

Real Time Location Tracking and Health Monitoring of Police Force

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Abstract— Nations internal security greatly rests on the shoulders of the police force. Many a times during encounter operations, police personnel are exposed to be injured or even be lost. Health and well being of the police force is essential as they safeguard our country from terrorist attacks and internal security lapses. This places the onus on engineers to equip our force with the advanced technologies. The main motive of this project is to determine the exact location and the health status parameters of the police force and then transmit the information to the control room in real time so that the appropriate actions can be taken in case of crisis. the developed technology greatly supports the search operations of the rescue teams and also drastically reduces the rescue time. The proposed design uses GPS module and sensor network to record all parameters in real time. In addition to this the policemen are provided with an alert switch to call out for help during emergency condition and a camera module to capture some evidences and transmit the information to the base station.

Keywords— GPS, Critical safety, GSM, Heart beat Sensor

I. INTRODUCTION

The Security of any Nation depends on the military, army, air-force and navy of country and the backbone of all these are our soldiers and the police forces. Without these forces it would be nearly impossible to protect a nation. But there are many concerns revolving around the security of these forces. Hence, it is essential to give more emphasis on the navigation and health monitoring technology of the police force, especially when they go for some missions and encounters.

II. LITERATURE SURVEY

This paper [1][4] provides the information about location tracking of soldiers during war field. Such a location tracking and communication can be done in near field using zigbee communication [2] provided the major disadvantage of the system easily trapped and information's can be blocked. The health monitor information includes heart rate, pressure, body temperature [3][9] are more sensitive through GSM lag of signal may deviate from critical situation may cause to death. This paper provides a solution based on literature survey includes:

- Predominant Accurate real time sensor information..
- Forecasting with videos and location tracking.
- Sensory information's are monitored in web.
- Smarter response to Emergency.

III. PROPOSED METHOD

A. System Description

The Real time location tracking which extracts the exact location and health status parameters of the police force and send them to the control room in real time. The lack of necessary communication or notification facilities during crisis hours is a major challenge faced by the police force. It has been observed that crisis management and personnel management during internal conflicts and stiff situations has become very much unfavorable. Some of the issues in the existing systems are:

- The health status of the policemen is not monitored continuously especially during combat.
- The policemen cannot get help when they get injured during adverse fight conditions.
- Difficulty arises for the rescue team to locate the injured persons.
- Evidences, which are found at the spot cannot be communicated to the control room by the police when they are under critical situation.

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B. Block Description

The proposed system architecture consists of two parts:

- Policemen's Unit
- Control Room's Unit

C. Policemen's Unit

The proposed unit envisages a body area sensor network comprising of a temperature sensor and heart beat sensor as shown in fig 1. The body parameters like heart rate and temperature are being sensed by the unit. Temperature is sensed in Celsius and the obtained value is given to Arduino for processing. A IR based heart rate sensor collects the heart beats in BPM. This sensed value being a digital signal can be directly fed to the arduino[5]. The microcontroller forms the brain the unit, with the unit taking necessary

control signals based on the sensed parameters. An emergency condition may be sensed by the unit and appropriate control or message sequences can be established with the control room.

For message transmission and live tracking of the personnel, the unit is provided with a GSM and GPS module. The proposed tracking unit may also be integrated as a single SoC on the unit. The data transmission to the control room happens on a periodic setup as per the design specification that may be defined by the user.

In addition to this, each policeman will be provided with a Panic switch and a Camera Module. The panic switch can be used to get help from the control room. The Camera Module can be used by the policemen to send real time images of the evidences to the control room in case of any crisis.

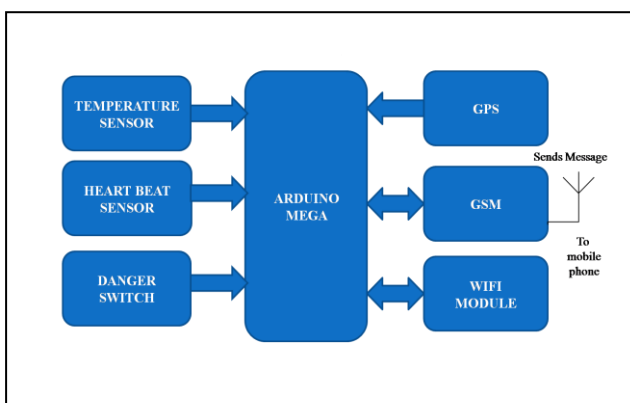


Fig. 1. Block Diagram of Police man Unit

D. Control Room's Unit

PC and the GSM module forms the major components of the base station unit as shown in fig 2. The data transmitted from the policemen's unit will be displayed on the control room PC. The following data can be viewed on the control room PC:

- Health status of policemen such as Body Temperature, Heart beat.
- The current location of the policemen.
- Alert message indicating that the policeman is under emergency situation and he requires the assistance from the control room.
- Real time images of evidences.

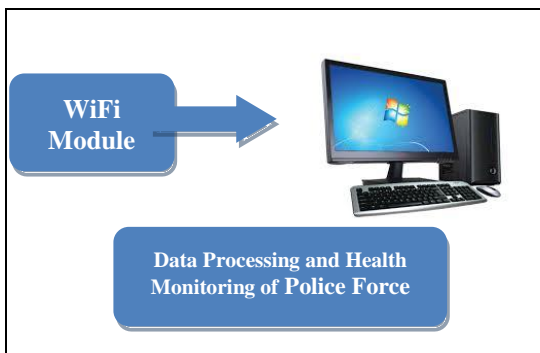


Fig.2. Block Diagram of Control Room Unit

E. Components Description

The following components are used to sense the parameters which are essential for the health monitoring of injured police

- Temperature sensor LM35
- Heart beat sensor LM358
- GSM module SIM900A
- GPS module 1575RA
- ESP8266 Wi-Fi module
- Panic Switch

F. Temperature Sensor

The body temperature of the policemen can be continuously monitored with the help of a temperature sensor as given in fig.5. The LM series are precision integrated circuit temperature sensors, whose output voltage is linearly proportional to the Celsius. These values are graphically viewed on the Thingspeak channel.

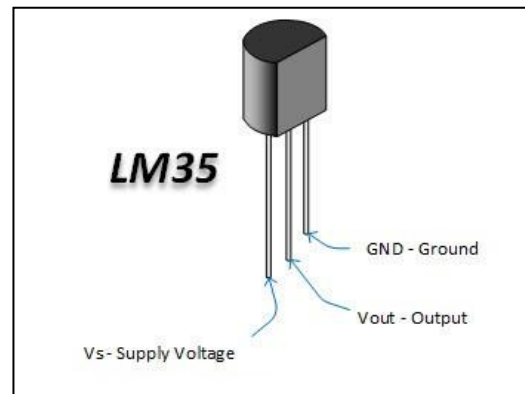


Fig. 3. Pin Diagram of LM35

G. Heart Beat Sensor

A pulse type sensor is attached to any part of the body where it is easily accessible non- invasively. The sensor operates on the principle of IR transmission and reception. the usually followed scenario is placing the sensor on the fingers and measure the blood flow rate which in turn is proportional to the heart rate. the change in blood volume flowing through the area gives a corresponding change in the intensity of IR light passing through the area. This reading of intensity changes are fed to a microcontroller for processing after necessary analog to digital conversion and pre processing[8].

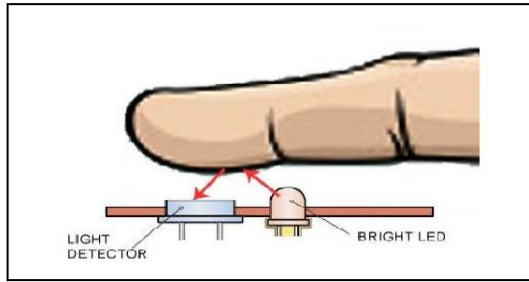


Fig. 4. Reflective Photoplethysmography



Fig. 6. 2400MHz--2483.5MHz GPS chip module

H. GSM module

The GSM Module (SIM900A) shown in fig.5. is used to provide information of the policemen such as heart rate, body temperature and GPS location of the particular police to a remote control room.



Fig. 5. GSM Module

I. GPS Module

The GPS module shown in fig.6. is used to send the location of the policeman to the remote control room in case of emergency. A large variety of GPS ready to use modules are available in the market with varying accuracies. GPS employs tracking signals from a total of 6 to 12 satellites which convey the position and time at a given instant[6][7]. A given receiver reads position and time data from multiple satellites and solves the for the desired location using trigonometric equations. The satellites orbit the earth with the constraint that at any given time, at least a minimum of four satellites are to be visible to a given receiver. The data received will be in NMEA (National Marine Electronics Association) message format and the most widely used protocol is NMEA-0183.

J. ESP8266 WiFi Module

The ESP8266 WiFi Module makes use of IEEE802.11 standard of wireless communication and is the most widely used standard in the recent days. In this design the ESP8266 is used to transfer data to the Arduino and to push data on to a web server application like ThingSpeak. The ESP8266 works as anode connecting itself to the router it is defined to connect to and pushes data to the web. ThingSpeak provides a facility to connect individual sensors and separate channels and to view the plot. Various data analytic tools are also supported to get a better understanding of the inputs. The stored data can also be accessed from anywhere in the world over the internet.



Fig. 7. ESP8266 WiFi Module

K. Panic Switch

A panic button or a switch shown in Fig.8. will be provided in this system, such as to enable the personnel to seek emergency helps in dire situations. When the policeman presses the panic button, his details such as body temperature, heart rate, GPS location and an alert message will be sent to the control room so as to enable timely rescue and help to the personnel.



Fig. 8. Push Button

IV. METHODOLOGY

Real time monitoring of Police force initiates with getting information from Heart Beat sensor, Temperature sensor. These sensors are analog in nature is converted to Digital using a A/D Converter. The acquired data is processed and removed the DC noise and processed to have a Digital Data. The information is relates with the threshold value to find the critical condition. Based on the location and emergency condition of a police .The data is communicated through control room through a WEB Application and Android App. This feature enables police to identify with real images. The following Fig.9 shows the Flowchart for policemen's unit.

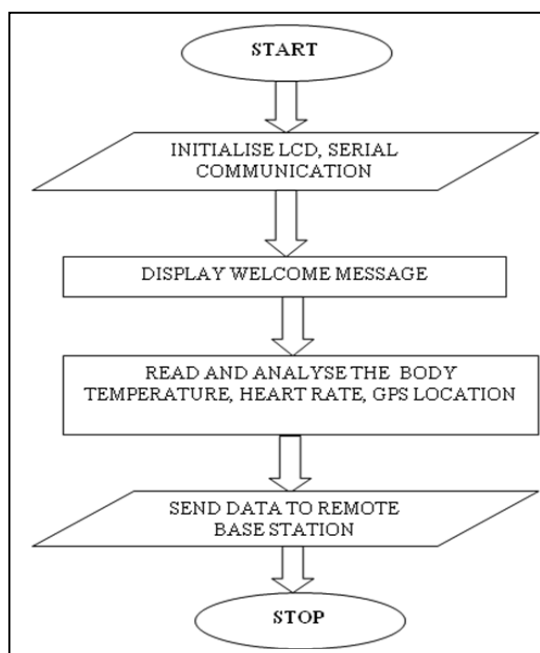


Fig. 9. Flowchart for policemen's unit

V. HARDWARE AND SOFTWARE SIMULATION RESULTS

Fig.10 shows the simulation result for interfacing the temperature sensor with Arduino Mega which is done using Proteus professional design suite. The experimental setup of interfacing the components to Arduino Mega Board is shown below. Each policeman will be provided with a unit

comprising of the Temperature sensor, the Heart beat sensor, a panic switch and a camera module.

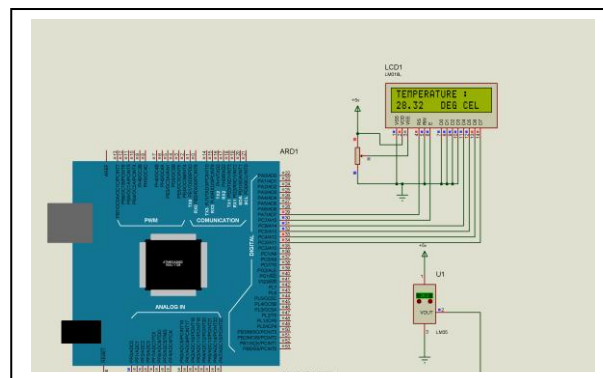


Fig. 10. Simulation Atmega3850 with sensor

The unit continuously monitors the health status of the policeman such as body temperature, heart rate and takes the necessary action during crisis. The sensor values will be sent to the ThingSpeak channel using ESP8266 Wi-Fi module and displayed on the channel. The panic switch can be used by the policeman to call out for help during emergency situation so that faster rescue process can be done if the person gets injured.

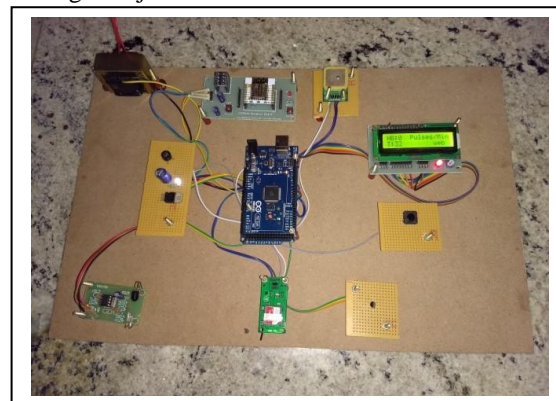


Fig. 11. Experimental Setup

When the panic switch is pressed, the location of the particular policeman is tracked by the GPS module and sent to the control room unit. In addition to this, the parameters such as body temperature, heart rate and an alert message stating that the policeman is in danger will also be sent to the control room.

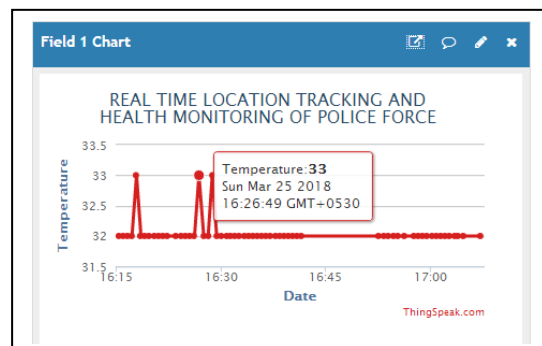


Fig. 12. Body temperature of Police man

The above Fig.12 shows the temperature sensor values continuously displayed on the ThingSpeak channel. The values indicate the body temperature of the policeman at a particular instant of time.

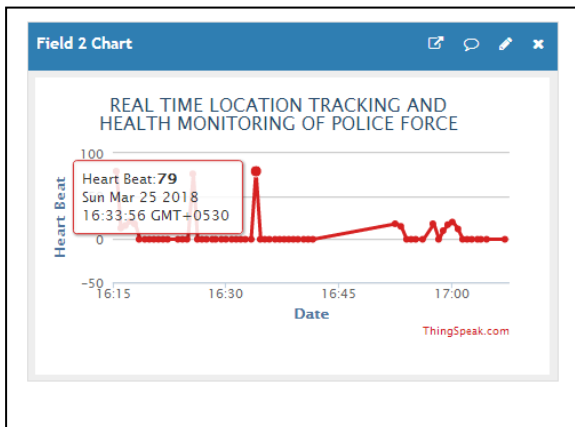


Fig. 13. Heart rate of a police man

The above Fig.13. shows the Heart rate of the policeman continuously monitored and displayed on the ThingSpeak channel in terms of beats/minute.

The information procured from police shown in Fig.14 gives the alert message sent to the control room when the panic switch is pressed. During this stage the parameters obtained like heart rate, temperature and the current location are transferred at the press of a button. In addition to this, there is an additional feature of real time video transmission to the control room with the help of Alfred Camera app.

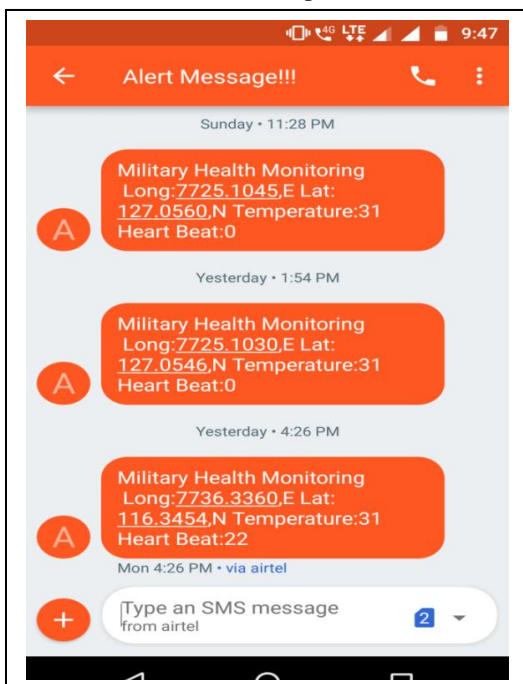


Fig. 14. Alert Message

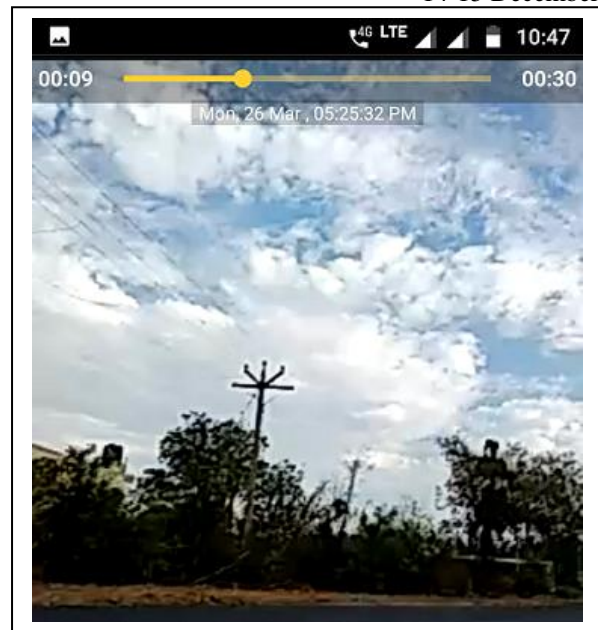


Fig. 15. Panic switch which invokes to capture current location of police man

The above Fig.15 shows the image captured by the Alfred Camera App.

VI. CONCLUSION AND FUTURE SCOPE

The above system would help in determining the health status of the policemen with measures of heart beats and body temperature. It would also help in tracking his position by using GPS modem and with GSM modem it can send all information to base station so that further necessary action could be taken in case of any emergency situation. The system also has the advantage of sending real time images of the policemen during some encounter operations. The idea can be further extended by enabling the policemen to communicate to the nearby policemen during emergency situations.

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