Arduino-based Soldier Location and Health Tracking System

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Abstract:- This paper reports a Soldier Strap or a Soldier Health and Location Monitoring device with millions of soldiers, the Indian Army ranks third in size worldwide. The army suffered a lot and went through major hardships and losses due to the unavailability of a real-time soldier tracking system. The system proposed in this paper will try to solve the above-mentioned problem. This system aims to measure the vital signs of the soldier, and the location and transmit this info to the army headquarters. For this purpose, heartbeat sensor, temperature sensor(LM35), GPS Model and Arduino(ATmega 328p) as the processor

Keywords:- Heartbeat sensor, Temperature sensor(LM35), GPS Model, Arduino(ATmega 328p)

I. INTRODUCTION

The Indian Army is one of the world's largest militaries. It is consistently ranked among the world's top five militaries. In terms of national security and protection, the military plays a significant role. In the midst of the battlefield's uncertainty, we must ensure that each and every soldier is safe and protected. Due to the lack of such a mechanism, this frequently does not occur. Many of the casualties have been determined to be due to a lack of prompt medical assistance rather than a direct enemy attack. As a result, finding a mechanism to track these soldiers becomes critical. The soldier's vital life signs and location are the bare minimums that must be monitored to ensure that the soldier is safe.

II. LITERATURE REVIEW

This paper is researched upon and written by Niket Patil and Brijesh Iyer, published in 2017. The topic of their research was a "Health Internet of Things. The main aim of this paper was to create a Health Monitoring and Location Tracking System for soldiers to maintain constant real-time communication between the headquarters and the on-field soldiers. For this purpose, they have used IoT or Internet of Things. Along with IoT technology, they have also used multiple sensors for this purpose. Their proposed system aims to track the heartbeat, temperature, oxygen analysis, and location of the soldier. The data processor they used is Arduino (ATmega 328p). The communication technique is GPS and IoT. The location will be tracked using the GPS module. Heartbeat, temperature, and oxygen will be tracked using a

pulse rate sensor, LM35 sensor, and Grove(gas sensor) respectively. Their system will also have a trigger in case any of these measurements fall below a certain threshold value. This trigger will communicate to the headquarters that these h Monitoring and Tracking System Using Critical values have fallen below the level. Their proposed system also has a panic button on the soldier's side for immediate emergency communication[1].

This paper is written by Akshita V. Armarkar, Deepika J Punekar, Mrunali V . Kapse, Sweta Kumari, and Jayshree A. Shelke published in 2017. The Topic of the research was a "Soldier Health and Position Tracking System". Soldiers get injured and even lose their lives during military conflicts and search and rescue missions. Army base stations require GPS devices to locate soldiers, WBASNs to detect health-related parameters in soldiers, and a wireless transmitter to transfer the data wirelessly in order to locate soldiers and offer health monitoring. [2]. Researchers Hong Beng Lim, Di Ma, Bang Wang, Zbigniew Kalbarczyk, Ravishankar k. Lyer, and Kenneth L. Watkin have discussed recent developments in technology as well as a variety of wearable, portable, lightweight, and compact sensors that have been developed for monitoring human physiological parameters. The electrodermal activity (EDA) sensor, blood pressure sensors, electrocardiogram (ECG) sensors, and other physiological and biomedical sensors are all part of the body sensor network (BSN), which can be used to monitor a person's health in real-time [3]. A proposal for the security of soldiers was made by Shruti Nikam, Supriya Patil, Prajkta Power, and V.S. Bendre. The condition of a soldier's health and the ammunition carried by them can both be seen using a variety of tools. The Biosensor has the excellent processing power and enables low-cost wearable health monitoring solutions. It is made up of several kinds of tiny physiological sensors and transmission modules.[4]. P.S. Kurhe and S.S. Agrawal have devised a system that allows for the capacity to track the soldiers at any time, according to Dinesh Kumar Jaiswar and Sanjana S. Repal in their survey. The soldiers will also be able to contact the control room using GPS coordinates when they are in trouble. Since World War II, when military forces understood its use for fleet management, navigation, placement, and targeting, location monitoring has gained significant attention. For remote soldier health monitoring and position tracking, this device is dependable and energy-efficient. Real-time transmission of a soldier's sensed and processed parameters is

possible. It enables the army control room to track soldiers' vital signs, such as heart rate and body temperature, using body sensors. [5].

This paper is researched and written by, Chaithra R L1 and Mamatha V2 published in 2019. The topic of their research was a "Internet of Things-Based Health Monitoring and Tracking System. Basically, this mechanism exists to ensure the soldier's protection. Soldiers are a vital part of the country, and their lives are precious. Lots of soldiers are facing many problems such as communication with the control room and no proper medical help at a proper time which leads to the death of the soldier. To minimize such cases, we have proposed a continuous alert system to track location and monitor the health of the soldier. The proposed system is very useful in detecting the location of the soldier in real time using GPS and communicating the health status parameter continuously using the GSM module embedded in the microcontroller. The tiny sensors can be attached to a soldier's body or uniform to monitor body parameters and send information to the control center and other soldiers when the body rate drops below a preset threshold. The soldier can send an alert message to the guardian and control room for help in the panic situation using an application. The control room/guardian also uses an android application to request the location of the soldier automatically in a panic situation. The soldier can also request the nearest hospital information in an emergency[6].

Deepa J, Ranjini, and Sharanya Raj conducted the research for this paper and wrote it. "Soldier Health and Position Tracking System Using GPS and GSM Module" was the focus of their study. The army staff is able to prepare battle strategies thanks to the tracking of soldier navigation from soldier to soldier, including understanding their speed, distance, height, and health state during the fight. GPS is used by the base station to determine the soldier's location. With the aid of GSM, the base station may access the soldier's present condition as it is shown on the phone, allowing for the identification of the necessary actions[7].

III. METHODOLOGY

The Overall Design of our system consists of the following phases:
1. Setup the component: ARDUINO, GPS, PULSE SENSOR, TEMPERATURE SENSOR, COMMUNICATION MODULE.
2. Coding of the following components.
3. Getting Health Status by using Pulse sensor and Temperature Sensor.
4. Communication between Soldier and Medical Authority Communication Module.
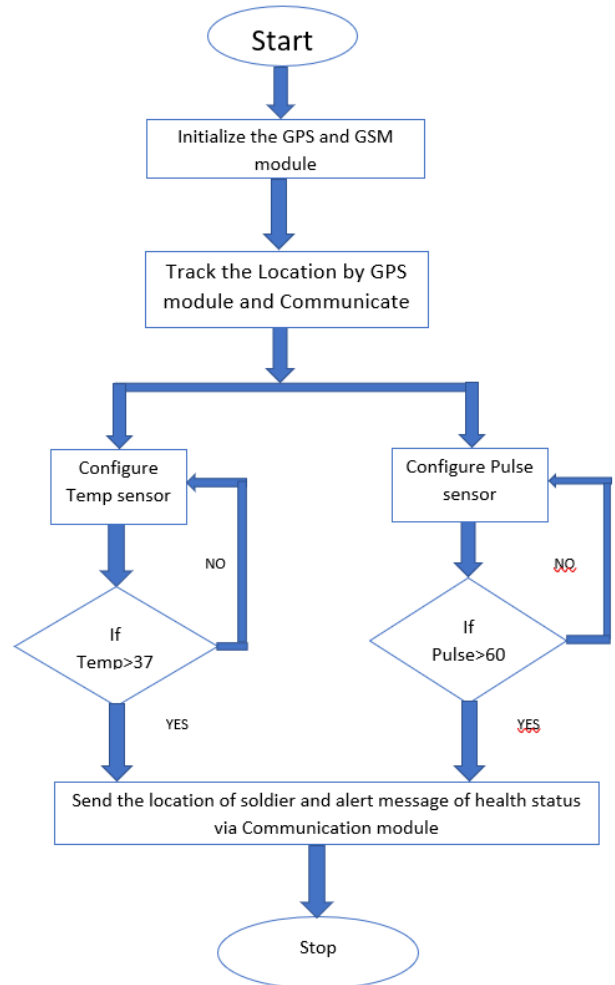5. Getting Exact Location of Soldier using GPS module, to get urgent help to the soldier.

Fig.1 Flow chart

IV. EXPERIMENTAL SETUP

DESIGN
Hardware Requirements:

1. Arduino:
Arduino is the brain of our project. It is the main microcontroller that is used for calculation, processing and communication of values in our project. It uses the Atmega328p microcontroller for processing.
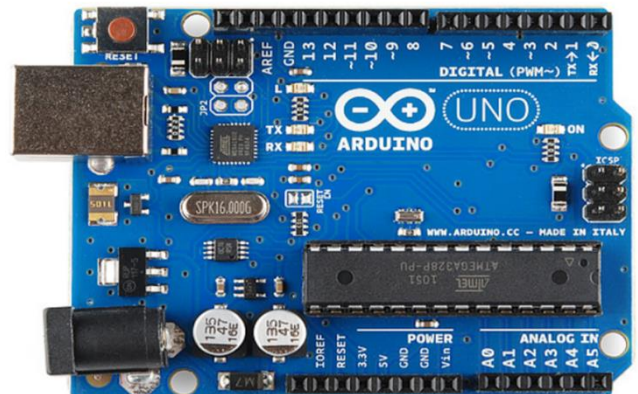

Fig. 2 Arduino UNO R3

2. Heartbeat Sensor/Pulse Sensor

One of the primary health monitoring sensors in our project. The pulse sensor has 3 main pins. The VCC, Ground and the Output pin. The simulation version has 4 pins, the 3 previously mentioned and the fourth being the test pin. Since, we cannot actually check whether the pulse is present or not, we use the test pin.

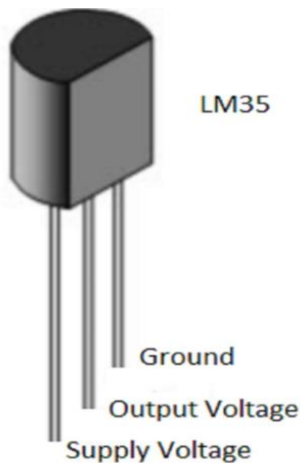Fig. 3 Heartbeat Sensor/Pulse Sensor

3. LM35 Temperature Sensor

Fig. 4   LM35 Temperature Sensor

LM35 is a standard 3 pin precision centigrade temperature sensor. As the name suggests, it is used to measure the temperature of our soldier on the battlefield. It has standard 3 pins. VCC, Ground and Output.

4. GPS Positioning Tracker

Fig. 5 GPS Positioning Tracker

Another important sensor that we have used is the GPS Position Tracking Module for Arduino. It has four pins. The VCC, Ground and two data communication Tx and Rx pins.
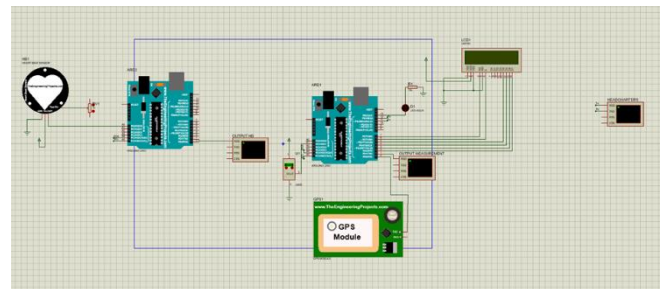

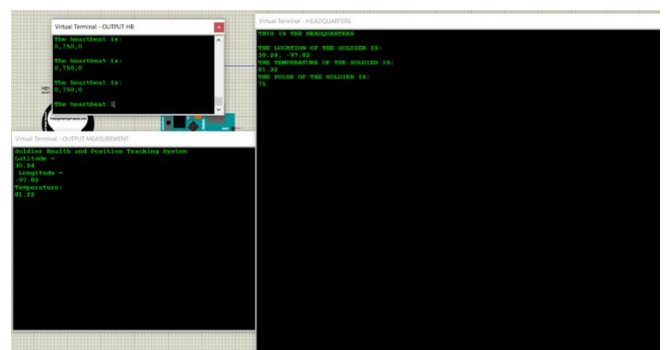Fig. 6 Block Diagram

Fig. 7 Circuit Diagram

V. OUTPUT

Fig. 8 Result

Fig. 9 Virtual terminal

Fig. 10 Heartbeat graph

VI. FUTURE SCOPE

A blood pressure sensor and an electro dermal activity sensor can be used combined to determine if a soldier is in danger. Is he calm or distressed?

We can make an emergency call if a soldier's health parameters exceed a specified threshold value or if the soldier's coordinates deviate from a predetermined path.

VII. CONCLUSION

Soldiers' Security and safety: GPS tracks a soldier's whereabouts anywhere on the globe, while a health system analyses crucial health metrics and environmental conditions, ensuring soldiers' security and safety. When finished, the aforementioned technology will assist in determining a soldier's health status utilizing readings of heart rate and body temperature. Additionally, it would help track his whereabouts using a GPS modem, and it could send all of the information to the base station via a GSM modem so that more may be done with it. As a result, a tracking and navigation system is a very useful idea for soldiers on the front lines of battle. Additionally, so that the base station may view the soldier in real-time.

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[4]. Deepa J , Ranjini , Sharanya Raj-"Soldier Health and Position Tracking System using GPS and GSM Modem."-International Journ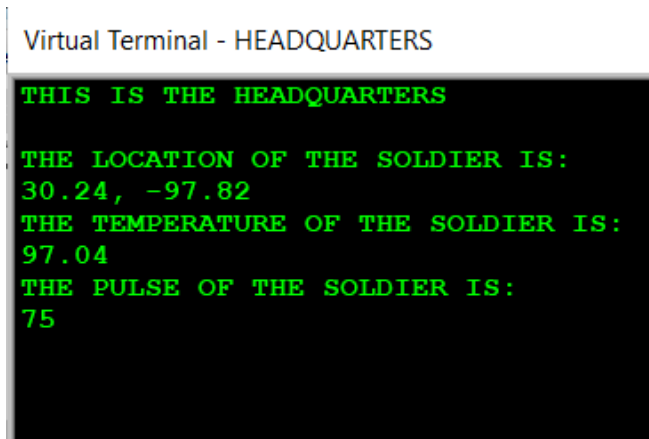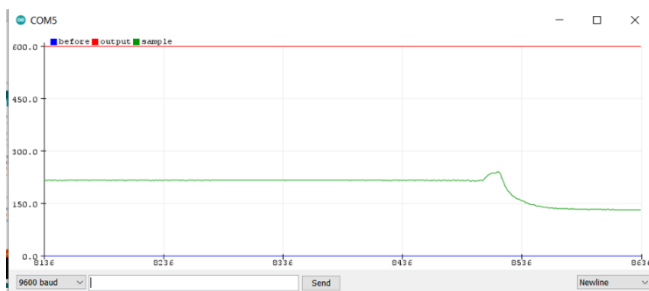al of Engineering Research & Technology (IJERT)2018