Real-time Soldier Health and Location Tracking System

Sai Chander Aysola1[1*], *Preethi* Addetla[1], *Venkatesh Surender Rahul* Arige[1], *Bharath Reddy* Banrapolu[1], *Pranay Raj* Renatla[1], *Y.* Lakshmi Prasanna[2], *Nikolai* Ivanovich Vatin[3]

[1]Department of Electronics and communication Engineering, KG Reddy College of Engineering & Technology, Hyderabad, Telangana, India-501504
[2]Department of CSE, GRIET, Hyderabad, Telangana, India
[3]Lovely Professional University, Phagwara, Punjab, India.

Abstract. To improve military personnel's overall health and operational efficiency, the Soldier's Health Monitoring and Position Tracking System integrates innovative technology in a comprehensive way. Military commanders are guaranteed complete situational awareness with this system's combination of real-time health monitoring and exact position tracking. Vital physiological indicators including heart rate, temperature, and blood oxygen levels are continuously collected and analysed as part of the health monitoring element. The measurements are sent wirelessly to a command centre, so any possible health problems may be identified quickly and responded to quickly. In order to keep meticulous records of each soldier's exact whereabouts in the field, the system simultaneously makes use of cutting-edge GPS and INS technology. The seamless integration of geo-spatial information with health data gives commanders a comprehensive picture of the troops' physical state and where they are. Military authorities may make educated judgements based on the collective health and positioning data using the system's user interface, which provides an intuitive dashboard for real-time monitoring. The data will be sent to the command centre via the Internet of Things. Components of the suggested system include gearbox modules, small wearable physiological equipment, and sensors. As a result, the suggested gear may be used to provide a cheap method of protecting the precious human life on the battlefield. Using global positioning system (GPS) and cellular service mobile phone (GSM) technology, this device can wirelessly monitor the soldier's vitals, including his or her heart rate and temperature.

1 Introduction

Being safe and secure is a desire shared by all people on Earth. Security concerns for multinational corporations, the military, and the army further complicate matters. Everybody, even the average Joe, does all they can to keep their data safe. Encrypting data before transmitting and receiving it and then decrypting it to get the original message is a common

* Corresponding author: saichander.a3@kgr.ac.in

approach for securely protecting data. We will transform the data into an unintelligible format before sending it. In order to decipher the original message, the receiver must perform the inverse process of encryption. Following the standard standards for encryption and decryption ensures that the data is safeguarded in every manner. This project gains additional flexibility with the use of wireless technology. Prior to utilising certain software or hardware connections, they must be installed into the system. In this project, all of the hardware connections and cables may be removed. Communication in the military must be secure. Confidential information is exchanged between them. No one should be able to hack the messages sent or received. A wireless communication system based on controllers is used for the secure communication system to transmit and receive messages and data in an encrypted manner. Half duplex and full duplex are the two forms of communication. An encrypted half-duplex system forms the basis of this project. This system's signals are impenetrable. Data transfer between nodes is a critical component of communication networks. Both the management network and system-wide control systems may benefit from these. Some decisions and information are kept hidden at the highest levels of management. Additionally, there must be no disruptions in the transmission of secret data from one location to another. The prime minister's and the defence minister's conversations, as well as those between their respective countries, must remain strictly confidential. To accomplish this, several forms of communication are used. Some individuals utilise encryption and decryption techniques, which include sending a mixed signal that includes some irregular data added at the transmitter end. In order to recover the signal from the transmitter, the additional signal is eliminated at the receiver end. The encryption makes deciphering the communication impossible even if it is tapped. Therefore, safeguarding against this kind of danger is ensured. This, however, is a rehash of techniques utilised by earlier varieties. These days, we still use the same decoding and encoding phenomena, but we communicate via more advanced means. Optimal communication would be by wireless means. For dependable wireless communication, nothing beats GSM modules with digital communication. These modules are well-liked because their range is up to 1.5 km and because they are resistant to communication failure caused by impediments. For the purpose of encoding and decoding, a microcontroller is used. Data transmission encoding and decoding methods are the focus of our research. Both of them make use of the ARDUINO UNO microcontroller, which allows for the transmission of data between two locations. In terms of the significance of the application, it is advantageous and economical.

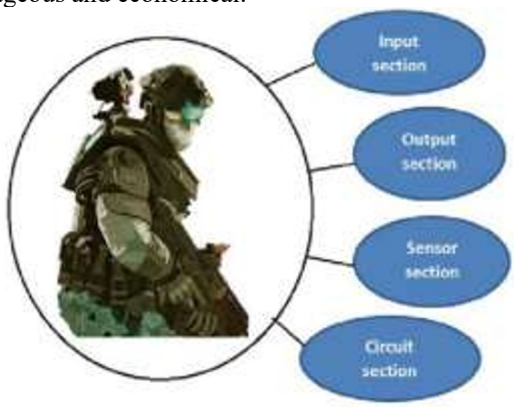

Fig.1. Block diagram.

2 Survey of Research

1) Everyday conversation has a crucial function. Wireless and wired communication are the two main categories. When compared to wired communication, wireless is generally better. However, in the event of industries, corporations, etc., there are instances when protected wireless connection is necessary. This article explains how to encrypt data before sending it wirelessly using ZigBee, which makes data transmission more secure. The paper is divided into two parts: the transmitter and the receiver. Using a piece of software called hyper terminal, which is designed for serial connection, data may be transferred to the microcontroller from a computer. Once the microcontroller receives data, it transmits the information to the ZigBee transmitter that is linked to it. Before being sent to the recipient, the data is encrypted. Data transfer is done using the ZigBee transceiver. Transforming plain text into cypher text is what encryption is all about. Plain text refers to the original data, whereas cypher text describes the data that has been altered using procedures so that only authorized individuals can decipher it. The process of decryption involves transforming ciphertext into plaintext. A password is needed to access the decrypted data that is shown on the computer. In this way, the data is safe from hackers.[1]

2) The protection of sensitive information at military bases is a top priority. Early systems were vulnerable to hacking by opponents, spies, and terrorists during data transfer between military sites. For this aim, cryptography is an essential mechanism. Data encryption and decryption techniques come in many forms, and new algorithms are always being developed. One robust technique used for data security in army stations is the polyalphabetic substitution cypher. Several methods for protecting sensitive information are covered in this work, including an approach that employs a polyalphabetic substitution cypher.[2]

Thirdly, in the past, terrorists, hostile governments, and even spies were able to steal data transmissions between military installations. Therefore, data security is crucial, particularly from a defensive standpoint. Data transmission security may be achieved in a number of ways. Secure data transfer is possible using a variety of methods, one of which is cryptography. Data encryption and decryption techniques abound, and new algorithms are constantly appearing on the market. One of the most robust methods used to secure data in military installations is the poly alphabetic cypher algorithm. The study delves into the topic of wireless data transfer between army stations utilising the Arm7 CPU and discusses a poly alphabetic cypher technique.[5]

[4] "An Internet of Things (IoT)-Based System for Soldier Health and Navigation: (2017)"-- Omkar Kumbhar, Priyanka Bagul, Sakshi Basangar, and Krutika Patil In order to help military or army officials plan battle plans, they suggested an effective system that tracks soldiers' whereabouts and health metrics while they're fighting. The Zigbee modules allow the base station to communicate with the soldiers and get their GPS coordinates. If a soldier gets lost on the battlefield, the base station can help him find his way back. Thanks to the Internet of Things (IoT), the central station can see the soldier's current state as shown on the PC. The location and orientation of the soldier are tracked using GPS, and a number of biological sensors are used to monitor the soldier's health parameters.

[5]Aashay Gondalia, Dhruv Dixit, Shubham Parashar, Vijayanand Raghava, and Animesh Sengupta (2018) "IoT-based Healthcare Monitoring System for War Soldiers using Machine Learning." This article details the incorporation of biomedical sensors and monitoring devices into the troops' equipment. All of the integrated components need to be small, lightweight, and power efficient in order to get the job done. The inability of troops to connect with command units is one of the most basic problems in military operations. Careful planning and coordination also rely on troops being able to navigate amongst themselves effectively. The proposed work is centred on tracking the whereabouts of soldiers. This will help the control room station to know exactly where the soldiers are so they can lead them

properly. The command post uses GPS to track the whereabouts of the soldier. When a soldier becomes disoriented on the battlefield, the base station must be contacted in order to reroute him. Soldiers participating in special operations or missions will find this material valuable. Wearable biomedical sensors provide troops with vital signs monitoring, electrocardiogram (ECG) functionality, vibration detection, temperature and humidity, bomb detection, and more. The soldier may move about freely with them implanted in his body. The system is designed to provide.

3 Proposed system

For the purpose of developing a troop tracking system that makes use of a wireless system to keep tabs on the following: How hot or cold your body is. Environmental sensors for biological applications: Here, we are using a pulse rate sensor and a body temperature sensor to determine the soldier's health state. The next step is to condition these parameters with signals before storing them in memory. The inability of the soldier to connect with the administrator in the control room is one of the most basic problems with military operations. When two organizations communicate over a shared network, each must adhere to certain administrative and operational standards. Therefore, it is impossible for one unit to connect with another or use the communication infrastructure run by the national army in the same area without extensive preparation and coordination. The objective of this study was to compare the Soldier Tracking and PeGSMormance Measurement System's specifications to those specified in the RFP. The secondary goals of this study were to collect information that would help future users of the system to know what it can and can't do, and to help with the time and resource planning that would be required to make the most of the system when training the soldier.

Fig.2. details of soldier

4 Working methodology

When it comes to emergency response and military operations, having a strong, precise positioning system that covers both inside and outside seamlessly is a huge help. GPS-based positioning techniques are mostly used in rescue operations. Using a GPS chip, the rescuer and the trapped person's positions and orientations are determined. By using the GPS data from both devices, a set of algorithms developed in the field of Geographic Information Science (GIS) may be used to determine the relative height, distance, and direction between them. The navigation between two soldiers is being done using this technique.GSM transceiver will transmit data continuously. This gadget aids soldiers in situational awareness by facilitating precise coordination via wireless communication. There is a serial interface on

GPS modules. This interface is used to broadcast receiver information in a specific data format. The NMEA, or National Marine Electronics Association, standardised this format.

4.1 Electromagnetic beacons and biosensors

A number of wearable sensors have been created to track numerous physiological characteristics in humans, thanks to recent technological advancements. There are a number of different sensing technologies that, when combined with the associated physiological signals, may form a comprehensive health monitoring system. The collection of real-time obtained parameters may provide an overall assessment of health state at any given moment, thanks to the measurement of these essential bio-signals and their subsequent processing for feature extraction. The ECG, EEG, Brain Mapping, and other vital signs of soldiers may be tracked. However, the soldier cannot bring them on the battlefield because of the sophisticated electronics and medical equipment they need. The whole apparatus would get cumbersome for the soldier.

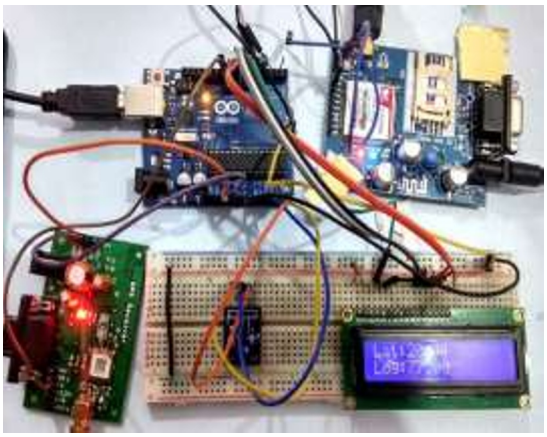

Fig.1. Hardware kit.

Fig.2. Output results.

5 Conclusion

We deduced the following from the aforementioned implementation: Protection and well-being of troops: In order to ensure the safety and security of our troops, we may use GPS to follow their whereabouts and vital signs from anywhere in the world. It Is Possible to Have Effective Conversations: With GSM, DS-SS, and FH-SS, soldiers may stay in constant contact with one another and their squad in the event of an emergency, regardless of where they are. Reduced power consumption and simplified circuitry. Reduced power consumption is a result of using ATMEGA328P processors. Additionally, the complexity is decreased due to the tiny size of the modules employed.

6 Future scope

The distances of surrounding hospitals are being used to determine the quickest way, however there is a possibility that there may be greater traffic along that route. Therefore, we need to develop an algorithm that finds the closest hospitals while minimising travel time and traffic. We are considering including modules that provide the system with traffic information. This will enable it to determine which node is the most efficient in terms of travel time from the accident site. We may also include a "first aid kit" to provide on-site medical care in the event of an emergency. We may enhance the suggested system's performance by including modules that evaluate the severity of injuries or other relevant data, such as blood type, heart rate, and current glucose level. This data can be sent to hospitals before patients ever reach the hospitals, allowing for faster treatment.

References

1. R. Ganiga, Rohit Maurya, Archana Nanade,"Accident detection system using Piezo Disk Sensor", International Journel of science, Engineering and Technology Research(IJSETR) volume6,Issue3,March 2017,ISSN 2278-7798.
2. Hemjit Sawant, Jindong Tan, Qingyan Yang Qizhi Wang," Using Bluetooth and Sensor networks for intelligent transport systems", In proceeding of Intelligent Transport System; 2004
3. Helia Mamdouhi, Sabira Khatun, Javed Zarrin," Bluetooth Wireless monitoring, Manging and Control for inter vehicle in vehicular adhoc networks", Journal of computer Science, Science Publication; 2009
4. Jules White, Brian Dougherty, Adam Albright, Douglas C," Using Smartphone to Detect Car Accidents and Provide Situational awareness to emergency responders chirs Thompson", Mobile Wireless Middleware, Operating system and Application;2010
5. Khyati Shah, Vile Parle, Swati Bairagi,Vile Parle "Accident Detection and Conveyor System using GSM and GPS Module" International journal of Computer Applications (0975-8887) .
6. Pooja Shindalkar, Aasiya Fatema Shaikh, Chaitanya Mate, "Arduino Based Vehicle Accident Detection System", International journal of Innovative Research in Computer and Communication Engineering (An 3297:2007 certified organization) Vol.5, Issue 4.
7. E.Krishna Priya, P.Manju, V.Mythra, "IoT Based Vehicle Tracking and Accident Detection System" International journal of Innovative Research in Computer and Communication Engineering, (An ISO 3297:2007 Certified organization) Vol.5,Issue 3.

8. Tanushree Dalai, "Emergency Alert and Service for Automotives for India", International Journal of Advanced Trends in Computer Science and Engineering (IJATCSE) Mysore India, vol. 2, no. 5, pp. 08-12, 2013.
9. Manuel Fogue, Piedad Garrido, Francisco J. Martinez, JuanCarlos Cano, Carlos T. Calafate, and Pietro Manzoni (2012) "Assistance through Communication Technologies and Vehicle", IEEE vehicular technology magazine.
10. PL Needham, Collision prevention: The role of an accident data recorder. Automated Emergency Call for Road Accident, European Commission Press G. Singh and H. Song, Using Hidden Markov Models in Vehicular crash detection, IEEE Transactions.
11. Aldunate R.G., Herrera O.A., Cordero J.P. (2013) Early Vehicle Accident Detection and Notification Based on Smartphone Technology. In: Urzaiz G., Ochoa S.F., Bravo J., Chen L.L., Oliveira J. (eds) Ubiquitous Computing and Ambient Intelligence. Context-Awareness and Context-Driven Interaction. Lecture Notes in Computer Science, vol 8276. Springer, Cham. https://doi.org/10.1007/978-3-319-03176-7_46.
12. Niranjan Kumar K., Rama Narasimha Dattu C.H., Vishnu S., Jino Ramson S.R. (2019) Automatic Accident Rescue System Using IoT. In: Smys S., Bestak R., Chen JZ., Kotuliak I. (eds) International Conference on Computer Networks and Communication Technologies. Lecture Notes on Data Engineering and Communications Technologies, vol 15. Springer, Singapore. https://doi.org/10.1007/978-981-10-8681-6_52.