WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

LORA BASED SOLDIER SECURITY SYSTEM WITH INTEGRATED IoT

[1]S. Tarun Kumar,[2]S. Yeshwarya ,[3]S. Thanuja,[4]P. Madhu Sudhan,[5]R. Krishna Chaitanya,[6]MR. M. Chandrakanth,[7]Dr. B. Siva Prasad

[1,2,3,4,5] B. Tech student Department of ECE, NSRIT, Vizag, AP, India
[6]Assistant Professor, Department of ECE, NSRIT, Vizag, AP, India
[7]Professor, Head of Department of ECE, NSRIT, Vizag, AP, India

ABSTRACT:

Using cutting-edge wireless communication and Internet of Things technology, the "LoRa-Based Soldier Security System Integrated with IoT" seeks to improve soldiers' safety and real-time surveillance in the field. The transmitter (Tx) and the receiver (Rx) are the two main components of the system. Important sensors like SpO2 and heartbeat sensors, an LCD display, a buzzer, a LoRa transmitter module, and an emergency keypad button are all included within the Tx unit. An LCD screen, a buzzer, a LoRa receiver module, and Internet of Things integration for remote monitoring make up the Rx unit. Critical health metrics and other data from the Tx side's sensors are continuously tracked. Both the Tx and Rx units sound an alert if any parameter exceeds certain threshold values or if the emergency button is hit. Using cutting-edge wireless communication and Internet of Things technology, the "LoRa-Based Soldier Security System Integrated with IoT" seeks to improve soldiers' safety and real-time surveillance in the field. The transmitter (Tx) and the receiver (Rx) are the two main components of the system. Important sensors like SpO2 and heartbeat sensors, an LCD display, a buzzer, a LoRa transmitter module, and an emergency keypad button are all included within the Tx unit. An LCD screen, a buzzer, a LoRa receiver module, and Internet of Things integration for remote monitoring make up the Rx unit. Critical health metrics and other data from the Tx side's sensors are continuously tracked. Both the Tx and Rx units sound an alert if any parameter exceeds certain threshold values or if the emergency button is hit.

KEYWORDS: Buzzer LCD display, Arduino Uno implementation, IoT integration, emergency alert system, Lora connectivity, and health monitoring.

LITERATURE SURVEY:

"GPS Based Soldier Tracking and Health Indication System," by Shruti Nikam, Supriya Patil, Prajkta Powar, and V.S. Bendre, International Journal of Advanced Research in Electrical, Electronics, and Instrumentation Engineering, Vol. 2, Issue 3, March 2013. In order to support the base unit in terms of troop security and health during wartime special operations, we set out to create a consistent and affordable project. Additionally, soldiers can contact the base station to request assistance. first determining the soldier's bodily characteristics, such as body temperature, heart rate, and oxygen saturation. Bobade, Patil Vidya Adhikrao, Ghadge Rasika Vijay, and M.V.N.R. Pavan Kumar The article "Health Monitoring and Tracking of Soldier Using GPS" by Sonali Vijaykumar was published in the International Journal of Research in Advent Technology in April 2014 (Vol. 2, No. 4). then using GPS to track the soldier's location. The soldier's ambient parameters, such as air temperature and pressure, are then obtained. In these situations, the blynk server processes the data and displays the results in the blynk app. Notifying the soldier and authorities in case of an emergency if any anomalies are discovered in the data collected from the soldier.

"Smart Soldier Assistance using WSN," International Conference on Embedded Systems (ICES 2014), 978-1-4799-5026-3/14/$31.00 © 2014 IEEE, pp. (244-249), M. Pranav Sailesh, C. Vimal Kumar, B. Cecil, B. M. Mangal Deep, and P. Sivraj. Military decision makers can create battle plans because to this project's related implementation of tracking soldiers and navigating between them during combat. This includes determining their speed, distance, and health status.

LM 35 Datasheet, SNIS159E-August 1999-Revised January 2015, Texas Instruments Inc. Various academicians and researchers have reported numerous attempts to track the soldiers' whereabouts and health status on the battlefield (Pavan Kumar et al. Since the soldier's various tracking parameters are relayed via Wi-Fi module, the base station can use IOT to access the soldier's current state. revealed a GPS-based system to track the whereabouts of the soldier and check their health metrics. Jassaz Al suggested using cloud computing and wireless sensor networks to process information quickly and in real time. With the aid of IoT, a ZigBee-based method was suggested in which the gathered data was subsequently added to cloud-based websites.

Critical situations can make advantage of this technology. The application of M-Health is the most important aspect of this. By putting this mechanism in place, we can increase national security while also enhancing soldier safety. Additionally, this device aids in providing real-time video information. We can lower the number of battle fatalities by implementing this system. We can therefore draw the conclusion that these kinds of gadgets are highly beneficial for guaranteeing soldiers' safety. The Technology To improve safety in emergency response and military operations, a strong, precise

positioning system with seamless inside and outdoor coverage is essential. Field rescue is the primary use for GPS-based location techniques. The GPS chip is used to determine the location and orientation of the imprisoned person and the rescuer.

INTRODUCTION:

A special-purpose computer system called an embedded system is made to carry out one or a small number of specific tasks, occasionally with real-time computing limitations. Usually, it is integrated into a whole gadget that also includes mechanical and hardware components. On the other hand, depending on programming, a general-purpose computer, such a personal computer, can perform a wide range of functions. Since they manage a large number of the everyday gadgets we use, embedded systems have grown in importance. Because the embedded system is used for specialized activities, design engineers can improve it to increase performance and reliability or decrease product size and cost. Economies of scale allow for the mass production of certain embedded systems.

The system is very helpful for getting health status information of soldier and providing them instant help .In this system, smart sensors are attached to the body of soldiers. As soon as any other soldier enters the enemy lines it is very difficult for the army base station to know about the location as well as the health of the soldiers. The important and vital role is played by the soldiers. This system will be useful for soldiers, who involve in missions or in special operations. This personal server will provide the connectivity to the server at the base station using a wireless connection. There are many concerns regarding the safety of these soldiers. The M-health can be defined as mobile computing, medical sensors and communication technologies for health care. Each soldier also has a GSM (Global system for Mobile communication) module which enables the communication with the base station in case of injuries. In today's era enemy warfare is an important factor in any nation's security. The national security mainly depends on army (ground), navy (sea), air-force (air). In our project we have come up with an idea of tracking soldier as well as to give status of the soldier during the war. It is possible by M-Health. The defense department of country must be effective for the security of that country. This is implemented with a personal server for complete mobility. This system enables GPS (Global positioning systems) tracking of these soldiers.

To preserve soldiers' precious lives on the battlefield, a portable, wireless, affordable, and highly reliable tracking device is urgently needed. Additionally, GPS can be used to steer soldiers in the right directions when conducting missions. The army suffers greatly as a result of the lack of information regarding injuries to its soldiers, which could lead to a higher number of fatalities and lasting disabilities. When the military is on the battlefield, it must be closely watched to ensure that soldiers are being used effectively and that tactics are being used to maneuver them into fight. If the control room has up-to-date information on the soldier's location and health, these numbers can be reduced.

The suggested device can track the soldiers' location via GPS and monitor their pulse rate, body temperature, and oxygen saturation in an environment. All of these systems, however, had one or more drawbacks, such as high installation costs, signal loss, excessive noise levels, and their bulkiness. The few main safety difficulties are knowing the soldiers' present location, not being able to communicate with the control room continuously while the operation is underway, not getting medical help right away, and operating in various geographic locations. The Indian military has 1,200,255 active soldiers and 990,960 reserve soldiers, making it the third largest standing army in the world.

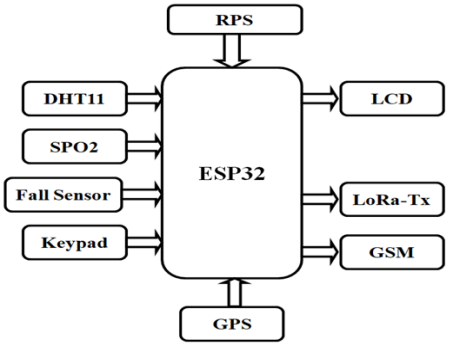
METHODLOGY:

The LoRa-Based Soldier Security System with Integrated IoT was developed using a methodical approach that integrated software implementation and hardware assembly. In order to comprehend the soldiers' real-time monitoring requirements during field operations, the team first carried out a comprehensive requirements study. The DHT11 temperature and humidity sensors, a heartbeat sensor, a GPS module, LoRa modules for communication, an Arduino Uno for the transmitter unit, and an ESP32 for the receiver and Internet of Things connectivity were among the crucial parts chosen based on this.

A transmitter and a receiver were the two main components of the system architecture. The transmitter was set up to receive sensor data and use the LoRa module to communicate the position and health data. This data was gathered by the receiver, which was constructed around the ESP32 module, and sent it to an Internet of Things platform for remote monitoring. To guarantee appropriate connectivity and operation, circuit diagrams were created and every hardware element was integrated.

On the software side, the Arduino and ESP32 modules were coded using the Arduino IDE. Real-time data transmission, emergency alert management, and sensor data collection were all programmed using the Python and embedded C programming languages. The IoT integration was managed by the ESP32, which uploaded sensor data to a distant server. Individual modules underwent extensive testing, and then the entire system was tested in a war simulation. The final prototype successfully demonstrated health tracking, GPS-based location reporting, and emergency alert triggering, proving the system's effectiveness and reliability in real-time soldier monitoring

BLOCK DIAGRAM:



WORKING PRINCIPLE:

The heartbeat sensor operates based on the principle of photoplethysmography (PPG), a non-invasive method that uses light to detect blood volume changes in the microvascular bed of tissue. The sensor unit typically consists of two main components: an infrared or red LED (Light Emitting Diode) and a photodetector (usually a photodiode or a light-sensitive transistor). These components are arranged in such a way that light emitted by the LED must pass through a part of the human body commonly the fingertip or earlobe before being detected by the photodetector on the opposite side or nearby. When the sensor is placed on a finger, the LED emits bright red light, which penetrates through the skin and underlying tissue. As blood pulses through the finger with each heartbeat, the volume of blood in the capillaries changes. These changes affect the amount of light absorbed by the tissue. During systole (when the heart contracts), blood volume increases, leading to more absorption and less light reaching the detector. During diastole (when the heart relaxes), the blood volume decreases, resulting in more light passing through to the detector.

The photodetector senses these variations in light intensity, and converts them into a small, fluctuating electrical signal. Since the changes are very subtle, the raw signal is typically weak and contains noise. To make it usable, this signal is passed through an amplifier circuit, often consisting of op-amps, which boost the signal strength and filter out irrelevant high-frequency noise.

The output from the amplifier is a pulsating analog waveform that corresponds to the user's heartbeat. For digital interfacing and microcontroller-based applications, this signal is often converted into a +5V logic level pulse essentially a series of square wave signals where each pulse represents one detected heartbeat.

Additionally, a visual indicator LED is often included in the circuit. This LED blinks in real time with each heartbeat detection, providing a simple and intuitive feedback mechanism to the user. The blinking light not only confirms that the sensor is operational but also gives a visual cue for pulse rate measurement.

In some advanced modules, further processing may be done to calculate beats per minute (BPM), average heart rate over time, and even detect irregularities such as arrhythmias when connected to a microcontroller or a digital system like ESP32.

FUTURE SCOPE:

With an emphasis on improving soldier safety and effectiveness in combat operations, the LoRa-based Soldier Security System with Integrated IoT has enormous development potential. Artificial intelligence (AI) and machine learning (ML) are two possible developments. By using AI and ML algorithms to evaluate sensor data and forecast possible health hazards, proactive medical interventions are made possible.

Improved Data Analytics: Making use of predictive analytics to anticipate trends in soldier health, allocate resources as efficiently as possible, and enhance mission planning.

Expanding the system to facilitate coordination between air, sea, and ground forces while guaranteeing smooth communication and improved situational awareness is known as multi-domain operations.

Integration of Edge Computing with 5G: Making use of edge computing and 5G technology to improve system performance, lower latency, and process data in real-time.

Integration of Edge Computing with 5G: Making use of edge computing and 5G technology to improve system performance, lower latency, and process data in real-time.

Smart Wearables: Creating smart wearables that improve troops' performance and safety by providing them with real-time feedback, instruction, and direction.

Better Clutter Suppression: By using sophisticated signal processing methods, clutter suppression is improved, enabling more precise target tracking and recognition.

These developments have the potential to greatly improve military operations' efficacy, safety, and efficiency—saving lives and enhancing mission results in the process.

We can infer from the above-mentioned system that we can use GSM to transmit data that is sensed from a distant soldier to the army control room. The technology is fully integrated and DIn an emergency, this technology enables the soldier to seek assistance from an army base station or from another

soldier. The army control room receives real-time soldier position data and health parameters from this system. Soldier protection and safety are provided by GPS, which tracks a soldier's whereabouts anywhere in the world, and a health system that keeps an eye on a soldier's critical health indicators.

CONCLUSION:

Soldier protection and safety are provided by GPS, which tracks a soldier's whereabouts anywhere in the world, and a health system that keeps an eye on their key health indicators. The employed modules are lightweight and smaller in size, making them portable. In this sense, the idea of a tracking and navigation system is particularly helpful to soldiers in combat situations. Additionally, the base station may view soldiers on the field in real time on a PC.

We can infer from the above-mentioned system that we can use GSM to transmit data that is sensed from a distant soldier to the army control room. The technology is fully integrated and uses a GPS receiver to track the soldier's location at any time, from any point on the planet. In an emergency, this technology enables the soldier to seek assistance from an army base station or from another soldier. The army control room receives real-time soldier position data and health parameters from this system. Soldier protection and safety are provided by GPS, which tracks a soldier's whereabouts anywhere in the world, and a health system that keeps an eye on a soldier's critical health indicators.

REFERENCE:

1. "GPS Based Soldier Tracking and Health Indication System," International Journal of Advanced Research in Electrical, Electronics, and Instrumentation Engineering, Vol. 2, Issue 3, March 2013, by Shruti Nikam, Supriya Patil, Prajkta Powar, and V.S. Bendre.
2. Bobade, Patil Vidya Adhikrao, Ghadge Rasika Vijay, and M.V.N.R. Pavan Kumar The article "Health Monitoring and Tracking of Soldier Using GPS" by Sonali Vijaykumar was published in the International Journal of Research in Advent Technology in April 2014 (Vol. 2, No. 4).
3. "Smart Soldier Assistance using WSN" by M. Pranav Sailesh, C. Vimal Kumar, B. Cecil, B. M. Mangal Deep, and P. Sivraj, International Conference on Embedded Systems (ICES 2014), 978-1-4799-5026-3/14/$31.00 © 2014 IEEE, pp. (244-249).
4. "Smart Soldier Assistance using WSN" by M. Pranav Sailesh, C. Vimal Kumar, B. Cecil, B. M. Mangal Deep, and P. Sivraj, International Conference on Embedded Systems (ICES 2014), 978-1-4799-5026-3/14/$31.00 © 2014 IEEE, pp. (244-249).
5. LM 35 Datasheet, SNIS159E-August 1999-Revised January 2015, Texas Instruments Inc., pp. (1-31).
6. "A Raspberry Pi-based Internet of Things patient monitoring system," International Conference on Computing Technologies and Intelligent Data Engineering, Kovilpatti, India, January 2016, pp. 1-4. R. Kumar and M. Rajasekaran.
7. R. Shaikh, "Arm7-Based Real-Time Health Monitoring System for Remote Patients," International Journal of Instrumentation, Control and Automation (IJICA), vol. 1, no. 3-4, pp. 102-105, 4, 2012.
8. "A Real Time Autonomous Soldier Health Monitoring and Reporting System Using COTS Available Entities," Second International Conference on Advances in Computing and Communication Engineering (ICACCE), Deharadun, India, May 2015, pp. 683-687, by S. Sharma, S. Kumar, A. Keshari, S. Ahmed, S. Gupta, and A. Suri.
9. "Location Tracking Applications," by S. Gamache, IEEE 15-10-0519-00, July 2010
10. "A Secure Freight Tracking System in Rails Using GPS Technology" by V. Ashok, T. Priyadarshini, and S. Sanjana, Second International Conference on Science Technology Engineering and Management (ICONSTEM), Chennai, India Pages 47–50, March 2016.
11. Wes system and Wayne Soehren, IEEE A&E system magazine, April 2008.