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GPS and GSM Based Soldier Health Monitoring and Tracking System

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ABSTRACT:In today's world, enemy warfare is an important factor in any nation's security. One of the important and vital roles is played by the army soldiers. There are many concerns regarding the safety of soldiers. So for their security purpose, many instruments are mounted on them to view their health status as well as ammunitions present with them .Bio-sensor systems comprise various types of small physiological sensors, transmission modules and processing capabilities, and can thus facilitate low-cost wearable unobtrusive solutions for health monitoring. GPS used to log the longitude and latitude so that direction can be known easily. These devices are being added to weapons and firearms, and some militaries such as the Israeli Army which are exploring the possibility of embedding GPS devices into soldiers vests and uniforms so that field commanders can track their soldier's movements in real time. RF module can be used for High-speed, short-range, soldier-to-soldier wireless communications that will be required to relay information on situational awareness, tactical instructions, and covert surveillance related data during special operations reconnaissance and other missions .So by using these equipments we are trying to implement the basic life-guarding system for soldier in low cost and high reliability.

KEYWORDS: Tracking, GPS, Biomedical sensors, Navigation, low-cost

I.INTRODUCTION

The infantry soldier of tomorrow promises to be one of the most technologically advancedmodern warfare hasever seen. Around the world, various research programs are currentlybeing conducted, such as the United States' Future Force Warrior (FFW) and the UnitedKingdom's Future Infantry Soldier Technology (FIST), with the aim of creating fullyintegrated combat systems. Alongside vast improvements in protective and weaponrysubsystems, another major aspect of this technology will be the ability to provide informationsuperiority at the operational edge of military networks by equipping the dismounted soldierwith advanced visual, voice, and data communications. Helmet mounted visors, capable ofdisplaying maps and real-time video from other squad members, ranges of physiological sensors monitoring heart rate, core body temperature etc. These devices will improvesituational awareness, not only for the host, but also for collocated military personnel whowill exchange information using wireless networks. The challenge was to integrate thesepiecemeal components into a lightweight package that could achieve the desired resultwithout being too bulky and cumbersome or requiring too much power. One of thefundamental challenges in military operations lays that the soldier's are not able tocommunicate with control room station. In addition, the proper navigation between soldier'sorganizations plays important role for careful planning and co-ordination. So in this paper wefocus on tracking the location of soldier from GPS, which is useful for control room station toknow the exact location of soldier and accordingly they will guide them. Also Highspeed,short-range, soldier-to-soldier wireless communications to relay information on situationalawareness ,GPS navigation, Bio-medical sensors, Wireless communication.

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RF module can be used for High-speed, short-range, soldier-to-soldier wireless communications that will be required to relay information on situational awareness, tacticalinstructions, and covert surveillance related data during special operations reconnaissance and other missions .So by using these equipments we are trying to implement the basic life-guarding system for soldier in low cost and high reliability.

II.RELATED WORK / LITERATURE REVIEW

There are several ways or methodology for the health monitoring and tracking of the soldiers. Some of them are as follows-

1. Simon L. Cotton and William G. Scanlon[1] proposed a methodology on the topic Millimeter - wave Soldier –to- soldier communications for covert battlefield operation. This paper had proposed covert communication btw soldiers will required the development of a bespoke directive medium access layer .The number of adjustments to a IEEE 802.11 distribution coordination function that will enable directional communication as suggested.

2. Hock Beng Lim, Di Ma, Bang Wang[2] proposed a methodology on **Body sensor network**.In this paper ,we describe an ongoing effort to develop a system consisting of interconnected BSNs for real time health monitoring of soldiers. Body sensor network consisting of such physiological and biomedical sensor placed on a human can be used for real time health monitoring.

3. J.Rantakokko, Joakimrydell,peterstromback[3] proposed a methodology on Accurate and reliable soldier and first responder indoor positioning: Multisensor systems and cooperative localization In this paper,it is proposed that inertial navigation with foot- mounted sensor is suitable as the core system in GPS denied environments ,since it can yield meter –level accuracies for a few minutes.however,there is still a need for additional supporting sensors to keep the accuracy.

4. Vincent Pereira ,A.Giremus , E.Grive[4] lproposed a methodology on Modelling of multipath environment using copulas for particle filtering based GPS navigation. Another class of approaches deals with multipath effects directly at the level of the navigation algorithm which estimates the position from the satellite ranging measurements. They have the advantage of leaving the receiver architecture unchanged.

5. M.V.N.R. Pavan Kumar1,GhadgeRasika Vijay[5] proposed a methodology on **Health Monitoring and Tracking of Soldier Using GPS**.This system can be used in critical conditions. The most significance in this is implementation of M-Health. By implementing this system we can improve the security of our country this also help to improve the safety of the soldier. This system also helps to provide real time video information. Using this system we can reduce casualties of war.

III.PROPOSED METHOD

After considering the above technologies the tracking of soldier and navigation between soldier to soldier such as knowing their speed, distance, height as well as health status of them during the war, which enables the army personnel to plan the war strategies. Base station gets location of soldier from GPS.The base station can access the current status of the soldier which is displayed on the phone with the help of gsm and hence appropriate actions can be taken.

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METHODOLOGY

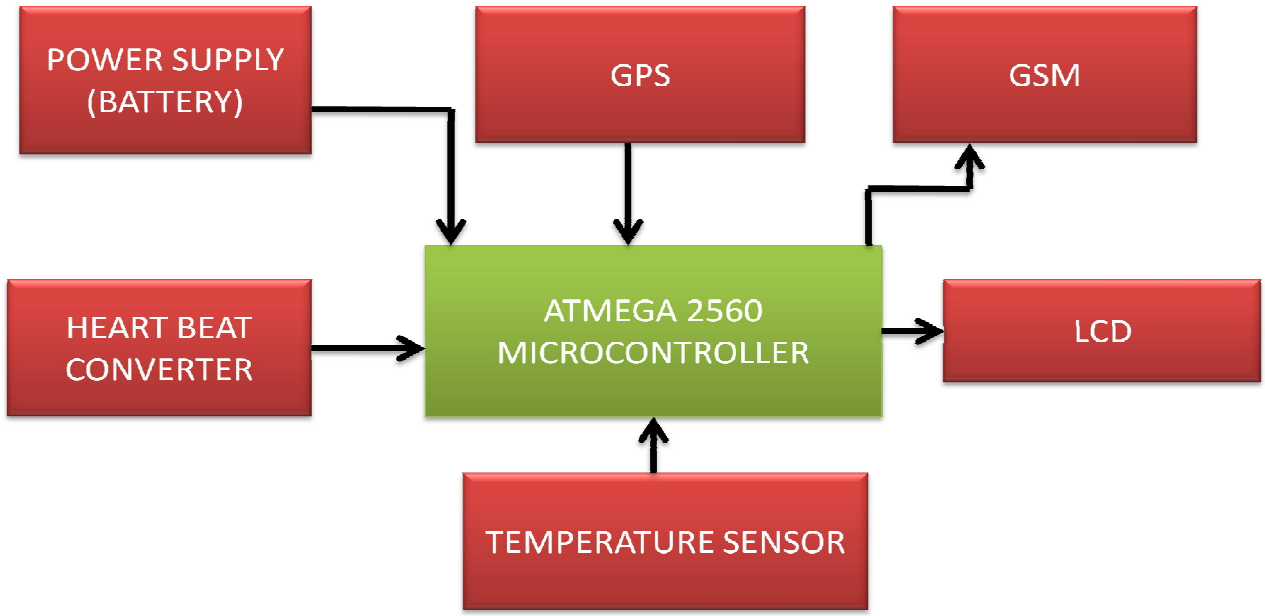
METHOD OF NAVIGATION USING GPS

A robust accurate positioning system with seamless indoor and outdoor coverage is highly tool for increasing safety in emergency response and military operation. GPS-based positioning methods mainly used to field rescue. The position and orientation of the rescuer and the trapped is acquired using GPS chip. Using the GPS data of both the units the relative distance, height and orientation between them are calculated from the geometric relationships based on a series of formulas in Geographic Information Science (GIS). Using this technology, we are doing the navigation between two soldier .the data will be send wirelesslyby RF Transceiver. This device can do accurate coordination via wireless communication, helping soldier for situational awareness. GPS module have serial interface. Receiverinformation are broadcast via this interface in a special data format. This format standardized by the National Marine Electronics Association (NMEA) .

PHYSIOLOGICAL SIGNALS AND BIOSENSORS

With recent advances in technology, various wearable sensors have been developed for the monitoring of human physiological parameters. The various sensing technologies are available, which can be integrated as a part of health monitoring system, along with their corresponding measured physiological signal. The measurement of these vital bio-signal and their subsequent processing for feature extraction, lead to collection of real time gatheredparameter which can give an overall estimation of health condition at any real time There are a number of medical parameters of soldier that can be monitored, like ECG, EEG, Brain Mapping, etc. But these require complex circuitry and advanced medicalfacilities and hence they cannot be carried around by the soldier. The entire system would become bulky for the soldier.

BLOCK DIAGRAM



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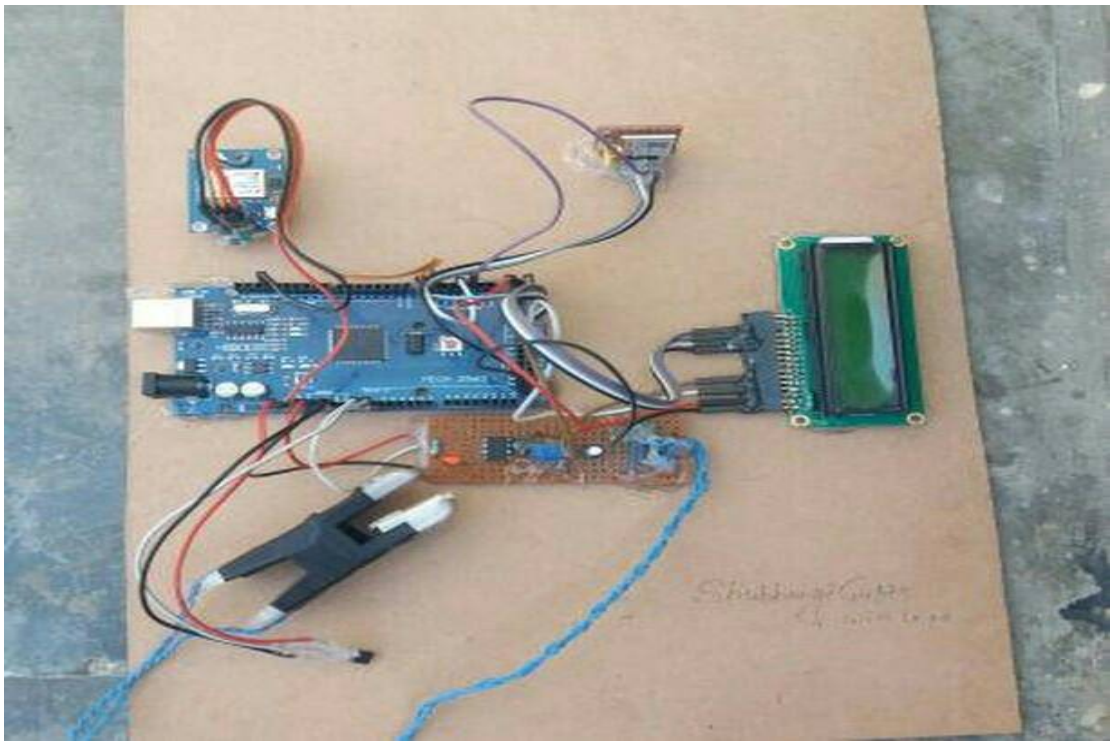
IV.WORKING

In this module, we have come up with an idea of tracking the soldier as well as to give the health status of the soldier during the war, which enables the army personnel to plan the war strategies. Also the soldier can ask for directions to the army base unit in case he feels that he is lost. By using the location sent by the GPS the base station can guide the soldier to safe area.This unit is placed on the soldier. It has mainly 4 parts:

1. Biomedical sensors
2. Key pad
3. GPS Receiver
4. GSM Modem



SOFTWARE

```
#include<SoftwareSerial.h> //library for serial communication
#include<TinyGPS.h> //library for GPS
#include <LiquidCrystal.h>//librabry for gsm


inttemperature_sensor = A0;
intpulse_rate_sensor = 6;
int temperature = 0;
intpulse_rate = 0;
```

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```
int k = 0;
int i = 0;
int rate = 0;
intLatti = 0;
intLongt = 0;
boolean flag_1 = LOW;
boolean flag_2 = LOW;
long lat = 0;
long lon = 0;
long time1 = 0;
long time2 = 0;
long temp1 = 0;
long temp2 = 0;

static void print_int(unsigned long val, unsigned long invalid, intlen);

SoftwareSerialgpsSerial(2, 3);//initialize serial port
TinyGPSgps;
LiquidCrystallcd(41, 39, 37, 35, 33, 31);

void setup() //setting up the hardware
{
delay(500);
pinMode(pulse_rate_sensor, INPUT);
Serial.begin(9600);
delay(100);
gpsSerial.begin(9600);//gps start at 9600 bps
delay(100);
lcd.begin(16, 2);
lcd.setCursor(1, 0);
lcd.print("SOLDIER HEALTH");
lcd.setCursor(3, 1);
lcd.print("MONITORING");
delay(2000);
}

void temperature_body()
{
temperature = (5.0 * analogRead(temperature_sensor) * 100.0) / 1024;
lcd.clear();
lcd.setCursor(0, 0);
lcd.print("Body Temperature");
lcd.setCursor(0, 1);
lcd.print(temperature);
lcd.setCursor(4, 1);
lcd.print("'C");
delay(5000);
}

void pulserate()
{
/*
```

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```
k=0;
while(k<5)
{
if(digitalRead(pulse_rate_sensor))
{
if(k==0)
time1=millis();
k++;
while(digitalRead(pulse_rate_sensor));
}
}
intsend_sms()//function for sending GPS coordinates
{
while (gpsSerial.available())
{
if (gps.encode(gpsSerial.read()))
{
gps.get_position(&lat, &lon);
Serial.println("AT");
delay(2000);
Serial.println("ATE0");
Serial.println('\r');
delay(1000);
Serial.println("AT+CMGF=1");
Serial.println('\r');
delay(1000);
Serial.println("AT+CMGS=\"0000000000\"");
Serial.println('\r');
delay(1000);
Serial.print("CURRENT POSITION:\n");

Serial.print("LATTITUDE: ");
temp1 = lat%100000;
Serial.print(lat/100000);
Serial.print(".");
Serial.print(temp1);
Serial.print(" ");

Serial.print("LONGITUDE: ");
temp2 = lon%100000;
Serial.println(lon/100000);
Serial.print(".");
Serial.print(temp2);

Serial.print("TEMPERATURE: ");
Serial.print(temperature);
Serial.print(" ");

Serial.print("PULSE RATE: ");
Serial.print(rate);
Serial.print(" ");
```

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```
Serial.println("\x1A");
delay(1000);
return (0);
}
}
}
```

V. RESULT AND DISCUSSION

This result shows the soldier's body parameters such as heartbeat and temperature values aswellas longitude and latitude positions are received on the mobile via SMS. We can directly detect the position of the soldier by inserting those values on mobile phone.

VI.CONCLUSION

From the above implementation we came to the following conclusion:

 Security and safety for soldiers: Using GPS we can tracks position of soldier anywhere on globe and also the health parameters which provide security and safety for soldiers.
 Effective Communication is Possible: Soldiers can communicate anywhere using RF, DS-SS, FH-SS which can help soldier to communicate among their squad members whenever in need and emergency.
 Less complex circuit and less power consumption. Since ARM processor require less power to operate
 So power consumption is less. Also the modules used are small in size, so complexity is also reduced.

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[5] M.V.N.R. Pavan Kumar1,Ghadge Rasika Vijay2 ,PatilVidya Adhikrao3,Bobade Sonali Vijaykumar4 *Department of Electronics and Telecommunication Engineering 1,2,3,4, LNBCIET, Satara-415020 1,2,3,4*Health Monitoring and Tracking of Soldier Using GPS.