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Soldier Tracking and Health Monitoring System using LabVIEW

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ABSTRACT

Defense services play a prominent role for country welfare. Technological advancements in defense services are swiftly growing to reduce the human loss. Health of soldiers plays a prominent role because they are the defenders who safeguard our country. During war some soldiers get injured and some may lose their lives. This project gives rise to a new concept of tracking the location of soldiers and also the health condition of them in the battlefield, which helps the commanders at base stations to sketch the war strategies. For the army base camp, it is mandatory to advise the soldier on the right path in the battlefield if he was lost. To locate the exact geographic position (longitude and latitude) of soldiers we use GPS receiver. It receives the signal and compares it from encircling GPS satellites to determine latitude and longitude of the soldier. At the Army bastion it gets the location of soldiers via GSM and the physical body condition of the soldier is monitored and the current health status is also sent to the base station with help of GSM. GPS, [5] which is useful for base stations to know the exact geographic position of soldiers and accordingly they will mentor them also by using high-speed, short-range soldier-to-soldier wireless communication devices to transmit instructions on present circumstances and provide awareness. The necessary things which are used in our proposed system are biomedical sensors, GPS receiver, wireless communication devices. Biomedical sensors used for measuring physical parameters like temperature, heart rate. We also use a fire sensor for detecting the fire.

Keywords: Biomedical sensors, GPS, GSM, myRIO, LabVIEW, SMS, Fire sensor**..**

1. INTRODUCTION

Our defense science and technology investment enables us to contrary military threats and to beat any benefits that adversaries may seek. Technology [1] got enlarged in the military options not only in warfare but also adding options excluding warfare in tracing the intention of promoting stability and reducing human loss. There is much solicitude in regard to the protection of the soldier. To protect the nation, the soldiers are the prominent factor of the future and they should be one of the most advanced forces in the world. Everywhere on the globe a lot of work is carried out for advanced implementation where soldiers' health and border security is the first priority. [2] Soldiers often lose lives near the enemy lines because of improper communication, it is mandatory to know the health condition as well as position for the bastion. Our country in war-fields has lost several lives as there was lack of communication between the soldiers and no health assistance. Recently on 26 February 2019, a military tangle between India and Pakistan began, Indian soldiers conducted a strike against militant launch pads across the line of control in Pakistan administered Azad Kashmir, and inflicted significant casualties. Soldiers in India are predominantly famous for their bravery, even though there is scarcity of munitions and protective measures. [4] Everyone should have concern regarding the health of the soldiers, thus a decision was taken to frame a project which effectively works to record and monitor the health condition of the soldier, his current geographic position to assist him to give proper medication as soon as possible. The tracking of soldier's location is implemented with the help of a global positioning system (GPS) and this tracked position is sent via global system for mobile (GSM) which is a wireless device for communication between base station and soldier. Soldier's health tracking is done by using biomedical sensors for measuring parameters such as temperature and pulse (heartbeat). Biomedical sensors are the noteworthy sensors which act as an interface between biological environment and electronic devices. [3] In the battlefield the advantage is less although if we increase the number of protective systems and munitions until the present situation is not known in the operation. In the battlefield soldiers face many difficulties like low ammunition, health problems, crossing enemy lines etc. In these worst scenarios soldiers should be provided help to communicate with the base station.

2. PROPOSED METHOD

It comprises of two unit's viz., Soldier unit and Base station unit. The wireless technology (My Rio) is used in proposed system for the communication.GPS [9] is interfaced with the Soldier Unit (moving unit) which sends the geographic position [3] (latitude and longitude) of the soldier in the battle field, to the base station unit, via myrio module transmitter. The receiver in the base station unit receives the signal and tracks the location. Pulse sensor and Temperature sensor [8] are attached with the soldier unit, to check if the soldier is alive or dead, and sends the health information to the base station unit. In case of any emergency scenario, soldiers can communicate with the base station by giving a call through a keypad interfaced with the unit. The status will be shown in the LCD display. [3]The base station unit monitors via Lab VIEW (PC).

3. SYSTEM DESIGN

This system comprises two parts such as software and hardware which are collaborated for soldier tracking and health condition of the soldier. The hardware part is designed and interfaced using LabVIEW software. Hardware part is interfaced using NI myrio with GUI programming language called LabVIEW software. Figure 1 below shows the block diagram of the soldier tracking and health monitoring system.

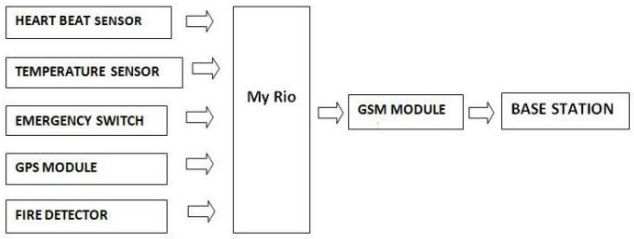

Figure 1: Block diagram of soldier tracking and health monitoring system

The system is splitted into several components in the soldier unit: a data acquisition unit for acquiring biosensor data, a GPS module, [4] a GUI module and a myrio for interfacing hardware and software. It reads the data from the hardware unit and processes it with software. The center part is splitted into two components: a GUI programming language (Lab VIEW) to interact with soldiers and a wireless module for communication. GPS is interfaced with the Soldier Unit (moving unit) which sends the current geographic position of the soldier during the war to bastion, with the help of GSM module. The receiver at the base station unit receives the signal and finds the position. Pulse sensor and temperature sensor are equipped to the soldier in order to check if the soldier is alive and sends the data to the base station unit.

The GSM comprises two parts Software and hardware. The configuration of GSM is 9001D RS232 GSM/GPRS modem that needs a hyper terminal to establish the communication to allow the GSM modem for sending messages to a hand-phone or a communicating device. LabVIEW is used to design a GUI which allows the GSM modem to send messages to mobile phones. The commands to control the modem are called AT commands. [5]AT is an abbreviation of Attention However, AT command should be written in GUI programming language according to user requirement to send a message to a mobile phone when the vibration sensor is triggered.

The Layout of this soldier tracking and health monitoring system is shown in figure 2. We perform two operations at the same time they are,

(i) Soldier tracking using GPS.

(ii) Health status of the soldier.

The hardware steadily checks for these two cases and responds to that correspondingly. Each module data is sent to the base station using a GSM module in the form of text SMS.

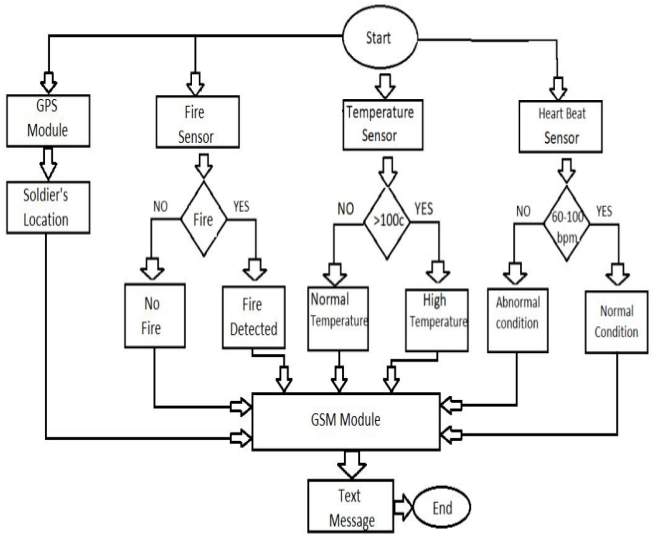

Figure 2: Layout of the Methodology

4. HARDWARE DESIGN

The Main Hardware requirements of a proposed system are GSM module, myRio, Sensors and GPS module.

4.1 GSM Module

A GSM (Global System for Mobile Communication) module is a communicating wireless modem that works when a subscriber identification module is added to it and GSM contains a set of sensors that use the radio waves and digital interface to send and receive required data. [6] GSM is an esoteric type of modem which works like a mobile phone because a SIM card can be inserted, with the help of IMSI(international mobile subscriber identity) GSM module can send messages to the base station.GSM is similar to a

mobile phone. From the mobile operator perspective, a GSM module looks just like a mobile phone. This kind of GSM module requires a SIM card to be able to operate as a digital identity to link with cellular phone networks. GSM is used to set up cellular connections and for sending mobile voice and information services. GSM/GPRS can be transmitted by the computer serial port for wireless GSM communication including sending and receiving SMS. [3] It can be roped to RS232 for remote management. Figure 3 shows GSM modem.

Figure 3: GSM Modem.

4.2 NI myRIO

NI myRIO is a hardware/software platform that offers students the flexibility to do engineering and real systems more quickly than ever before. It is an embedded evaluation board to develop applications onboard FPGA and microprocessor, myRIO-1900 is a portable reconfigurable I/O device that students can design and control the systems. NI myRIO-1990 connects to a host computer over USB. NI myRIO-1900 contains analog input and output(AIO) digital input and digital output (DIO), audio and power output in a compact embedded device, NI myRIO-1900 expansion ports are called (MXP) connectors they are divided into A and B and carry identical sets of signals. The signals are distinguished in software by the connector name, as in connector A/DIO1 and connector B/DIO1. Figure 4 shows the front view of myRIO.

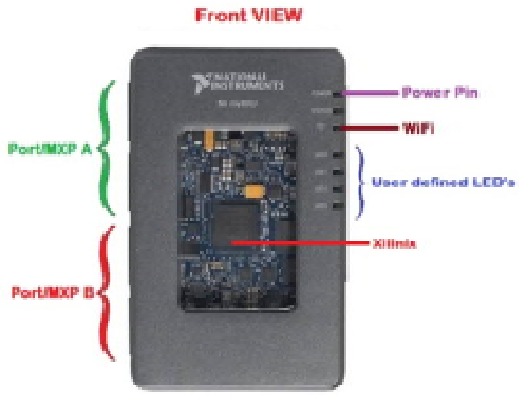

Figure 4: myRIO.

4.3 GPS Module

The Global Positioning System (GPS) is a satellite-based location tracking system, which determines the geographic position of an object. And this technology was first introduced by the UNITED STATES military in the 1960s. [7] GPS operation is based on 'trilateration' mathematical principle. GPS comprises three main components such as Space segment, Control segment and User segment. Position is determined from distance measured by the satellite; the encircling four satellites are used to know the exact position of the receiver on the ground. GPS is compatible with 3V/5V systems and made at TTL level, and it has a high gain active antenna and the operating current is 45mA and operating voltage is 2.5V to 5V. Baud rate is 9600kbps.The output of this GPS module is standard NMEA sentences. GPS units is also helpful to calculate other information, such as speed, trip distance, and distance to destination, sunrise, sunset, time, date and more. Figure 5 shows the GPS module.

Figure 5: GPS Module.

The final setup connections are shown in figure 6.

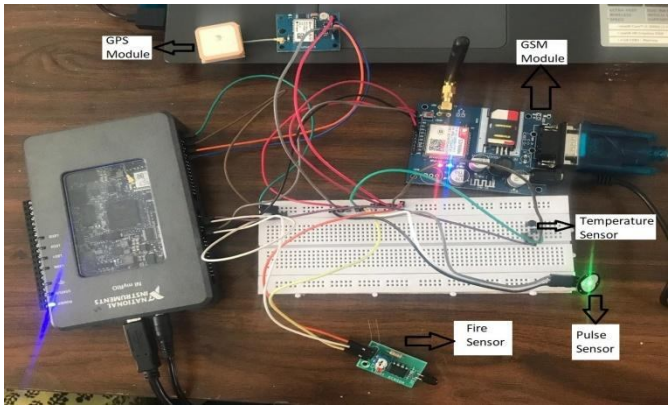

Figure 6: Final setup connections

5. EXPERIMENTAL RESULTS

From this project, the security and safety of soldiers are implemented by the GPS; GPS track position of soldiers anywhere on earth and also system monitors health conditions of soldiers. The continual co function will be possible anywhere using GSM which may help soldiers to speak with their commanders when they need. The less complex circuit and therefore the power consumption so for

this manner, the concept of tracking and monitoring system is incredibly important and useful for soldiers. When soldiers are on military field during battle, also the bottom station will receive a true time view of soldiers on field.

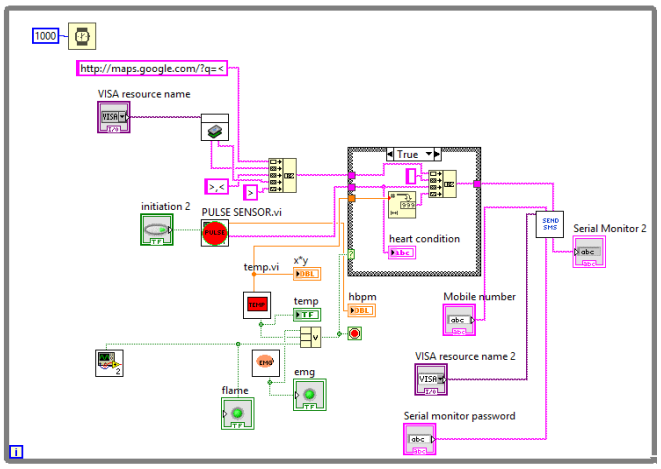

Figure 7: LabVIEW Code

The LabVIEW code for our project is shown Figure 7.The LabVIEW code for different modules is shown in various figures below.

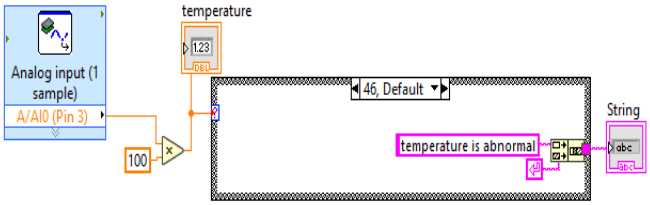

Figure 8: Temperature Sensor Code

Figure 8 shows the LabVIEW code for temperature sensor. It helps to measure the body temperature of the Soldier.

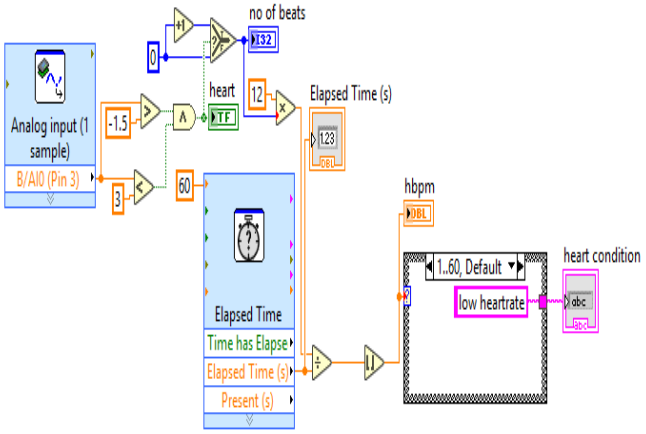

Figure 9: Pulse Sensor Code

Figure 9 shows the LabVIEW code for Pulse sensor. The pulse sensor works on the principle of Plethysmography that means it measures the pulse rate through the changes in the blood.

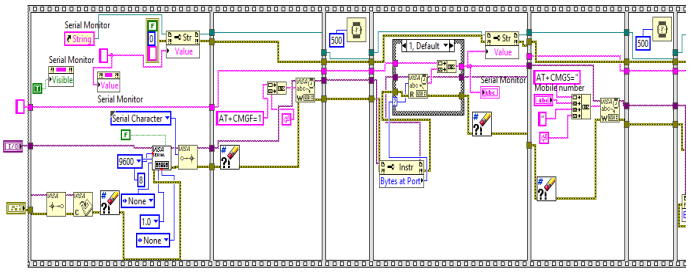

Figure 10: GSM Module Code

Figure 10 and Figure 11 shows the LabVIEW code for GSM Module. The GSM transmits the information to the base Station.

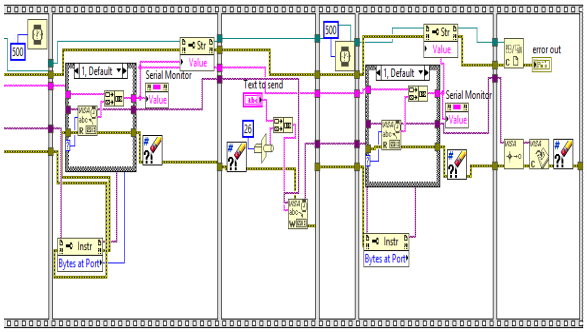

Figure 11: GSM Module Code

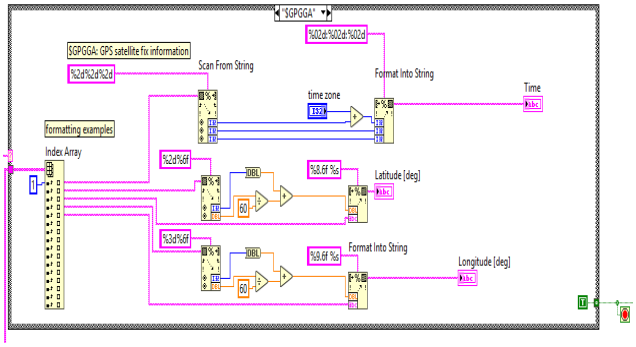

Figure 12: GPS Module Code

Figure 12 shows the LabVIEW code for GPS module. The GPS module works on the principle of Trilateration.

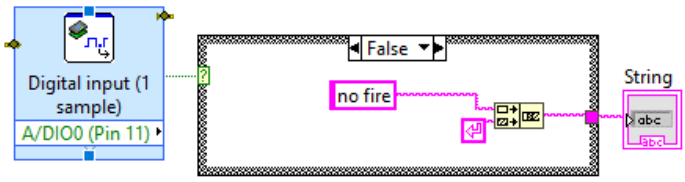

Figure 13: Fire Sensor Code

Figure 13 shows the LabVIEW code for fire sensor. It helps to detect the fire when ever any fire accidents take place.

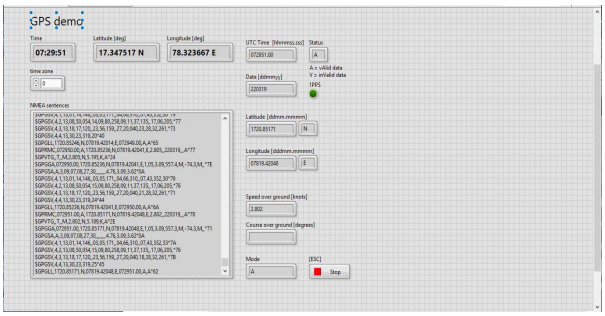

Figure 14: GPS Module Output

The Figure 14 shows the GPS module output it gives the exact location of the soldier. The output gives latitude, longitude, time and date.

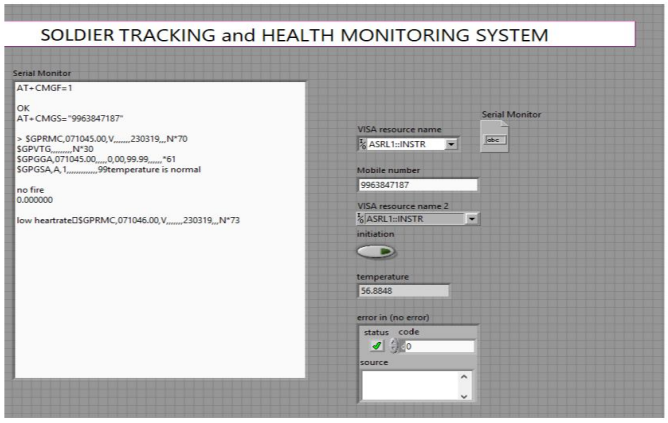

Figure 15: Final Output in LABVIEW

The final output of the project is shown in figure 15.

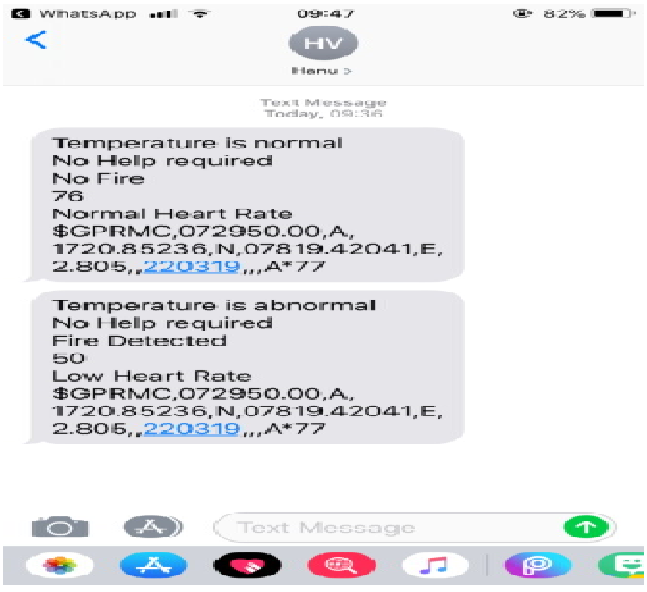

Figure 16: Health status of soldier.

The text message of Health status of the soldier is shown in Figure 16.

6. CONCLUSION

In military missions, one of the most important things is that sometimes the soldiers are unable to maintain communication with the main station. The safety of our country is the most crucial mission for soldiers. Our project helps to monitor the health status of soldiers using pulse sensors to measure heartbeat and LM35 to calculate the body temperature of soldiers and fire sensors if any fire accident has occurred. We are able to track the location of the remote soldier by using GPS and send all information to the army main station by using wireless transmission technology called GSM for the necessary action to be taken. Thus this system provides safety to our soldiers. This system helps the soldier to get help from the army base station in any panic situation. The betterment of the base station unit can also be done by making proper GUI at base station PC and officials at base station can also send feedback or any order to soldiers via base station unit.

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