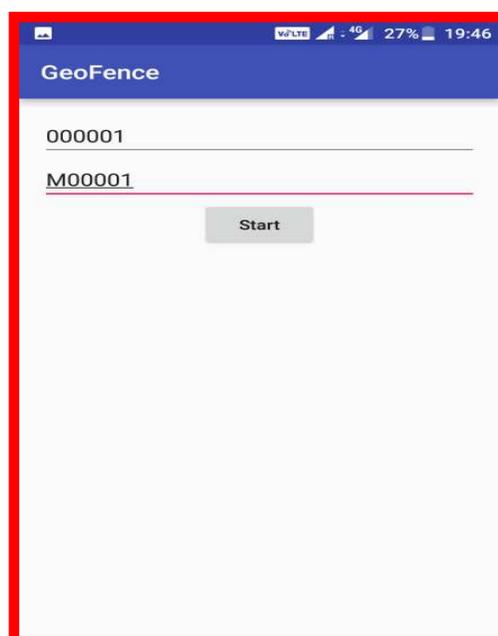
## BASECAMP MAP ACTIVITY



**Fig 6.3 Map Activity**

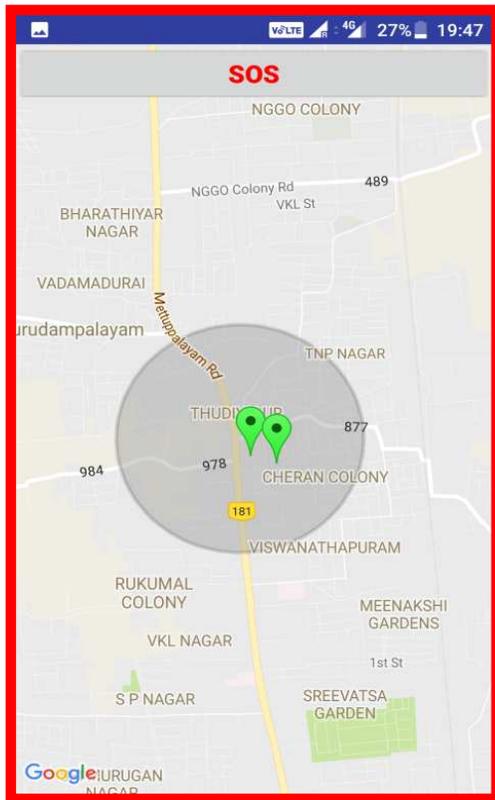
In the Fig6.3, the location of the soldiers along with the base camp location is visualised and based on this information the instructions are provided to the soldier.

## SOLDIER LOGIN ACTIVITY



**Fig 6.4 Soldier Login**

## SOLDIER MAP ACTIVITY



**Fig 6.5 Soldier Map Activity**



**Fig 6.6 Soldier SOS call**

In the soldier login Fig 6.4 the soldier id and the mission id is specified to login the soldier into the mission. With the help of this geo-fence app the soldier could be provided with the location information of the other soldiers and the location of the base camp and the destination and the radius of the mission if specified.

The SOS function can be called automatically when there is a medical emergency and can also be called manually by the soldier using the SOS button. Once the function is called the location mark of the soldier is turned RED, thus indicating an emergency situation.

## **CHAPTER 7**

### **CONCLUSION**

This system is a small contribution for a fair Defense, which helps to monitor each soldier's health conditions. The automation of system with reduction in manpower and time consumption helps the government. It helps the Defense to succeed in their missions and preventing the soldier's life. The position of the each member increases the range and accuracy in their attacks, which reduces the injury that happens in the field and even in case of distress it can be easily tracked and necessary actions, can be taken.

### **FUTURE ENHANCEMENTS**

This system can be improved with some additional functionality like,

- Use of satellite to identify the location and live monitoring of Mission.
- Server based system where one base camp can access the entire solders machine across the Mission Day. This will reduces the cost and uses a single database to store all the details.
- Use of touch pad with micro boards to reduce in size and easy to carry.

## CHAPTER 8

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