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WIRELESS EMBEDDED ELECTRONICS FOR SOLDIER SECURITY

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Abstract : An integral aspect of each nation's security apparatus are its soldiers. Many soldiers lose their lives and suffer injuries during military operations. Because our soldiers are our nation's guardians, keeping us safe from terrorist attacks, enemy attacks, and other dubious acts that could endanger both our nation and ourselves, their health is of utmost importance. Regarding the protection of the troops, there are several considerations. As a result, soldiers are equipped with a wide range of devices and technologies for security reasons, tracking both their health and ammo. We focus on monitoring physiological parameters such as oxygen levels in the blood and body temperature, as well as environmental factors such as temperature, humidity, and air quality; and physical parameters such as motion, location, and temperature. The information collected from the sensors and GPS module will be wirelessly sent using the soldier's LoRa kit. To undertake further statistical analysis, the gathered data will be moved to the cloud. Army personnel are able to monitor each soldier after learning about their health. During a bivouac, our proposed system allows military personnel to assess troops' vital signs, such as blood pressure, body temperature, ECG, and SpO2, and to track each battalion's current GPS position. It also includes an additional capability that lets troops manually call for help by pushing an alert switch to let the army officials at the bivouac know if they need help or think they may have detected an enemy infiltration.

Keywords: LoRa Module, GPS Module, MAX30100, DHT11 Humidity and Temperature Sensor, MQ2 Sensor, SpO2 Sensor, Accelerometer, and Arduino Uno.

I.INTRODUCTION

INTRODUCTION

Our goal was to create a reliable and affordable solution that would support the base unit during special operations in times of conflict by protecting the security and well-being of its soldiers. The lack of information on injuries to its people, which could lead to a rise in the number of deaths and lasting disabilities, causes great suffering for the army. It is beneficial to keep an eye on soldiers who are suffering from difficult conditions at all times to prevent potentially fatal events. If the control room had access to real-time data regarding the soldiers' whereabouts and health, these figures could be reduced. These characteristics are sent to the monitoring room via GPS technology. The most popular technology in the last several decades for tracking soldiers' lives on the battlefield have been GSM-based tracking systems, RF transceivers, walkie-talkies, ZigBee, and cable-based systems.

This project's implementation of tracking soldiers and moving between them during a conflict—including determining their location, speed, and health—allows military commanders to formulate battle plans. Consequently, they are able to act right away by providing assistance to those who have asked for it. Soldiers' health restrictions are tracked by a multitude of biological sensors, and their placement and position are controlled by a GPS module.

LITERATURE SURVEY

A special-purpose computer system called an embedded system is made to carry out one or more specific tasks, sometimes with real-time computational limitations. Usually, it is integrated into a full gadget that also includes mechanical components and hardware. On the other hand, a personal computer or other general-purpose computer can do a wide range of functions based on its programming. Because they are in charge of so many everyday objects, embedded systems have grown in importance in recent years. The health status of soldiers can be tracked and monitored with the use of live track applications, the Internet of Things (IOT), and GPS. The proposed device, which tracks soldiers' current position and fitness level using GPS, could be mounted on a soldier's body. The proposed module could be mounted on a soldier's body to track their current location and health status using GPS, sending the data to a base station via iot. With the help of the presented module, a low-cost circuit to protect soldiers' lives on the battlefield could be implemented. It gets more difficult to locate and return a troop or soldier to the army base station after they become lost during combat owing to unfavorable fighting circumstances or surroundings. Furthermore, every military organization needs to build and construct a clever, compact, portable, resilient system in order to offer safety measures for its personnel. In order to do this, a wireless network covering the body (WBAN) is developed, in which every soldier is seen as a node and is composed of a variety of sensors that monitor their individual situations. These kinds of sensors can be included into a uniform or bulletproof

jacket. The apparatus keeps an eye on the soldier's movements, physiological condition, and environment. The control room can make choices and create a successful fighting strategy if it is mindful of these traits.

PROPOSED SYSTEM

In this proposed system, the military may track a soldier's current GPS position and keep an eye on their physical state, including body temperature and heart rate. This is made possible by the soldier health and position tracking system. Here, data transmission and communication between the troops and the authorities are made easier by the built-in Wi-Fi module on the ESP-32 microcontroller and NodeMCU. Soldiers may talk to each other thanks to the ESP-32's integrated Wi-Fi and Bluetooth modules. The ESP-32 microcontroller has integrated digital to analog converters.

3.1development in the submitted method

The system makes use of an Arduino Uno microcontroller.

• The GSM module in the current system is utilized to transport data between nodes.

• GSM is a digital cellular technology that is open and utilized for mobile communication. However, soldiers in the field did not carry any mobile devices. • As a result, this low-power, long-range loRa module is being employed.

• Storing the data on an IoT cloud.

EXISTING SYSTEM

The Arduino board and microcontrollers utilized in the current system are not the same as the microcontrollers we use. For data transfer to the authorities and communication between soldiers nearby and the authorities or base station, Zigbee, Lora WAN, and GSM modules have been used. Direction is easy to detect because GPS records the latitude and longitude. Some military forces, such as the Israeli Army, are looking at the possibility of putting GPS units inside troop uniforms and vests so that field commanders can track the movements of their soldiers. Guns and other weapons are now being equipped with these gadgets. Real-time, high-speed, short-range wireless communications between soldiers can be facilitated using GSM and GPS devices. For missions like special operations reconnaissance, these communications are essential for situational awareness, tactical directives, and information pertaining to clandestine surveillance. Therefore, we are attempting to create a simple lifeguarding system for soldiers that is very reliable and cheap cost using this equipment.

4.1 Block diagram

Figure 1 Block diagram

HARDWARE REQUIREMENTS

5.1Arduino uno

Figure 2 Arduino uno

The Arduino Uno(fig 2) microcontroller board is available for free and is built on the ATmega328P processor. Six analog inputs, a USB port, a power connector, an ICSP header, a reset button, and fourteen digital I/O pins are all included. It has every module required to keep the microcontroller running. To begin, simply use a USB cord to hook it into your machine or an adapter to supply electricity.

5.2 ESP32

Figure 3 ESP32

The ESP32(fig 3) is a single, low-power, 40 nm TSMC Wi-Fi and Bluetooth combination chip operating at 2.4 GHz. It is engineered to attain optimal power and radiofrequency performance, exhibiting resilience, adaptability, and dependability throughout an extensive range of uses and power conditions.

5.3 GPS Module

Figure 4 GPS Module

A wireless chip module integrated into a mobile phone or computer's mainboard is the GPS module(Fig 4). It is able to establish communication with the US Global Positioning System. It has the ability to find and navigate based on the strength of an internet connection's signal.

5.4 MAX 30100

Figure 5 MAX30100

A combined heart rate monitor and pulse oximeter is the MAX30100(fig 5). To detect pulse oximetry and heart-rate signals, it includes two LEDs, a photo detector, improved optics, and low-noise analog processing of signals. There have been reports of 96–99% accuracy for the MAX30100 sensor.

5.5 BMP 180

Figure 6 BMP 180

The purpose of the BMP180(fig 6) was to monitor atmospheric pressure precisely. Weather and altitude are both influenced by atmospheric pressure. A very low power, high precision digital barometer is the BMP180. With an absolute precision of less than 0.02 hPa, it provides a measurement range of 300 to 1100 hPa.

RESULT AND DISCUSSIONS

With the use of a GPS receiver, the fully integrated system can locate soldiers from any position on the planet. Using a temperature sensor and a heartbeat sensor, this technology assists in keeping an eye on troops' vital signs such as their body temperature and heart rate. This represents the project's view, in which controllers are interfaced with every sensor. Wirelessly controlled robotic arms with an industrial background have bright futures. These devices should continue to advance in terms of efficiency, accuracy, and affordability as technology develops. The result of our project is given in figure 7.

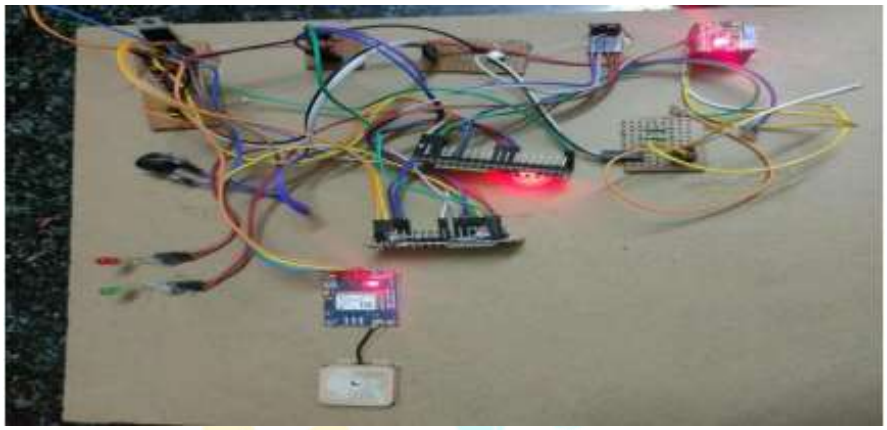

Figure 7 Results

CONCLUSION

When we started the project, we had no idea how successful the design would end up becoming. Throughout the project's conception and execution, we made every effort to adhere to moral standards. With the use of a GPS receiver, the fully integrated system can locate soldiers at any time, from any location on the planet. Using a temperature sensor to measure soldiers' body temperatures and a heartbeat sensor to measure soldiers' heartbeats, this system assists in monitoring the soldiers' health parameters. Finding out each soldier's health status from the combat zone is helpful. This facilitates quick decision-making and helps avoid accidents by offering support or additional help.

II. ACKNOWLEDGMENT

UPCOMING EXTENDS

It is possible to combine additional equipment with the system, such as biochemical, EEG, and EDA (electrodermal activity) sensors. Flexible electronics can be used to incorporate the soldier's unit into the wearable gear, improving convenience for the soldiers. To obtain the audio samples from the soldiers, microphones might be used. Soldiers can send the base station pictures of their immediate surroundings by using surveillance cameras.

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