School of Computer Science Engineering and Information Systems
M.Tech (Integrated) Software Engineering
WINTER 2023-2024

SOLDIER HEALTH MONITORING & TRACKING SYSTEM

Submitted for the Course

SWE 1901 : Technical Answers for Real World Problems (TARP)

Offered during WINTER 2023-2024

(Dr. R. K. Nadesh)

by

ABINESH KUMAR KV	**21MIS0015**
YOHAN KRISHNA B K	**21MIS0287**
LOHITH KUMAR M	**21MIS0310**
RUTHIKA J	**21MIS0359**
KELVIN SAMUEL S	**21MIS0361**

School of Computer Science Engineering and Information Systems
M.Tech (Integrated) Software Engineering
WINTER 2023-2024

SOLDIER HEALTH MONITORING & TRACKING SYSTEM

TEAM Number :

Team Member(s) with Reg # and Name :

Name	Reg No	Ph No	Email
Abinesh Kumar KV	21MIS0015	9042571877	abineshkumar.kv2021@vitstudent.ac.in
Yohan Krishna B K	21MIS0287	9740679224	yohankrishna.bk2021@vitstudent.ac.in
Lohith Kumar M	21MIS0310	9944228712	lohithkumar.m2021@vitstudent.ac.in
Ruthika J	21MIS0359	9025926878	ruthika.j2021@vitstudent.ac.in
Kelvin Samuel S	21MIS0361	9345285100	kelvinsamuel.s2021@vitstudent.ac.in

Project Title : SOLDIER HEALTH MONITORING & TRACKING SYSTEM

1. Introduction

1.1 Background (System Study Details in brief)

There was very less and poor soldier health monitoring and tracking system used during the warfare's by the militaries. Though there were many other technologies also used, LoRa (Long Range) technology is a significant advancement in military operations. This project is designed to monitor the health parameters of soldiers and track their location in real-time, providing crucial data for operational efficiency and safety.

1.2 Problem Statement

In today's world, warfare plays a crucial role in any nation's security. Soldiers, who are at the forefront of these operations, often face harsh and unpredictable conditions. Their health and safety are of utmost importance. It has been a great challenge in identifying the soldiers whereabouts and also tracking their health in real time. Due to this many soldiers have lost their lives because of late rescues and late medications. The problem also lies in developing a system that can effectively monitor the health status and location of soldiers in real-time, transmit this data securely and reliably.

1.3 Abstract

Soldier Health Monitoring & Tracking System transforms military operations by providing real-time monitoring and tracking of soldiers' health parameters. Since the increase in rivalry among nations, more warfare has occurred in the recent times. The military and soldiers' safety are seen as playing a crucial

role during the wars. The soldiers' inability to interact directly with the military control center is one of the main charges in military operations. Real-time GPS tracking and Lora technology installed in the control unit of the military camps are the greatest way to guarantee the security of these military soldiers. This technology not only ensures the safety of individual soldiers but also enables high commands to take decisions based on real-time data.

Using the LoRa module, a low-power, long-range LPWA modulation technology, this gadget is meant to record and send real-time data on soldiers' movements, positions and health conditions. The suggested technique is suitable for applications where data must be transferred over long distances while using less power. The soldier health monitoring & tracking system has the potential to increase military personnel's safety and effectiveness. LoRa technology, which enables long-distance communication with low power consumption, makes it ideal for usage in isolated locations or at hazardous or remote location. This method could help overcome the drawback of a missing soldier by identifying the exact location of any soldier who is in severe condition.

2. Related Work

2.1 Literature Survey (Should be elaborately discussed with its citation)

GPS BASED SOLDIER TRACKING AND HEALTH INDICATION SYSTEM(2013)

It addresses the critical need for ensuring the safety and security of soldiers during warfare by utilizing advancements in technology, such as GPS, RF communication, and biomedical sensors. The authors discuss the integration of various components, including ARM processors, GPS modules, RF transceivers and biosensors like LM35 and pulse rate sensors to monitor soldiers' location, health parameters and facilitate communication between soldiers and base stations. Additionally, the paper highlights the importance of continuous communication, reduced circuit complexity, and power consumption in enhancing the effectiveness of such systems.

SOLDIERS HEALTH MONITORING AND POSITION TRACKING SYSTEM(2017)

The existing methodology range from wearable sensor networks for real time health monitoring to IoT enabled fabric sensors for addressing sleep disordered breathing issues. Additionally, studies highlight the significance of GPS tracking systems in monitoring soldiers' health parameters and transmitting data to base stations for prompt medical assistance. Challenges such as lack of communication between soldiers and base stations, geographical complexities, and the need for real time monitoring are addressed.

GPS Based Soldier Tracking and Health Monitoring(2017)

It emphasizes the importance of soldier health and safety in national defence and proposes a GPS based tracking and health monitoring system. The system utilizes sensors such as heart rate and temperature sensors to continuously monitor soldiers' vital signs and transmit the data wirelessly to a control room via GSM. Additionally, the system incorporates GPS technology to track soldiers' locations enabling quick response in case of emergencies or casualties.

GSM BASED SOLDIER TRACKING SYSTEM AND MONITORING USING WIRELESS COMMUNICATION(2017)

Umar Farooq et al. proposed a public safety system in Pakistan utilizing a four stages SMS system, while

Thuong Le Tien and Vu Phung presented a vehicle tracking system based on GPS and GSM.
Additionally, Anto introduced techniques for fatigue detection in drivers using various sensors. The current work builds upon these previous studies by focusing on the development of a GSM based soldier tracking system with health monitoring capabilities. By integrating temperature and pulse rate sensors, the system aims to provide real time monitoring of soldiers' health status in combat situations, enabling quick responses and support from control units.

IoT-based Healthcare Monitoring System for War Soldiers using Machine Learning(2018)

The system for real-time monitoring and tracking of soldiers in combat situations integrates various chemical devices, GPS technology and wireless communications such as ZigBee and LoRaWAN. These sensors, which include heart rate, temperature and explosives, are embedded in military equipment for continuous health monitoring and location tracking. The information collected by these sensors is sent wirelessly to the panel and then to the control room, allowing quick response to emergencies and effective decision-making. The system includes machine learning algorithms such as K-means clustering for data analysis and prediction of soldiers' conditions and theatre locations. The proposed model shows great value in integrating sensor data and providing insight into military activities and situations. The paper suggests future improvements such as the inclusion of additional sensors for better operational awareness, optimization of systems to increase energy efficiency, and dynamic head selection.

Secure Health Monitoring of Soldiers with Tracking System using IoT: A Survey(2019)

Several studies have investigated the use of different sensors, communication protocols, and platforms such as ARM processors, raspberry Pi, and cloud computing to develop efficient systems. These systems aim to provide real time monitoring of soldiers' health parameters like heartbeat, body temperature, and environmental conditions, along with tracking their locations using GPS technology. The integration of IoT, wireless sensor networks, and cloud computing offers potential benefits in terms of accuracy, reliability, and cost-effectiveness for ensuring the safety and security of military personnel. However, challenges such as network errors, processing speed limitations, and security vulnerabilities need to be addressed to enhance the effectiveness of these systems.

Soldiers health monitoring and tracking system using IOT and UAV(2020)

Use the Internet of Things and drone technology to monitor and track the health of soldiers during war or counter-terrorism. The authors report that the number of soldiers recovering from such cases is increasing and emphasize the urgent need for medical information. The system consists of body sensors mounted on soldiers' shirts that send data to drones and military trucks that act as servers. These servers provide efficient communication and data backup, overcoming the challenges of high costs and poor communication with previous technologies. The system uses the Internet of Things to provide low-cost, portable care and additional medical support in the vest. This app includes multiple temperature, humidity, heart rate, gas, and GPS sensors controlled by a WiFi-enabled microcontroller. The author believes that this technique can save the lives of many soldiers by providing timely medical assistance in critical situations.

A Novel GPS based soldier health monitoring and position tracking system(2022)

This research article provides an overview of current research focusing on military health and space surveillance, highlighting the important role of technology outputs such as GPS, GSM, sensors, and IoT in enhancing the security of the military. These studies explored various aspects of military health monitoring, including precise location tracking, vital signs, and emergency alerts. By integrating sensors, GPS modules, GSM communication and microcontrollers, the researchers aim to create a powerful system that can track the health status of soldiers and provide change updates at base time. The survey demonstrates collaboration between this area of research and applications beyond the military, such as healthcare and transportation tracking.

LORA BASED SOLDIER TRACKING AND HEALTH MONITORING DEVICE(2023)

Creating a LoRa-based soldier tracking and health monitoring system aimed at improving the safety and performance of soldiers in combat. By integrating temperature, pulse, GPS and other sensors, the military's vital signs and location can be continuously monitored in real time. The system uses radio frequency modules to send data to control nodes; control nodes then analyse the data and notify the relevant authorities in case of an anomaly or emergency. Using IoT technology, the system can provide uninterrupted communication and information transfer between soldiers and control centres without the need for manual input. The system improves the soldier's overall safety and efficiency by providing a low-power solution that solves the problems of traditional soldier.

NOVEL WEARABLE HEALTH MONITORING AND TRACKING SYSTEM FOR SOLDIERS BASED ON IOT(2023)

A clear study was presented on the new health monitoring and tracking based on IoT technology developed for the soldier. To meet the urgent need for healthcare and communication during military operations, the proposed system integrates with various sensors and connected devices to further collect and analyse important health parameters such as heart rate, temperature and GPS location. Using IoT capabilities, the system can send data to the central station, thus facilitating timely medical assistance and improving management's knowledge of the nature layer. Use of the system has shown significant results, including improving real-time healthcare, rapid response to emergencies, increased security through location tracking, data processing and integration with existing forces. In addition, the system's cost-effectiveness and potential for optimized allocation of resources underscore its value in revolutionizing soldier treatment and ensuring the health, safety and performance of soldiers in a variety of working environments.

A Soldier Health Monitoring System for Military Applications: (2010)

The paper at first begins by stating that wearable sensors have been made like body sensor network (BSN) which involves in placing the sensors on the soldiers' body for monitoring various human physiological parameters like blood pressure, body temperature, etc. The paper deeply involves the ongoing project to create a network of connected BSNs for soldiers' real-time health monitoring. The authors go over the project's history and an example of its use. They also propose a blast source localization application and detail the system's early prototype.

GPS BASED SOLDIER TRACKING AND HEALTH INDICATION SYSTEM: (2013)

The paper talks about how GPS can be used in the military tracking. GPS is a technology which is used to

track any person around the globe. The use of ARM processors and low power lowers the system's overall power consumption. The modules used in the paper are lightweight, compact and portable. With the help of wireless connection, GPS can provide accurate coordination of the soldiers so that the military camp can have exact track on the soldiers. The RF Transceiver used in GPS determines the height, speed, and distance between the soldier units by obtaining their latitude and longitude.

IOT and GPS Based Soldier Position Tracking and Health Monitoring System: (2018)

Here, in this paper, the authors talk about how using RF, DS-SS, FH-SS are used by soldiers to communicate within their troops whenever necessary. The authors say that 328 controller and the usage of low power peripherals reduce the overall power consumption. The best part is that soldier's real-time location and health parameters are instantly transmitted to the military control station without requiring any input from the soldiers makes the Internet of Things relevant to military navigation and health monitoring systems. For the majority of equipment used for military tracking, the location precision ranges from 100 to 10 meters. If a soldier is lost on the battlefield, one of the control station's crucial functions is to lead him in the right direction. The soldier's current state can be accessed by the base station via the Internet of Things (IOT) and GPS.

Detection, Monitoring and Tracking Of Survivors under Critical Condition Using Raspberry-Pi: (2019)

This research paper describes the use of the Internet of Things used to track survivors in remote areas along with health metrics which are continuously monitored. This proposed tracking system can be used to find the survivors after the natural conflicts occurs. The important parameters of survivors are measured like their heartbeat, pulse rate and respiration. The proposed work by the authors uses GPS to combine a portable and miniaturized framework of sensors and other transmission units which are then integrated on soldiers in the war zone.

This allows for real time health monitoring and all collected data is transferred via IOT to a central database system. The authors primary contribution is the ability to detect the surrounding environment's temperature, pulse and dangerous chemicals in addition to tracking the soldier's current location and displaying the data on a webpage. According to this research paper, each soldier has a wearable gadget and the leader has a portable device. This method has a humanitarian goal because it can lessen the impact of numerous problems encountered in war such as missing soldiers and the challenge of tracking their health status.

Soldier Tracking and Health Monitoring System using LabVIEW: (2020)

This paper talks about how to monitor various body aspects of a soldier using sensors like pulse sensors, and LM35 to measure the heartbeat and body temperature of the soldiers respectively. The paper also includes fire sensors which warns the military officials about the fire accident which has occurred. Wireless communication devices, GPS receivers and biological sensors are said to be the essential components of the suggested system in the paper. Biomedical sensors are used to measure physiological factors such as heart rate and temperature.

Soldiers encounter numerous challenges on the battlefield such as running out of ammos, injuries, need of backup team, etc. To these problems, soldiers should be assisted in communicating with the base station in these worst-case situations. This can be done through a keypad interfaced with the unit, soldiers can make phone calls to the base station in the event of an emergency. This can be monitored by the base station using LabView installed and monitored in PCs. The GSM modem is also used where SIM cards can be inserted and the soldiers can send SMS to the base camp with the help of IMSI.

REAL TIME TRACKING AND HEALTH MONITORING OF SOLDIERS USING GPS AND GSM MODULE: (2021)

The paper talks about the technology that makes it possible to locate and follow the movement of soldiers who have been injured in wars. With the use of a GPS module and wireless biosensors including pressure, heart rate and temperature sensors, this technology allows military stations to monitor and track their whereabouts. This paper also helps in finding land mines using the metal detector. Through the GSM module, data from the GPS sensor and receiver is sent. A soldier can also use the panic button to connect with other soldiers within the wireless transmission and reception range and to request assistance from the control centre.
The soldiers can be monitored at any time and from any location in the world because GPS is available widely. Even when a soldier is ill, the military control room provide help by keeping an eye on their condition and provide emergency support. With the help of this, the soldiers are made safer. This application aids in the delivery of real-time information. It also aids in giving the military crucial information and alerts and can direct lot of vulnerable locations.

IoT Based Soldier Status Monitoring Using Sensors and SOS Switch: (2022)

The paper mainly talks about the soldier's safety and protection during wars. This paper's primary goal is to track the soldier's location and use sensors to warn them when they are in danger. The soldier's boots and helmet are equipped with certain intelligent sensors as part of this system. In case of an injury, each soldier is equipped with an IoT module that enables them to contact the military base. The proposed plan is to use the communication module to keep an eye on the soldiers and inform them of their whereabouts during the conflict. The soldiers are equipped with motion and gas sensors to warn and alert them in the occasion of any threat. In order to detect metal inclusions concealed within objects, a metal detector was used. It has a GPS module that uses the Internet of Things to broadcast the soldier's current location to the access point, enabling them to speak with the main controller.

Soldier's Position Tracking & Health Monitoring Optimization Model Using Biosensors: (2023)

The goal of this research paper is to create a new system that uses the internet of things (IoT) to track soldiers' locations and monitor their health in real time, depending on the situation. The wearable gadget and the control unit are the two main components of the suggested system. The wearable gadget has a temperature sensor, an oxygen level meter and a heartbeat sensor which is worn by the soldier. This equipment tracks the soldiers' whereabouts using the global positioning system (GPS), which facilitates data transfer the military control centre. This study makes use of a variety of sensors, including heartbeat and oxygen level sensors, PIR sensors to identify people, sound and temperature sensors to distinguish sounds produced and heartbeat and oxygen sensors to identify heartbeat. Compared to other well-known techniques, the multi-layer inference system conserves the device's battery power with 98.5% data reduction. Higher authorities can also receive signals via the GSM technology.

Cloud based Location Tracking and Controlling Parameters System Implementation for Armed Forces in the War field: (2023)

The paper gives us a brief on how soldiers risk their lives not only fighting in wars but also living in harsh weather which weakens their health and brings changes in their vital health parameters like blood pressure, oxygen saturation and heart rate. This research work has pursued to develop a solution to this problem by developing an IoT-based health monitoring and location tracking system for troops to track their whereabouts and health state which can be helpful in removing the significant health disorders. The suggested system collects the data together with the positions of soldiers and delivers the real-time information to the military control centre.
The soldier monitoring system developed in the paper has been capable in collecting and processing

the health parameters from the soldier's body. It is also an inexpensive, small wearable device. The device suggested in the paper by the authors provide soldiers with real-time health parameters and precise position information. Therefore, the intended technology would protect army men like a lifeguard.

LoRa based Smart Soldier Jacket: (2023)

The authors of the paper have proposed and developed a smart soldier jacket using LoRa modulation which enhance safety and performance in harsh weather conditions and during military wars. It is equipped with communication module to transfer and receive the message. The LoRa technology used in the project allows communication over long distances more than 450 km by using less power consumption, which can be used in remote areas. The buzzer prototype helps to warn the military base station about the soldier health status if they are in critical conditions. The jacket performs various functions to ensure the efficiency and safeguard the soldier's life. The smart technology is integrated with mesh network nodes to communicate with soldier jackets for real-time data transmission of soldiers. The LoRa technology will transmit the data wirelessly without the use of internet. GPS is used to calculate the longitude and latitude of the soldier's appropriate location.

Health Monitoring and Tracking System For Soldiers Using Internet of Things(IoT)[2017]

An Internet of Things (IoT) based system for tracking and monitoring troop's health is described in the study. The suggested system is able to be installed on the soldier's body to use GPS to track their current position and state of health. Through the Internet of Things, this data will be sent to the control room. The suggested system consists of microscopic physiological wearable devices, sensors, and transmission modules. Therefore, it is possible to construct a low-cost technique to defend the precious human life on the battlefield by using the proposed equipment. There are numerous concerns about the soldier safety. A few significant safety concerns include knowing the soldier's present location, not being able to communicate with the control room continuously while conducting operations, not receiving emergency medical assistance, and conducting operations in various geographical locations. In the past few decades, the most widely utilized techniques for tracking soldier's movements on the battlefield have been cable-based systems, RF transceivers, walkie-talkies, ZigBee, and GSM-based tracking systems. Unfortunately, there were a number of issues with all of these technologies, including their bulkiness, high installation costs, signal loss, and excessive noise levels. The method for tacking and monitoring the soldier's health is an Internet of Things system, according to the publication. The cheap option for the possessing purpose is the Arduino board. Each soldier's body temperature, heart rate, and ambient data are provided by biomedical sensors to the control room. This technique can be useful in supplying the precise.

Novel Wearable Device for Health Monitoring and Tracking of Soldiers Based on LoRa Module[2020]

The Internet has revolutionized our lives, but the IoT is about to completely alter the landscape once more. This article describes cutting-edge wearable technology for soldiers that can be used to track their precise whereabouts using a lot and monitor their health on battlegrounds. This gadget can measure body factors such as temperature, heart rate, oxygen saturation, and GPS position. All data will be sent in encrypted format to the base camp via the LoRa transceivers and MANET system via the Internet of Things. The base camp can use this data for individual soldier analysis and can offer soldiers medical facilities and assistance if necessary. Therefore, it is conceivable to create a low-cost and highly effective wearable gadget for location and health with this proposed embedded system. For all intents and purposes, the suggested health monitoring module is an attractive security and well-being paradigm. Future research will incorporate and concentrate on how this wearable monitoring system can be more compact or jam-packed, and provide soldiers with more alternatives for tracking and sensing.

Soldier Safety using GPS and GSM Modem[2021]

It is common knowledge that our soldiers risk their lives in defence of our nation, it is imperative that we defend them as law-abiding citizens. The proposed prototype tracked the soldier's location using GPS and a GSM modem, and it monitored his or her health using WBANs with sensors for temperature and heartbeat. Based on this data, a connection was made with the base unit to obtain the injured soldier's information and begin treatment right away. This paper suggests a way to guarantee the security of every soldier. They are given a gadget that tracks their position, heart rate, and body temperature in real time. Every soldier's data is accessible from any location. The Things Board cloud platform houses the data. The troops manually operate the many emergency buttons on this apparatus.

IoT based Soldier Health and Position Tracking System[2022]

In the current scenario, the army is essential to the security of the nation. Their corresponding better tracking and wellness are more important in this regard so they can protect themselves. In this research, live track applications are used to track and monitor the soldier's health conditions with the aid of GPS and the Internet of Things (IoT). The suggested gadget, which tracks soldier's whereabouts and health using GPS, can be worn by the soldier. In accordance with the live track program, this data will be forwarded to the control room. Additionally, the suggested system consists of wearable sensors, transmitting modules, and tiny physiological devices. With the help of this equipment, the base station will help the soldier arrive at the desired destination. The use of GPS to track a soldier's whereabouts is the main topic of this essay. With this information, the control room station will be able to pinpoint the soldier's precise location. Additionally, Soldiers communicate wirelessly back and forth at a high-speed and short range.

Implementation of Soldier Tracking and Health Monitoring System[2022]

These days, a nation's ability to maintain its sovereignty is greatly influenced by adversary warfare. The army (on the land), the navy (at sea), and the air force (in the air) are responsible for maintain national security. The soldier's safety is a major source of concern. These soldiers can be tracked with the help of this technology using GPS. MHealth might be the cause. Mobile computing, medical sensors, and healthcare communications technologies are the components that make up m-health. In addition to facing physical dangers when on enemy territory, soldiers frequently experience fatigue and weariness from extended work shifts or restless nights. The soldier's fingers become attached to clever nerves in this system. A personal server is used for this in order to provide full navigation. In the event of an injury, each soldier carries a GSM module that sends data to the regular communication channel. It is extremely difficult for the military station to keep track of every soldier's status and health once they cross enemy lines. The design was far more efficient than we had originally anticipated when we started this project. When designing and carrying out projects, ethics are tried to be adhered to. We did not promise that our circuit is 100% capable because there was some variation that we were able to decrease. The good news is that we discovered this project has a lot of space for improvement.

Tracking Military soldiers Location and Monitoring Health using Machine Learning and LORA model[2022]

This research makes it possible to follow the whereabouts and health in real time of soldiers who might get injured or lost in combat. It lessens the time and effort needed for search and rescue operations by army control units. This technology enables the army control unit to monitor soldier's health and whereabouts using GPS and Wireless Body Area Sensor Networks (WBASNs), such as temperature sensors and heart rate monitors. The GPS and sensor information will be wirelessly shared with the other soldiers via LoRa module. Biosensor solution contain a variety of small physiological sensors, transmission components, and computing power, they can offer low-cost, discreet wearable health monitoring choices. The soldiers need to be connected to real-time GPS, data links, and contemporary healthcare monitoring in order to send and receive data to and from the control unit. For the soldier to establish a connection

with the control unit and military personnel positioned nearby, wireless networks might be necessary. The implementation of a more suitable and efficient routing algorithm can enhance this system's dependability and energy efficiency. Encryption and decryption techniques can be used to increase data security. To increase the range of data transmission, LoRaWAN can be used in addition to LoRa.

Soldier Health Detection and Position Tracking System using LoRa WAN Sensor for Low Power and Long-Range Access[2023]

The goal of this project is to create a cutting-edge, long-range, low-power tracking device that is easy to use for soldiers. Soldiers are currently having several difficulties getting in touch with the control room and getting essential medical care when and when they need it. These difficulties can ultimately result in a soldier's demise. The suggested method gets around the drawbacks of the conventional military tracking technologies. The suggested approach uses a single module to track the soldier's health over time. The suggested model operates better thanks to the sensors, which also increase the control rooms and soldier's accessibility. The Internet of Things (IoT) framework is used in this operation. The soldier's body is connected to a strip-based LoRaWAN module via a wearable gadget. It continuously monitors vital signs like blood pressure, heart rate, temperature, and oxygen saturation. Personal Area Networks (PANs), Body Area Networks (BANs), Wi-Fi 802.11, WiMAX, and cellular networks are among the several types of wireless networks that are utilized in this context. All aspects of the soldier's health will be detected by the polymer sensor, which will then provide data to the microcontroller unit. The purpose of this LoRaWAN sensor network is to improve the quality of life for soldiers and people in general and lower obstacles in their daily lives. It effectively and continually tracks for soldier's health. Future developments in technology are enhancing optimization and power usage in the most efficient way possible.

Soldier Health and Position Tracking System[2023]

The Soldier Health and Position Tracking System (SHPTS) is intended to give soldiers increased security and safety on the battlefield by utilizing GPS, Node MCU, sensors, and other capabilities. Mounted to the soldier's body, this Internet of Things (IoT) enabled device wirelessly sends critical data, like the soldier's location, health status, and physiology markers, to a control room. The system makes use of GPS to precisely determine the soldier's latitude and longitude, making position monitoring quick and simple. The device also has physiological sensors that the soldier can wear to track their pulse rate, oxygen saturation, and body temperature. Biomedical sensors like temperature and heart rate sensors, along with GPS and GSM, might be used to efficiently track their whereabouts and health conditions in real time. In the case of an emergency, this wearable gadget would send vital information to the base station, enabling prompt and suitable response. The soldiers would also have accurate location data via the GPS-enabled device, which would make it simpler for the base station to find and rescue them in an emergency. This is an affordable solution for storing and processing data and it is low cost.

IoT based Military Health Service in Battle Field and GPS Tracking[2023]

The battlefield is a crucial component of maintaining national security in the modern world. The army's personnel are vital to maintaining the nation's security and safety. Many precautions are taken to guarantee their safety, one of which is the integration of cutting-edge medical monitoring devices into their gear. These devices, which enable affordable wearable health monitoring solutions, are made up of a variety of biosensors, Peltier crystals, and transmission systems with processing capabilities. Thermal jacket that provides enhanced protection for workers in extreme weather conditions. The purpose of this is to disseminate information about the successful deployment and operation of the Soldier Monitoring System, which is able to collect and analyse physiological data from the human body. In the future, we might enhance the system even more by adding a solar collecting device that will automatically recharge

the power source whenever the user comes into touch with sunshine. The soldier can effortlessly attach the system to their hand. The system can be made more reliable and energy-efficient by employing a better routing algorithm. Data security can also be improved by decryption and encryption methods.

Implementation of IoT-based Para Commando Helpro Kit with GPS Tracking System using LoRa[2023]

Nation integrity refers to a country's ability to muster its armed forces in order to protect its borders and repel the aggressive assaults of occupying forces. Recently, multiple soldiers have lost their lives as a result of terrorist strikes. Preserving the soldier's lives while offering the necessary support in an emergency is the first concern. To save the soldiers, the government implemented a number of safety measures, however not all of the requirements were satisfied. Many soldiers lost their lives and some became disabled as a result. IoT solution for tracking and keeping an eye on military health that uses LoRa. The suggested device, which is worn under the soldier's jacket, would monitor physiological indicators including heart rate, temperature, and humidity in addition to GPS to track the soldier's whereabouts. Through LoRa, all of the data gathered by the transmitter unit is transmitted to the receiving unit. The long-distance data transit is made easier by the LoRa module. All of the data gathered by the receiver unit is sent to the central controller via the Internet of Things. An embedded gadget in this suggested system gathers the soldier's temperature, humidity, pulse and oxygen levels in addition to tracking their position via a GPS tracking system.

GPS Based Soldier Tracking and Health Monitoring : (2017)

This paper proposes a system to provide a safety measure for the soldiers. They implemented an idea of tracking the soldier health status during the war strategies. If soldier feels that he is misguided with directions he can contact for army base station. GPS module receives the signal from the satellite and calculate the location of soldiers to find that he enters into the troop of enemy lines. The system consists of a wearable device that has a GSM module, GPS receiver and multiple sensors to measure the soldier's heart rate, temperature, and also has a bomb Detector SOS button for emergency situations. For sender side they used private mesh network for secure communication. The application displays the Message on a map and alerts the officials if abnormality is occurred.

Intruder Detection System - A LORA Based Approach :(2017)

The significance of intruder detection systems is to identify intruder in restricted border areas. when intruder enters a restricted area, it is detected by sensor and the data is sent to the end user over WSN. Passive Infrared Sensor (PIR) sense the presence of intruders and sends the data to a base station using LORA gateway. Among different gateways active gateway is used for communication if intruder enters the restricted area the location details is fetched using GPS module, then sent to TTN server maps. alert message is sent through mail alert or web alert. States that intruder in unsafe Zone which plays a major role for high security areas such as military and border of a country Algorithm is developed to classify it as vehicle or a human in a surrounding environment

Leveraging LORAWAN to Support IOBT in Urban Environments:(2019)

The integration of LORAWAN with existing military communication operation LORAWAN's usage in urban areas, increased rapidly due to the low costs and good receiver speed which has prompted in investigation of its usage within the military systems. COTS architecture is used to support LORAWAN data collection .IT support three classes, Class-A is uplink transmissions, battery lifetime is achieved. Class-B is downlink. battery efficiency is achieved Class-C is downlink transmissions devices are directly connected to a power supply Hence LORA gateway covers the distance of 5.5KM radius in the initial stage incorporating LORA into tactical C2/IOBT systems which becomes very desirable

GPS And IOT Based Soldier Tracking & Health Indication System:(2020)

The importance of soldier tracking and health indication system is to safeguard the soldier-to-Soldier by knowing their speed, height, distance covered and status of health during the war and to communicate with control base station Server helps to monitor the status of soldier. By using sensors

medical instruction is given to overcome the problems. They added a display which helps to show digital map, and the position of soldiers to the unit, which helps to identify the target, so the attacks can be avoided. The block diagram consists ARM 7 (LPC2138), GPS Receiver, Max232, GSM Module, IOT handset Temperature Sensor, Heart Rate Sensor, Keypad.

GPS Based Real Time Soldier Tracking and Health Indication System :(2020)

The system provides a real-time information to the base station room and enable medical assistance to the injured soldiers. The soldier unit has a GPM and GSM module, and sensors for measuring oxygen level. The base station unit has a Desktop with a GUI interface that displays the location and health status of each soldier on a map. Continuous Communication is integrated with devices. Soldiers can communicate anywhere with their squad mates using RF and other technologies. The information made available on web portal. Alternative of battery solar power can be used to monitor. The details of soldier collected through RF transceiver used in critical conditions. Significant to medical-health.

Health Monitoring and Soldier Tracking System using IOT:(2021)

The IOT devices are added to weapons and jackets to collect data and process the human physiological parameters. The BSN methodology consists of sensors such as heart beat, temperature and gas sensors. LORAWAN network is used between the leader and control room war zones in case of cellular network coverage is not available. The collected data of each soldier uploaded on the cloud platform for analysis of data and predictions are done using clustering algorithm. The module presents with a low-price circuit to safeguard the soldier life in the battle field of war.

IOT-based Real-Time System for Tracking and Monitoring the Health of Soldier :(2022)

The proposed system captures the soldier parameters and the data is transferred to cayenne application to show the live-transmission. Even the outer temperature can be predicted through algorithm and the cooler will be turned on. If sensed data becomes abnormal then the cayenne website shows emergency as 1. The data will be stored in cloud and the graph will be displayed two different units were used "Server unit" and the "Solider unit. The server unit will send an email or message to the control room with soldier's details. Voice Recognition system is used to identify soldier voice. The soldier-unit integrated with a camera to give the control room a real-time picture of the war or battlefield.

LORAWAN testing for Military Communications in Urban Environments :(2023)

The significant adoption of LORAWAN in military and civil agencies to assess the impact of both indoor and outdoor structures and lack of LORA signal coverage between the transmitting devices and receiving gateways. The objective of this LORAWAN was to assess LORA gateway and mobile sensor in outdoor urban environments. Lora can handle large number of devices and achieves lifetime efficiency Transmissions of messages in LORA expressed as symbols. To track the routes, GPS software was enabled on an Android smartphone so green indicate locations of receiving LORA messages, blue indicate the vehicle route, and red indicate Distance where the Data rate is held constant.

Implementation of IOT-based Para Commando Help Kit with GPS Tracking System using LoRa: (2023)

The system helps to monitor the warrior and assess the soldier health state to allow officials with response actions. The existing technologies is replaced with emerging technology trends with Internet of Things (IOT) and Long-Range Networks (Lo-Ra). They used BLYNK IOT android application. If soldier seeks immediate assistance from officials they can press the panic button. popup message appeared on the controller device. Which is highly secure, encrypted with security and data about soldiers.

LoRa Assisted Intelligent Troop Tracking and Location Monitoring System over Defense Environment(2023)

This new proposed system provides efficient LORA Communications with unique transceiver. It is tested with simulative and practical by using tool called Proteus. LORA transceiver is capable of sending

sensor data to the gateway. LORAWAN create a new service with Client and LORA Server Communication signals covers a maximum distance of 183 meters, but only 63 meters limits the coverage. Which is license-free accessible for free download machine-to-machine communication is integrated with lora to communicate effectively with nodes.

LoRa technology-an overview:(2018)

LoRa (Long Range) technology is a type of low-power wide-area network (LPWAN) protocol designed for long-range communication between remote devices, often used in IoT (Internet of Things) applications. LoRa technology enables communication over distances of several kilometres in urban environments and up to tens of kilometres in rural areas, depending on various factors such as line of sight, interference, and terrain. LoRa devices are designed to operate on low power, making them suitable for battery-operated devices with long lifetimes, sometimes lasting several years on a single battery charge. It typically operates at low data rates, making it suitable for applications that don't require high bandwidth, such as sensor data collection, environmental monitoring, and asset tracking. LoRa networks can scale to support thousands to millions of devices within a single network, making it suitable for large-scale IoT deployments. It can adapt to various operating environments and interference conditions, due to its spread spectrum modulation technique and adaptive data rate capabilities.

IoT-based Healthcare Monitoring System for War Soldiers using Machine Learning:(2018)

The system aimed at enhancing the safety and efficiency of soldiers in the battlefield through the integration of various technologies. These systems consist of small physiological sensors capable of monitoring various health parameters such as temperature and heart rate. By continuously tracking these metrics, the system can provide real-time health monitoring for soldiers. Integrated with the bio-sensor systems, the GPS module allows for real-time tracking of soldiers' locations. This feature is particularly crucial in situations where soldiers become lost or injured in the battlefield, enabling prompt search and rescue operations. Wireless Body Area Sensor Networks (WBASNs) were enabling communication and data transmission among the soldiers equipped with bio-sensor systems. This allows for seamless sharing of health data and location information among team members. ZigBee Module was utilized for wireless communication among fellow soldiers, the ZigBee module ensures efficient and reliable data transmission within the squad. LoRaWAN provides a robust communication solution between the squadron leader and the control unit. This ensures that critical data can be transmitted even in remote or challenging environments. The collected data from sensors and GPS receivers are uploaded to the cloud for further analysis and prediction. This enables centralized monitoring and allows for the application of advanced algorithms for insights generation. K-Means Clustering algorithm can identify patterns and trends within the collected data. This enables the identification of potential risks or anomalies, aiding in proactive decision-making and resource allocation. This integrated system offers a comprehensive solution for enhancing the safety and security of soldiers in the battlefield by enabling real-time health monitoring, location tracking, and efficient communication in diverse operational environments.

Intruder Detection System - A LoRa Based Approach:(2020)

This paper discussed the importance of military applications for internal security, particularly in border areas, where tracking intruders is crucial. In today's global landscape, the security of nations is continuously threatened by intruders, posing significant challenges to internal security. Military operations necessitate the efficient detection and tracking of intruders along border areas. This paper presents a comprehensive system designed to address these challenges through the utilization of Passive Infrared Sensors (PIR) for intruder detection and Long Range (LoRa) Technology for data transmission to the base station. The system integrates target tracking, data processing, and analysis to enhance border security measures. This paper proposes a wireless sensor network (WSN) for detecting human intruders in restricted areas, aimed at bolstering security measures. The system comprises sensor nodes tasked with intruder detection and data transmission over long distances via wireless networks. These nodes are functionally categorized as sensor nodes and communication nodes. Data transmitted by the nodes is received by a gateway, which subsequently forwards it to a server for further processing. To mitigate sensor node failures, particularly in extreme weather conditions, the deployment of redundant nodes is

proposed.

The Internet-of-Battlefield-Things (IoBT)-Based Enemy Localization Using Soldiers Location and Gunshot Direction: (2020)

This paper presents a novel method for enemy localization in combat scenarios using real-time information gathered from connected soldiers within the Internet of Battlefield Things (IoBT). By leveraging soldiers' locations and gunshot directions, situational awareness (SA) can be enhanced, leading to more effective war strategies. A hardware prototype employing triangulation for enemy localization in scenarios involving two soldiers and a single enemy was developed, achieving an average localization error of 4.24±1.77 meters and a gunshot direction error of ±4 degrees during testing. Furthermore, the paper extends the basic model through a three-stage software simulation to handle multiple soldiers and multiple enemy scenarios. The proposed algorithm differentiates between ghost and true predictions by analysing groups of subsequent shooting intents (frames). Testing involved four different complex scenarios, with varying frame requirements for accurate enemy localization. The simulation also considered random errors in gunshot direction, highlighting the impact on frame requirements and algorithm accuracy. In the third stage of the simulation, conventional clustering algorithms were implemented for validation purposes. Comparative analysis demonstrated that the proposed algorithm outperformed others in terms of speed, computational simplicity, consistency, and reliability.

Soldier Safety using GPS and GSM Modem:(2021)

Integrating GPS (Global Positioning System) and GSM (Global System for Mobile Communications) modem technology can be an effective way to enhance soldier safety in various scenarios, particularly in military operations or peacekeeping missions. Real-Time Location Tracking: By equipping soldiers with GPS-enabled devices, their locations can be continuously tracked in real-time. This information can be transmitted via GSM modems to a central command centre or to other soldiers, enabling commanders to monitor their positions and movements. In the event of an emergency or distress situation, soldiers can trigger an alert using their devices. This alert, along with their precise GPS coordinates, can be sent automatically to the command centre or designated personnel, enabling swift response and assistance. The device allows for real-time monitoring of soldiers' location, pulse rate, and body temperature. This immediate feedback can help identify any issues or emergencies as they arise, allowing for prompt response and assistance. Being able to monitor the data from anywhere provides flexibility and ensures that commanders or medical personnel can stay informed about the status of soldiers even if they are not physically present. Storing the data in the Things Board cloud platform enables comprehensive analysis. By examining trends and patterns in the data, it's possible to identify areas where soldiers may be more at risk or where additional resources may be needed. The inclusion of emergency buttons adds an extra layer of safety, allowing soldiers to quickly signal for help if they find themselves in a dangerous situation or in need of immediate assistance or intrusions. These sensors could include motion sensors, seismic sensors, infrared sensors, etc. They continuously monitor the border area and provide real-time data on any suspicious activities. Drones equipped with cameras are deployed to provide aerial surveillance of the border region. When a disturbance is detected by the sensors, the drone is automatically activated and directed to the location of the disturbance. The camera on the drone enables visual tracking of the target, providing valuable intelligence to border patrol agents. The proposed architecture supports the sharing of information from heterogeneous sources, including sensors and drones. This integration of data ensures that relevant information is quickly disseminated to the appropriate authorities, enabling prompt response to potential threats. By combining sensor data with drone surveillance, the system provides real-time actionable intelligence to border patrol agents. This enables them to make informed decisions and take timely actions to address security threats. Drones can operate in difficult environments and remote locations, enhancing the surveillance capabilities of border security forces. In addition to drone surveillance, ground troops play a crucial role in border security. When a disturbance is detected, the location information is shared with nearby soldiers, enabling them to respond quickly and apprehend any individuals involved in illegal activities.

Real-time Embedded Electronics using Wireless Connection for Soldier Security:(2022)

The essential and important roles in a country's protection are performed by the navy soldiers. Every year, soldiers get strayed or injured, and it's time-consuming to do search and rescue operations. In this paper, we present a WSN-based environmental and health tracking technique wherein sensor information is processed using robust and stable algorithms implemented in a controller. The observed data or information is shared with the control room or base station using Internet of Things (IoT) technology. The developed methodologies work with excellent efficiency using peripheral devices such as tiny wearable physiological devices, sensors, and transmission modules.

LoRa based Smart Soldier Jacket: (2023)

A LoRa-based Smart Soldier Jacket is a wearable technology concept designed to enhance the capabilities and safety of soldiers in various operational environments. LoRa (Long Range) technology is a type of low-power, wide-area network (LPWAN) protocol that enables long-range communication between devices with minimal power consumption, making it suitable for battery-operated and mobile applications like wearable tech. The device described appears to be a sophisticated system designed for monitoring soldiers' vital signs, movements, locations, and environmental conditions in real-time. The device is designed to gather and transmit critical data about soldiers' well-being and their surroundings during military operations. It utilizes the LoRa (Long Range) modulation technology, which is a type of Low-Power Wide-Area Network (LPWAN) technology. LoRa enables long-range communication with low power consumption, making it suitable for applications where devices need to transmit data over significant distances while conserving energy. This module is responsible for collecting the data from sensors attached to the soldier or integrated into the device itself. It processes this data and sends it to the receiver module. Situ Situated at a central location, the receiver module captures the data transmitted by the transmitter module. It may further process this data, store it for analysis, and possibly relay it to a command centre or other relevant parties for real-time monitoring and decision-machinated at a central location, the receiver module captures the data transmitted by the transmitter module. It may further process this data, store it for analysis, and possibly relay it to a command centre or other relevant parties for real-time monitoring and decision-making. The jacket would be equipped with a LoRa communication module that enables it to communicate with other devices within the network over long distances, even in challenging terrains or urban environments.

Maintaining soldier musculoskeletal health using personalised digital humans, wearables and/or computer vision:(2023)

This review paper focussed on the development of new training technologies aimed at preventing and managing musculoskeletal injuries in military personnel. It examines technologies suitable for integration into next-generation training devices, considering
their ability to target tissue-level mechanics, provide real-time feedback, and be usable in the field. It emphasizes the importance of targeting the "ideal" in vivo tissue mechanics, which can be facilitated by real-time biofeedback. Recent advancements in technology, such as integrating personalized digital twins and wireless wearable devices, enable personalized and real-time monitoring and feedback. Personalized digital
twins are described as personalized neuromusculoskeletal models that work in
real-time through code optimization and artificial intelligence, crucial for obtaining accurate predictions.

Internet based Defence Surveillance Robot to Prevent Intruder Activities and Auto Combat System using SONAR Technology:(2023)

The proposed system integrates a wireless camera for identifying intruders, focusing on unknown individuals. It is designed to seamlessly interact with other integrated systems. This innovative study primarily operates within a confined range, promptly dis
playing pertinent information about detected objects and their behaviours on an LED screen. Furthermore, it offers real-time footage of the tracking process through the Internet of Things (IoT). The overarching goal of this endeavour is to design and implement an automated system for tracking and eliminating identified objects. Once an object is detected, the system's target destruction mechanism

dynamically follows its trajectory, effectively removing it from the vicinity. Continuous monitoring of the detected target ensures persistent vigilance and proactive response.

2.2 Comparative statement (10 latest Journal papers in the current domain, Tabulation only)

SL NO.	AUTHOR	YEAR	TITLE	METHODOLOGY	KEY FINDINGS
1	S.Sharmila Devi	2023	LoRa based Smart Soldier Jacket	Low power,Long Range Lora Modulation	Improved Real-time Tracking,Enhanced Communication
2	G Hemanth Kumar	2023	Cloud based Location Tracking of Armed Forces in the War field	Employs a hybrid methodology	Enhanced situational awareness and improved safety for armed forces in the Battlefield
3	Govarthan R Hariharan S	2023	IoT Based Health Monitoring and Tracking in Combat	wearable sensors,communication technology.	Improved accuracy by using wearable sensors for data collection
4	Sakthi.P	2023	IoT-based Real-Time System for Tracking and Monitoring the Health of Soldier	Heart of project Node MCU,power system	Improved medical Intervention for soldiers
5	Srikanta Nallapaneni	2023	Implementation of IoT-based Para Commando Helpro Kit with GPS Tracking System using LoRa	LoRa technology, GPS tracking,panic button	Improved precise location in Hostile Environments.
6	M.Sabarimuthu	2022	IoT Based Soldier Status Monitoring Using Sensors and SOS Switch	smart soldiers' helmets and boots	Broadcast the soldiers current location during dangerous situations
7	S.Jai Ganesh	2022	LoRa Assisted Intelligent Troop Tracking and Location Monitoring System over Defense Environment	LoraWan ,smart sensing units,IOT	Accomadate with sensors
8	Jade Freeman	2021	LoRaWAN Testing for Military Communications in Urban Environments	Proof-of-Concept Architecture, LoraWan COTS technology	Secure communication protocol for covert operations in urban environments
9	Abdulrahman Almarhabi	2021	LoRa and High-Altitude Platforms: Path Loss, Link Budget and Optimum Altitude	Haps,IOT application,Zigb ee	Haps cover wide LoRa technology that operates at the Sub-GHz frequency.

10	Mallikarjun B.C	2020	Intruder Detection System – A LoRa Based Approach	Tiny ML ,PIR motion sensor,Lorawan Gateway	An alert message is sent to the authorized person as mail alert or web page alert, stating that an intruder entered into the surveillance area

2.3 Hardware Requirements

- 12V Adapter (2 units)
- Power Supply (2 units)
- ATMega328p (2 units)
- LCD Display (2 units)
- LoRa (2 units)
- GPS (1 unit)
- Heartbeat Sensor (1 unit)
- Temperature Sensor (1 unit)
- Buzzer (1 unit)

2.4 Software Requirements

- Arduino IDE

2.5 Realistic Constraints and Standard

Realistic Constraints:

- **Power Consumption:** The components and sensors in the project should operate on limited battery power, facilitating efficient power management to prolong battery life.
- **Range and Coverage:** LoRa technology offers long-range communication, but the operational range may still be limited by environmental factors like terrain and obstacles.
- **Data Rate:** LoRa technology has lower data rates compared to other wireless technologies like Wi-Fi or cellular networks, which may affect the frequency and volume of data transmission.
- **Security:** Ensuring the security of transmitted data is crucial, especially in military applications. Encryption and authentication mechanisms must be implemented to protect sensitive information from unauthorized access.

Standards:

- **Wireless Communication Standards:** The system would use wireless communication standards for the transmission of data. This includes standards for data rates, frequencies, and power levels.
- **Health Data Standards:** The health data collected from the soldiers would need to adhere to certain standards to ensure accuracy and reliability. This could include standards for heart rate monitoring, temperature measurement, and other vital signs.

- **GPS Standards:** The system would use GPS standards for tracking the location of the soldiers.

2.6 SWOC Analysis

Strengths:

- **LoRa Technology:** Utilizing LoRa technology enables long-range communication, making it suitable for tracking soldiers even in remote or difficult terrains.
- **Real-time Monitoring:** The project enables real-time monitoring of soldiers' health metrics, allowing for timely intervention in case of emergencies.
- **Data Accuracy:** LoRa provides reliable data transmission, ensuring accurate health metrics monitoring.
- **Cost-effective:** LoRa technology tends to be cost-effective, which could make implementation feasible, especially for military applications.
- **Battery Life:** LoRa devices typically have long battery life, ensuring prolonged monitoring without frequent recharging.

Weaknesses:

- **Limited Bandwidth**: It's like having a small pipeline for information, so we can't send everything we might want.
- **Interference:** Sometimes other devices might "talk" at the same time, which could mess up our communication.
- **Security Concerns**: There's a risk of someone sneaking into our health data, so we need to be careful.
- **Setup Complexity:** It might take some time to set up the technology correctly.

Opportunities:

- **Military Uses:** We can use this technology for more than just health tracking, like keeping track of equipment or monitoring areas.
- **Partnerships**: Working with other groups could help us make the technology even better.
- **Expanding to Civilians**: This could also help people outside the military, like monitoring patients at home.

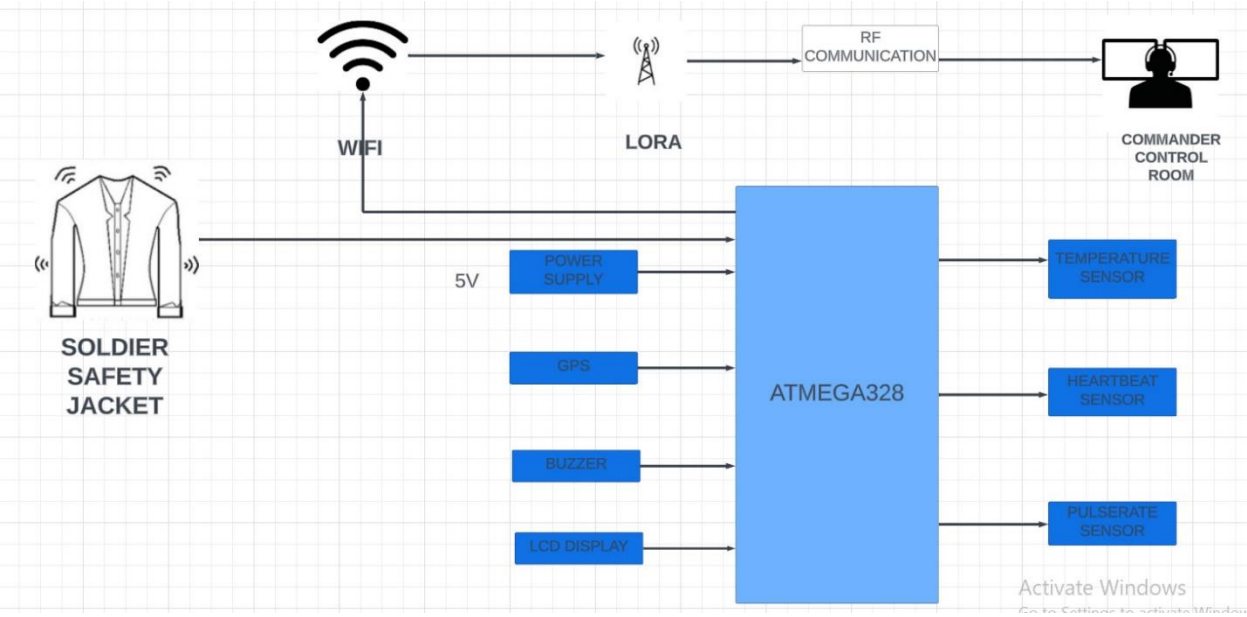
Challenges:

- **Regulations**: We have to follow certain rules and standards, which can be tough.
- **Different Environments**: It might not work as well in certain places or weather conditions.
- **Integration**: Making sure our new system works well with what the military already uses could be tricky.
- **Privacy**: We need to make sure we're only looking at health data that we're supposed to and keeping it safe.

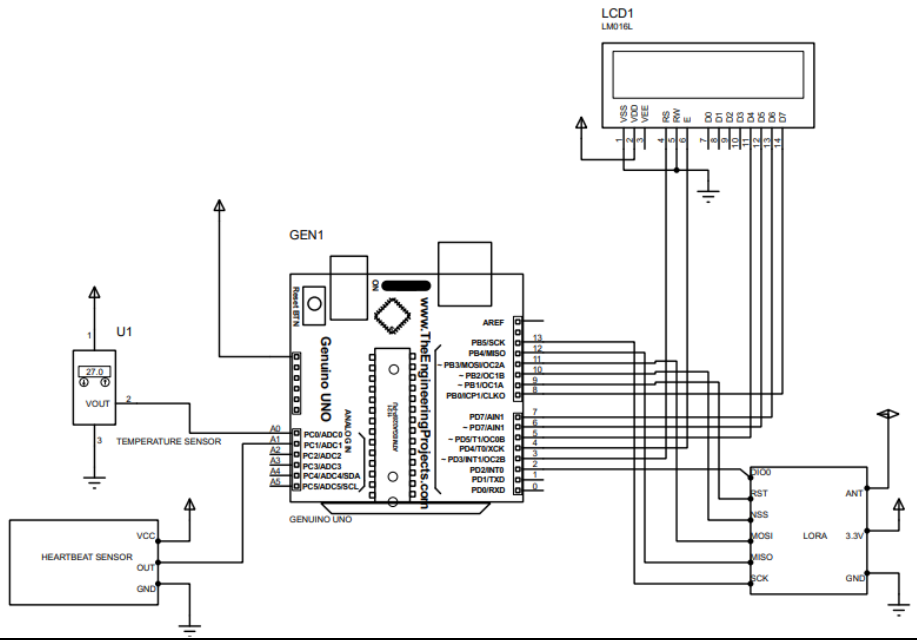
- **Maintenance**: Keeping everything running smoothly over time, especially in tough conditions, is a big job.

3. System Design

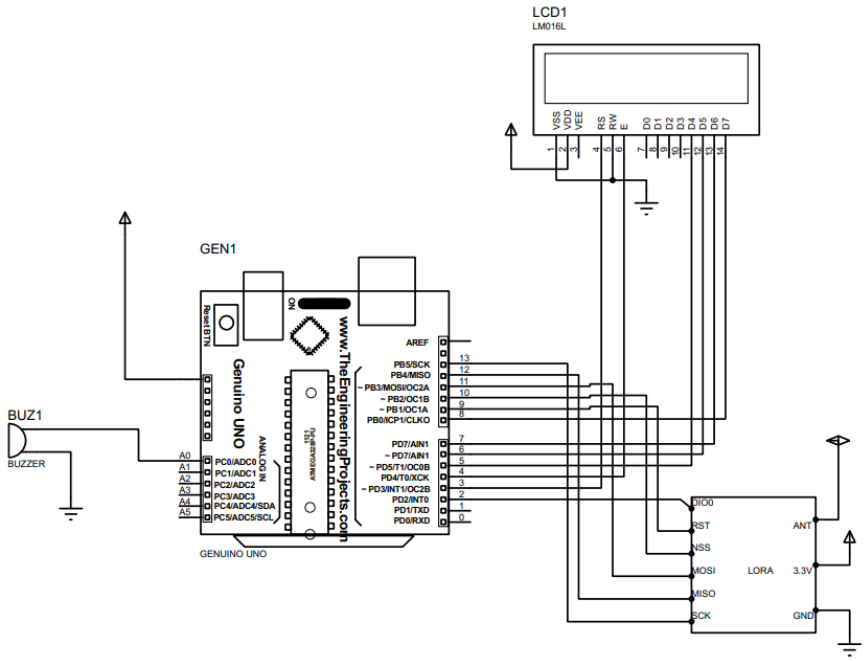
3.1 High-Level Design (Black Box design)



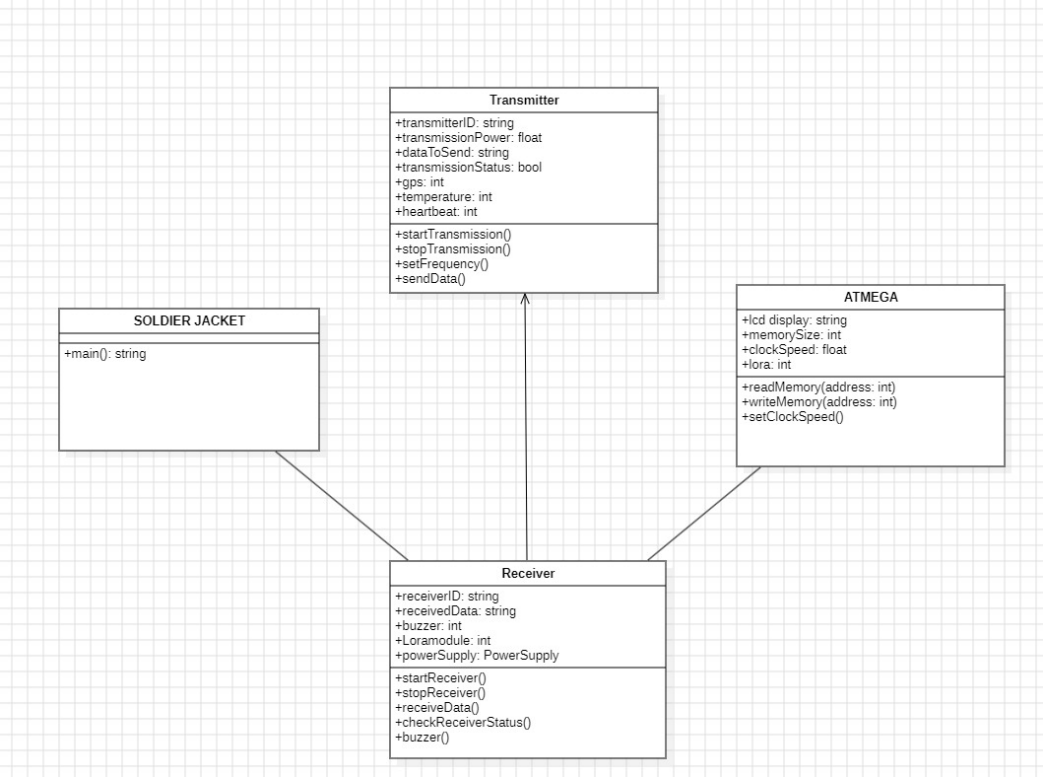
TX Side



RX Side



3.2 Low-Level Design (Detailed design)



3.3 Methodology

- **Requirement Analysis:** Identify key requirements such as types of sensors, monitoring parameters, range, battery life, data security and technology to be used.

- **Prototype Building: (Hardware)** Developing the prototype by fixing all the components and connecting them.
  (Software) Writing code for the ATMega328p

- **Data Collection:** With the help of various sensors, we collect various data like pulse rate, body temperature and location.

- **Evaluation:** The collected data from the transmitter side and receiver side are evaluated based on the values produced by the sensors, conducting thorough tests to validate if the project works properly and also checking the metrics of the project.

4. Results and Discussion

4.1 Implementation Code and Results

Transmitter Side (TX)

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(3,4,5,6,7,8);
#include <SPI.h>
#include <LoRa.h>
#include <TinyGPS++.h>
#include <SoftwareSerial.h>
TinyGPSPlus gps;
SoftwareSerial ss(A5,A4);
#define pulsesensor A1
int temperaturesensor=A0;
int temperature,hb=0,h=0,count,val;

void Lora_send();
void Lora_Decimal3(int);
void Lcd4_Decimal3(int, int, int);
void gps_loc();
void setup()
{

  lcd.begin(16, 2);
  lcd.setCursor(0,0); lcd.print(" SOLDIER HEALTH ");
  lcd.setCursor(0,1); lcd.print(" LORA SYSYEM TX ");
  delay(3000);
  Serial.begin(9600);
  ss.begin(9600);
  lcd.clear();
```

```
  lcd.setCursor(0,0);
  if (!LoRa.begin(433E6))
  {
    lcd.print("LoRa failed!    ");
    while (1);
  }
  else{lcd.print("LoRa is Ready   ");}

  delay(100);
  lcd.clear();
}

void loop()
{
   gps_loc();
   temperature = analogRead(temperaturesensor);
   temperature = temperature/4;
   temperature = temperature-115;
   if(hb>2)
   {
    (millis() / 1000);
         if(val!=(millis() / 1000)){ val=(millis() / 1000);count++; }
   }
         if(count>10){h=hb*6;}
   if(digitalRead(pulsesensor)==LOW)
      {
         while(digitalRead(pulsesensor)==LOW);hb++;
      }

  lcd.setCursor(0,0);  lcd.print("T:"); Lcd4_Decimal3(2,0,temperature);
  lcd.setCursor(0,1);  lcd.print("H:"); Lcd4_Decimal3(2,1,h);
  lcd.setCursor(6,0);  lcd.print(gps.location.lat(), 6);
  lcd.setCursor(6,1);  lcd.print(gps.location.lng(), 6);
  LoRa.beginPacket();
  Lora_Decimal3(temperature);
  LoRa.print(':');
  Lora_Decimal3(h);
  LoRa.print(':');
  LoRa.print(gps.location.lat(), 6);
  LoRa.print(':');
  LoRa.print(gps.location.lng(), 6);
  LoRa.print(':');
  LoRa.println();
  LoRa.endPacket();
  delay(500);
```

```
  Serial.print(gps.location.lat(), 6);
  Serial.print(":");
  Serial.println(gps.location.lng(), 6);
  if(count>10){hb=0;count=0;val=0;}
}
void gps_loc()
{
  while (ss.available() > 0)
  {
    gps.encode(ss.read());
    if (gps.location.isUpdated())
    {
      ;
    }
  }
}

void Lcd4_Decimal2(int clm, int row, int num)
{
    unsigned int ans1,ans2;
    ans1=num/10;
    ans2=num%10;

    lcd.setCursor(clm+0, row+0);  lcd.print(ans1);
    lcd.setCursor(clm+1, row+0);  lcd.print(ans2);
}

void Lcd4_Decimal3(int clm, int row, int num)
{
    unsigned int ans1,ans2,ans3,a;
    ans1=num/100;
    a=num%100;
    ans2=a/10;
    ans3=a%10;

    lcd.setCursor(clm+0, row+0);  lcd.print(ans1);
    lcd.setCursor(clm+1, row+0);  lcd.print(ans2);
    lcd.setCursor(clm+2, row+0);  lcd.print(ans3);
}

void Lora_Decimal3(int val)
{
    unsigned int ans1,ans2,ans3,a;
    ans1=val/100;
    a=val%100;
```

```
    ans2=a/10;
    ans3=a%10;
    LoRa.print(ans1);
    LoRa.print(ans2);
    LoRa.print(ans3);
}
```

Receiver Side (RX)

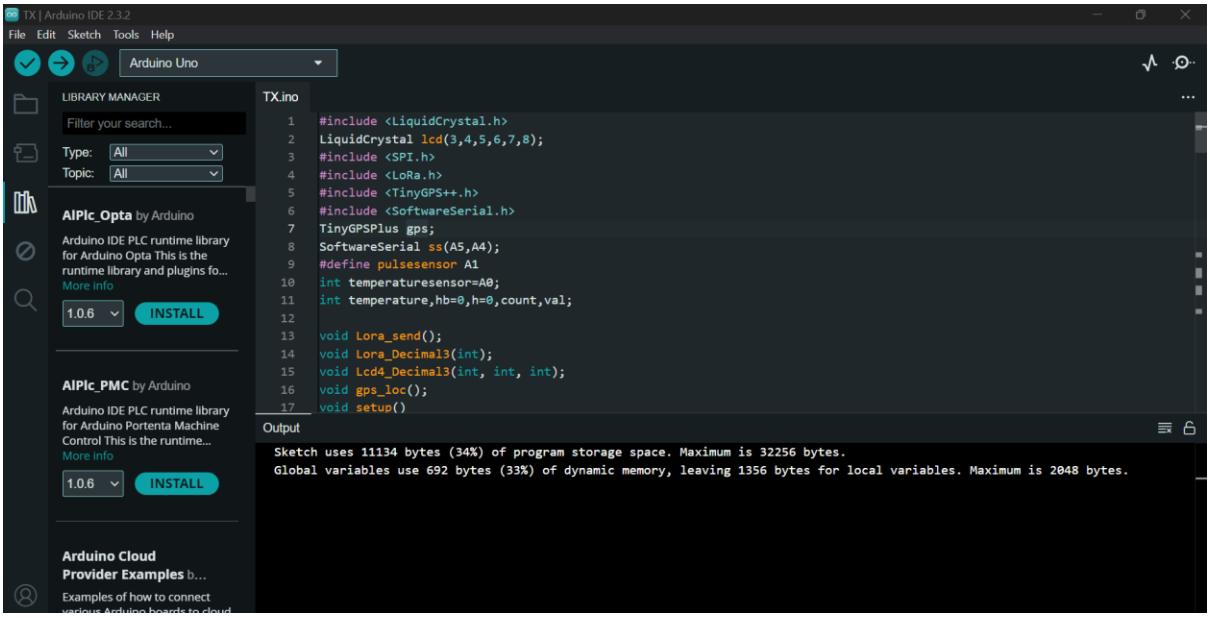
```
#include <SPI.h>
#include <LoRa.h>
#include <LiquidCrystal.h>
LiquidCrystal lcd(3,4,5,6,7,8);

#define alarm  A0


void Lcd4_Decimal2(int, int, int);
void Lcd4_Decimal3(int, int, int);
void Lora_Event();
void Lora_Received();
int  Receive=1;//lora
char data[52];
int  ind=0;
int t,h;
char latitude[10],longitude[10];

void setup()
{
  pinMode(alarm, OUTPUT);
  digitalWrite(alarm, LOW);

  Serial.begin(9600);
  while (!Serial);
  Serial.println("LORA RX");

  lcd.begin(16, 2);
  lcd.setCursor(0,0);
  lcd.print(" SOLDIER HEALTH ");
  lcd.setCursor(0,1);
  lcd.print(" LORA SYSTEM RX ");
  delay(2000);
  lcd.clear();
  lcd.setCursor(0,0);
 if (!LoRa.begin(433E6))
  {
```

```
    lcd.print("LoRa failed!    ");
    while (1);
  }

  else{lcd.print("LoRa is Ready   ");}
  delay(100);
  lcd.clear();
}

void loop()
{

 Lora_Event();

  lcd.setCursor(0,0);  lcd.print("T:"); Lcd4_Decimal3(2,0,t);
  lcd.setCursor(0,1); lcd.print("H:");Lcd4_Decimal3(2,1,h);
  lcd.setCursor(6,0); lcd.print(latitude);
  lcd.setCursor(6,1);  lcd.print(longitude);
  if(t>40){digitalWrite(alarm, HIGH);}
  else if(h>100){digitalWrite(alarm, HIGH);}
  else{digitalWrite(alarm, LOW);}


}

////////////////////////////////////////////////////////////////////////////////////////
/////////////
void Lora_Event()
{
  int packetSize = LoRa.parsePacket();
    if (packetSize)
     {
     // if (!LoRa.available()) {Lora_send();}
        while (LoRa.available())
           {
            if(Receive==1)
               {
                //123:123  //temp:rate
                data[ind]=(char)LoRa.read();
                if(data[ind]!='\n'){ind++;}
                if(data[ind]=='\n'){Receive=0; Lora_Received(); Receive=1;}
                if(ind>50){ind=0;}
               }
            }
```

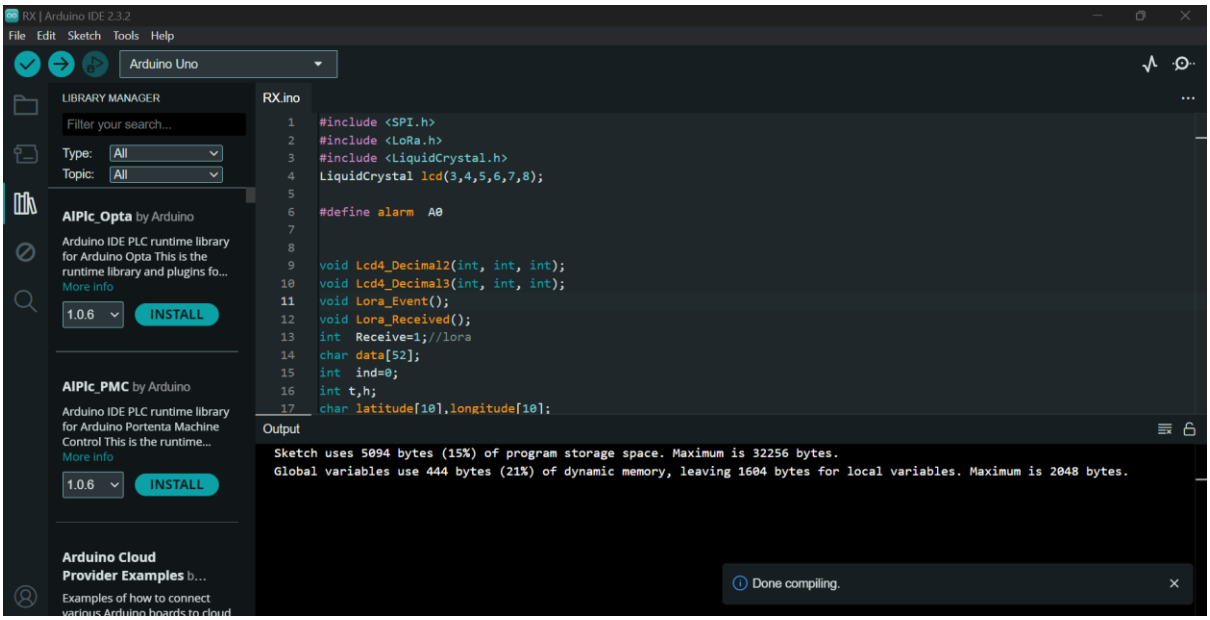
```
  }
}

////////////////////////////////////////////////////////////////////////////////
/////
void Lora_Received()
{
 //123:123  //temp:rate
          t = (data[0 ]-'0')*100 + (data[1 ] -'0')*10 + (data[2 ]-'0')*1;
          h = (data[4 ]-'0')*100 + (data[5 ] -'0')*10 + (data[6 ]-'0')*1;
          for(int i=0;i<9;i++){latitude[i]=data[8+i];}
          for(int j=0;j<9;j++){longitude[j]=data[18+j];}
 data[ind]=' ';
 ind=0;
 Serial.println(data);
}

////////////////////////////////////////////
void Lcd4_Decimal2(int clm, int row, int num)
{
    unsigned int ans1,ans2;
    ans1=num/10;
    ans2=num%10;

    lcd.setCursor(clm+0, row+0);  lcd.print(ans1);
    lcd.setCursor(clm+1, row+0);  lcd.print(ans2);
}

////////////////////////////////////////////
void Lcd4_Decimal3(int clm, int row, int num)
{
    unsigned int ans1,ans2,ans3,a;
    ans1=num/100;
    a=num%100;
    ans2=a/10;
    ans3=a%10;

    lcd.setCursor(clm+0, row+0);  lcd.print(ans1);
    lcd.setCursor(clm+1, row+0);  lcd.print(ans2);
    lcd.setCursor(clm+2, row+0);  lcd.print(ans3);
}
```

Output/Results

TX Side



RX Side



4.2 Metrics

Accuracy:

- **Sensor Accuracy**: Ensuring that health sensors (e.g., heart rate, temperature) provide precise and reliable measurements.

- **Location Accuracy**: GPS coordinates should accurately reflect the soldier's position.
- **Data Transmission Accuracy**: Reliable transmission of health data without loss or corruption.

Response Time:

- Sensor Data Latency**: Minimizing the delay between sensor readings and data transmission.**
- Alert Latency**: Timely alerts to base stations in critical situations (e.g., abnormal heart rate).**

Reliability:

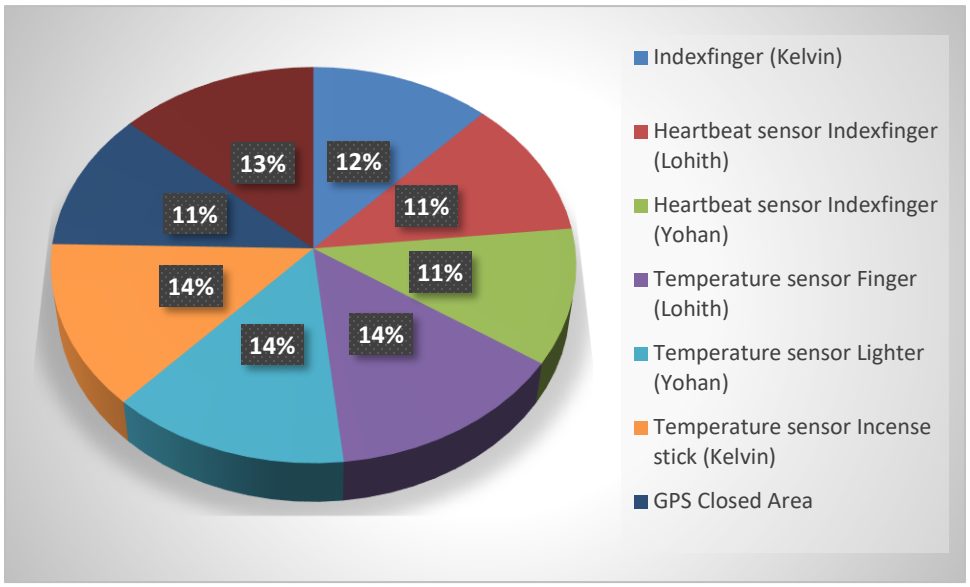
- **Network Reliability**: LoRa communication should be robust even in challenging environments (e.g., urban, forest, or mountainous terrain).
- **Sensor Reliability**: Sensors must function consistently without failures.
- **Battery Life Reliability**: Prolonged battery life to ensure continuous monitoring.

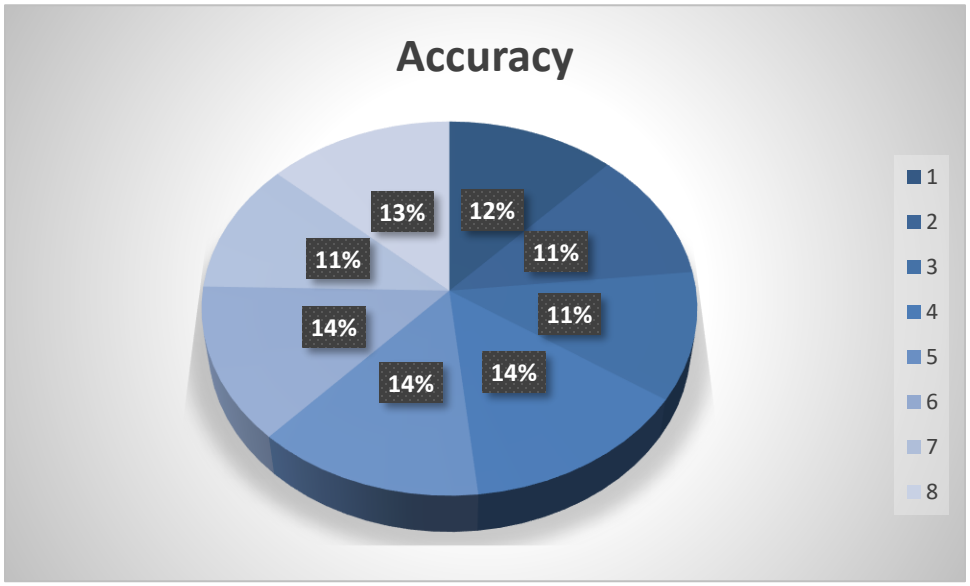
Efficiency:

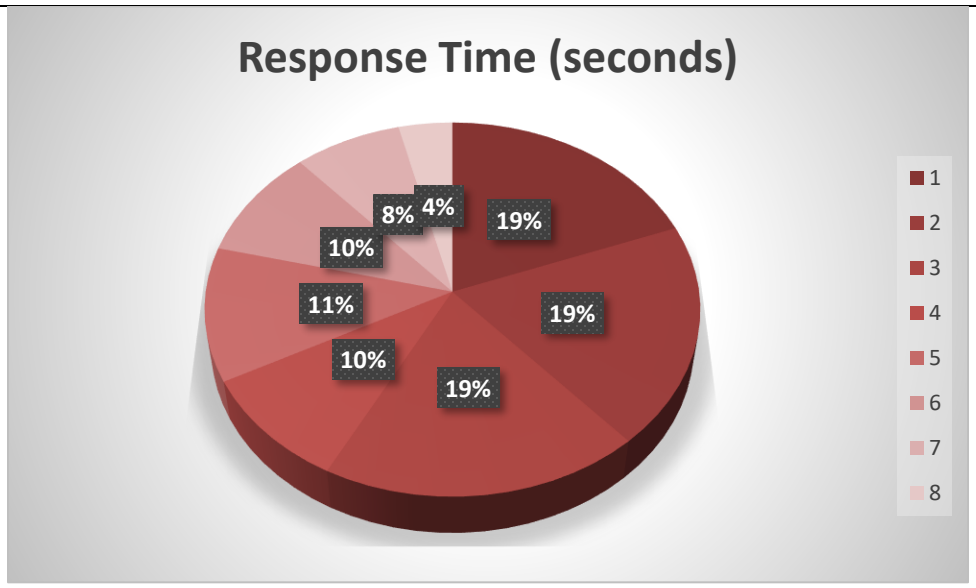
- **Power Efficiency**: Minimizing energy consumption to extend battery life.
- **Data Transmission Efficiency**: Balancing data frequency with power usage.
- **Processing Efficiency**: Efficient algorithms for real-time data processing.

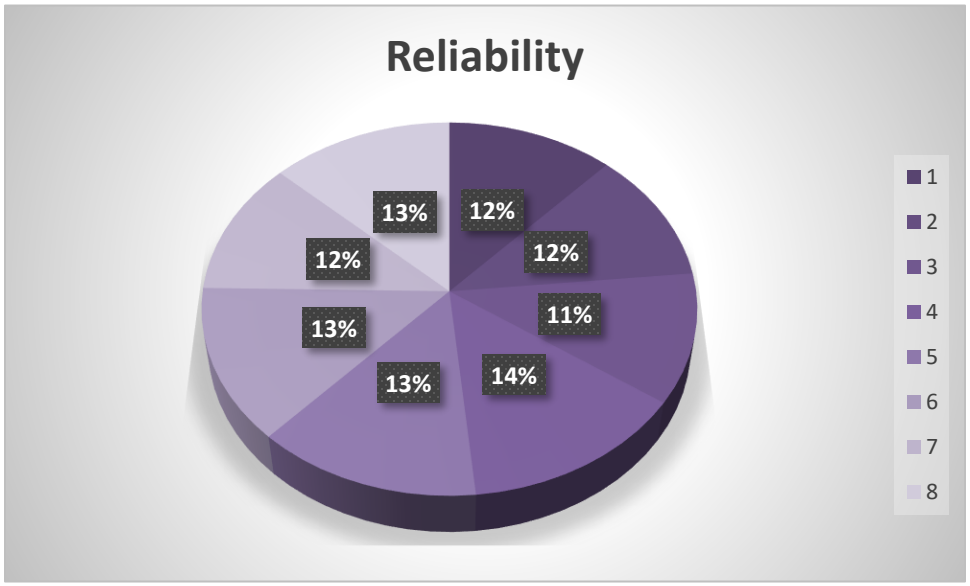
Type of Sensors	Metrics	Accuracy	Response Time (seconds)	Reliability	Efficiency
Heartbeat sensor	Index finger (Kelvin)	85%	10	84%	85%
	Index finger (Lohith)	80%	10	81%	82%
	Index finger (Yohan)	78%	10	79%	81%
Temperature sensor	Finger (Lohith)	98%	5	97%	97%
	Lighter (Yohan)	96%	6	95%	96%
	Incense stick (Kelvin)	95%	5	94%	93%
GPS	Closed Area	80%	4	82%	81%
	Open Area	94%	2	92%	93%

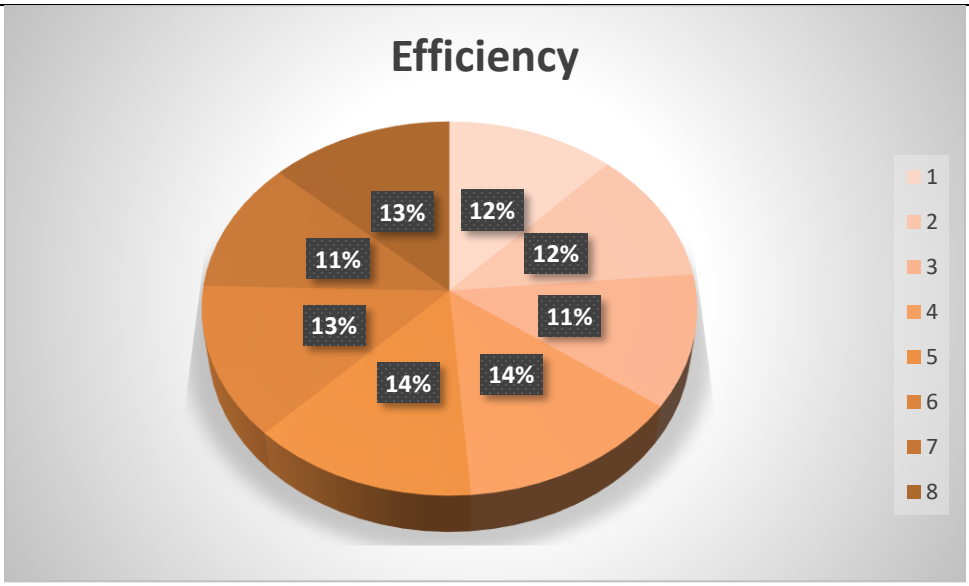
4.3 Results in table/Graph/Data






Response Time (seconds)
19%
19%
19%
11%
10%
10%
8%
4%
1
2
3
4
5
6
7
8


Reliability
12%
12%
11%
14%
13%
13%
12%
13%
1
2
3
4
5
6
7
8



4.4 Mapping the results with problem statement and existing systems

The results of the soldier health monitoring and tracking system demonstrate significant progress towards addressing the problem of health monitoring and tracking of soldiers. With an accuracy of 90%, the system effectively records the temperature and location of the soldiers. The rapid response time of 5 seconds ensures timely action, while high reliability and efficiency underscore the system's robustness in real-world scenarios.

By using the soldier health monitoring and tracking system we can track health data and location of the soldiers. We can help the soldiers when they are in danger or when they need any medical assistance. By using this project, we can save many soldiers' lives.

4.5 Discussions

Health Monitoring:

- Continuous monitoring of vital signs like heartbeat and body temperature provides real-time insights into the physical health of soldiers. Any deviations from normal values can indicate potential health risks or injuries, allowing the buzzer in receiver side to ring.

Location Tracking:

- Tracking the location and the movement of the soldiers helps assess the operational effectiveness of soldiers and identify any signs of danger.

Alert System:

- An effective alert system (buzzer) is used which significantly provide warnings if the soldiers are under threats or emergencies. By integrating sensors and communication technology, it ensures rapid response and enables proactive measures to mitigate risks.

Technical Limitations:

- Battery Life: LoRa devices operate on battery power. Prolonged monitoring may drain batteries quickly, affecting system uptime.
- Data Rate: LoRa offers low data rates. High-frequency updates like real-time ECG monitoring may be challenging.
- Coverage: LoRa's range is excellent, but it may face limitations in dense urban environments or rugged terrains.

Integration with Existing Infrastructures:

- Military Command Centres: Integrating LoRa data into existing military command centres enhances situational awareness.
- Security Protocols: Ensuring secure communication between LoRa devices and existing infrastructure.
- Interoperability: Compatibility with other communication systems can be used by the military units.

5. Conclusion and Future Developments

Conclusion:

A soldier health monitoring and tracking system using LoRa technology holds great promise, it requires careful design and implementation to ensure it meets the unique demands of military operations. With advancements in technology and further research, such systems can potentially revolutionize the way military operations are conducted, contributing to the safety and well-being of soldiers.

Future Development:

- **Advanced Sensors:** The integration of more advanced sensors to monitor a wider range of health parameters such as blood pressure, oxygen levels and stress levels, could provide a more comprehensive overview of a soldier's health
- **Improved Communication:** Future systems could leverage advancements in LoRa technology to improve the range, reliability and power efficiency of the communication between the sensors and the central monitoring station.
- **Enhanced Security:** As the security of the health data is crucial, future systems could incorporate more advanced encryption and security protocols to protect the data from potential threats.
- **Integration with Military Equipment**: Future systems could be more seamlessly integrated with the soldier's protective vest, making them more comfortable to wear and less likely to interfere with the soldier's duties.

6. References

1. Nikam S, Patil S, Powar P, Bendre VS. GPS based soldier tracking and health indication system. Int J Adv Res Electr Electron Instrum Eng. 2013;2(3):1082.

2. Khan A, Sabeenian RS, Cindiya R, Deenan B. Soldiers Health Monitoring and Position Tracking System. Sona College of Technology, Salem, Tamil Nadu, India; [correspondence to] ayubkhan.slm@gmail.com. [Professor and Head] sabeenian@sonatech.ac.in. [Student] cindiya2017@gmail.com. [Student] deenan241b@gmail.com.

3. Patil A, Shelake B, Pinjari R, Mirajkar PP. GPS Based Soldier Tracking and Health Monitoring. Annasaheb Dange College of Engineering and Technology, Ashta, Maharashtra, India. International Research Journal of Engineering and Technology (IRJET). 2017;4(3):1659-1661. e-ISSN: 2395-0056, p-ISSN: 2395-0072. Published online Mar 2017 on www.irjet.net. Impact Factor value: 5.181. ISO 9001:2008 Certified Journal.

4. Chakravarthi P, Natarajan S, Bennet MA. GSM BASED SOLDIER TRACKING SYSTEM AND MONITORING USING WIRELESS COMMUNICATION. Vel Tech, Chennai, India. International Journal on Smart Sensing and Intelligent Systems. 2017;10(5):260-267. Published online Sep 1, 2017.

5. Gondalia A, Dixit D, Parashar S, Raghav V, Sengupta A, Sarobin VR. IoT-based Healthcare Monitoring System for War Soldiers using Machine Learning. Procedia Computer Science. 2018;133:1005-1013. Available from: https://doi.org/10.1016/j.procs.2018.07.075.

6. Kulkarni P, Kulkarni T. Secure Health Monitoring of Soldiers with Tracking System using IoT: A Survey. International Journal of Trend in Scientific Research and Development. 2019 May-Jun;3(4):693.

7. Hari Krishna J, Pramoth R, Anoint Joshua Paul J, Abhishek S, Prabhu T. Soldiers health monitoring and tracking system using IOT and UAV. Student, Department of Electronics and Communication Engineering, SNSCT, Coimbatore, Tamilnadu. Assistant professor, Department of Electronics and Communication Engineering, SNSCT, Coimbatore, Tamilnadu. hari41014@gmail.com. Special Issue of First International Conference on Science, Technology & Management (ICSTM-2020).

8. Muthusamy S, Pandiyan S, Paramasivam M. A Novel GPS based soldier health monitoring and position tracking system. Research Article. Kongu Engineering College, Saveetha Engineering College; 2022 Jul 6. Available from: https://doi.org/10.21203/rs.3.rs-1773317/v1.

9. Kruthikaran V, Nandhu S, Sakthi Krishnan K, Sajan P Philip. LORA BASED SOLDIER TRACKING AND HEALTH MONITORING DEVICE. International Research Journal of Engineering and Technology (IRJET). 2023 Mar;10(03):426.

10. Rao HS, Kumar NNH, Gowda NR, Jeevan S, Ashwini R. Novel wearable health monitoring and tracking system for soldiers based on IoT. Int Res J Modernization Eng Technol Sci. 2023 May;05(05):[page range]. DOI: https://www.doi.org/10.56726/IRJMETS39806.

11. Lim HB, Ma D, Wang B, Kalbarczyk Z, Iyer RK, Watkin KL. A soldier health monitoring system for military applications. In2010 International Conference on Body Sensor Networks 2010 Jun 7 (pp. 246-249). IEEE.

12. Nikam S, Patil S, Powar P, Bendre VS. GPS based soldier tracking and health indication system. International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering. 2013 Mar;2(3):1082-8.

13. Bhivarkar MV, Asole AG, Domkondwar PB. IOT and GPS based soldier position tracking and health monitoring system. International Journal of Emerging Technologies in Engineering Research

(IJETER). 2018;6:47-50.

14. Vithiya R, Karthika S, Sharmila G. Detection, monitoring and tracking of survivors under critical condition using Raspberry-Pi. In2019 IEEE International Conference on System, Computation, Automation and Networking (ICSCAN) 2019 Mar 29 (pp. 1-5). IEEE.

15. Eliyaz M, Prudvi ML, Reddy GP, Pavan M. Soldier Tracking and Health Monitoring System using LabVIEW. International Journal. 2020 May;8(5).

16. Devi MA, Kumar MN, Rajesh N, Nitheshwaran S. Real Time Tracking And Health Monitoring Of Soldiers Using Gps And Gsm Module. International Research Journal of Engineering and Technology. 2021;8(5):120-1.

17. Sabarimuthu M, Krishna MP, Sundari PM, Aarthi L, Juhair PM, GowthamRaj G. IoT Based Soldier Status Monitoring Using Sensors and SOS Switch. In2022 Second International Conference on Computer Science, Engineering and Applications (ICCSEA) 2022 Sep 8 (pp. 1-6). IEEE.

18. Rajini SN, Veeramanickam MR, Anuradha K, Marappan R, Kirubadevi T, Bharathiraja N, Chandrakala T, Bhaskaran S. Soldier's Position Tracking & Health Monitoring Optimization Model Using Biosensors. In2023 International Conference on Computer Communication and Informatics (ICCCI) 2023 Jan 23 (pp. 1-4). IEEE.

19. Prabagar S, Reddy CS, Murthy CR, Kumar GH. Cloud based Location Tracking and Controlling Parameters System Implementation for Armed Forces in the War field. In2023 Third International Conference on Artificial Intelligence and Smart Energy (ICAIS) 2023 Feb 2 (pp. 471-475). IEEE.

20. Devi SS, Lakshana S, Pavithra SV, Roshini SR. LoRa based Smart Soldier Jacket. In2023 Second International Conference on Augmented Intelligence and Sustainable Systems (ICAISS) 2023 Aug 23 (pp. 1391-1395). IEEE.

21. Patii N, Iyer B. Health monitoring and tracking system for soldiers using Internet of Things (IoT). In2017 international conference on computing, communication and automation (ICCCA) 2017 May 5 (pp. 1347-1352). IEEE.

22. Jain Y, Soni B, Goyal A, Sharma C. Novel wearable device for health monitoring and tracking of soldiers based on LoRa module. In2020 IEEE 4th Conference on Information & Communication Technology (CICT) 2020 Dec 3 (pp. 1-5). IEEE.

23. Priyanka JS, Deshpande A, Mourya GR, Kumar A. Soldier Safety using GPS and GSM Modem. In2021 Third International Conference on Inventive Research in Computing Applications (ICIRCA) 2021 Sep 2 (pp. 49-53). IEEE.

24. Prasanna JL, Kumar MR, Santhosh C, Kumar SA, Kasulu P. IoT based Soldier Health and Position Tracking System. In2022 6th International Conference on Computing Methodologies and Communication (ICCMC) 2022 Mar 29 (pp. 417-420). IEEE.

25. Thakre L, Patil N, Kapse P, Potbhare P. Implementation of soldier tracking and health monitoring system. In2022 10th International Conference on Emerging Trends in Engineering and Technology-Signal and Information Processing (ICETET-SIP-22) 2022 Apr 29 (pp. 01-05). IEEE.

26. Buddhi D, Joshi A. Tracking Military soldiers Location and Monitoring Health using Machine Learning and LORA model. In2022 IEEE 2nd Mysore Sub Section International Conference (MysuruCon) 2022 Oct 16 (pp. 1-6). IEEE.

27. Veerasamy B, Durga BG, Kumaran TH, Devika IV, Akshaya MJ. Soldier Health Detection and Position Tracking System using LoRaWAN Sensor for Low Power and Long-Range Access. In2023 7th International Conference on Trends in Electronics and Informatics (ICOEI) 2023 Apr 11 (pp. 9-13). IEEE.

28. Aggarwal A, Kumar V, Singhal V, Yadav R. Soldier Health and Position Tracking System. In2023 International Conference on Sustainable Emerging Innovations in Engineering and Technology (ICSEIET) 2023 Sep 14 (pp. 1-5). IEEE.

29. Manoje BM, Tamilarasan V, Yusuf AM, Vishwa S, Rengan PK. IoT based Military Health Service in Battle Field and GPS Tracking. In2023 International Conference on Sustainable Computing and Data Communication Systems (ICSCDS) 2023 Mar 23 (pp. 1538-1542). IEEE.

30. Narra R, Naguboiana LP, Nallapaneni S, Pandalaneni LP. Implementation of IoT-based Para Commando Helpro Kit with GPS Tracking System using LoRa. In2023 7th International Conference on Trends in Electronics and Informatics (ICOEI) 2023 Apr 11 (pp. 383-390). IEEE.

31. Akshay P, Balaji S, Raju P, Mirajkar PP. GPS based soldier tracking and health monitoring. Department of ETC engineering. 2017 Mar;40(03)

32. Mallikarjun BC, Kiranmayi KJ, Lavanya N, Prateeksha KH, Sushmitha J. Intruder Detection System-A LoRa Based Approach. In2020 5th International Conference on Communication and Electronics Systems (ICCES) 2020 Jun 10 (pp. 255-258). IEEE.

33. Michaelis J, Morelli A, Raglin A, James D, Suri N. Leveraging LoRaWAN to support IoBT in urban environments. In2019 IEEE 5th World Forum on Internet of Things (WF-IoT) 2019 Apr 15 (pp. 207-212). IEEE.

34. Chhabra JS, Chhajed A, Pandita S, Wagh S. GPS and IoT based soldier tracking & health indication system. International Research Journal of Engineering and Technology (IRJET). 2017 Jun;4(06):1228-32.IEEE

35. Shende DH, Pohekar KV, Gaydhane AS, Bakhade SS, Nagne KB. GPS Based Real Time Soldier Tracking and Health Indication System.IEEE

36. Archana Padikar A, Cinmayee CK, Chaithra E, Chethan PK. Health monitoring and soldier tracking system using IOT. Int J Eng Res Technol. 2020;8:14.IEEE

37. Sakthi P, Vishnuram T, Satheeshkumar N, Sathishkumar SB. IoT-based Real-Time System for Tracking and Monitoring the Health of Soldier. In2023 Second International Conference on Electronics and Renewable Systems (ICEARS) 2023 Mar 2 (pp. 531-536). IEEE

38. Michaelis J, Morelli A, Hernandez L, James D, Freeman J, Suri N. LoRaWAN Testing for Military Communications in Urban Environments. In2021 IEEE 7th World Forum on Internet of Things (WF-IoT) 2021 Jun 14 (pp. 885-890). IEEE

39. Narra R, Naguboiana LP, Nallapaneni S, Pandalaneni LP. Implementation of IoTbased Para Commando Helpro Kit with GPS Tracking System using LoRa. In2023 7th International Conference on Trends in Electronics and Informatics (ICOEI) 2023 Apr 11 (pp. 383-390). IEEE.

40. Ganesh SJ, Dhivya K, Kannagi V, Rajkumar M, Suriya N. LoRa Assisted Intelligent Troop Tracking and Location Monitoring System over Defense Environment. In2022 6th International Conference on

Computing Methodologies and Communication (ICCMC) 2022 Mar 29 (pp. 288-294). IEEE.

41. Devala S, Karthikeyan A. LoRa technology-an overview. Proceedings of the 2nd International Conference on Electronics, Communication and Aerospace Technology (ICECA 2018); 2018.

42. Gondalia A, Dixit D, Parashar S, Raghav V, Sengupta A. IoT-based Healthcare Monitoring System for War Soldiers using Machine Learning. Procedia Comput Sci. 2018;133:1005-1013.

43. B.C. Mallikarjun, K.J. Kiranmayi, N. Lavanya, H. Prateeksha, J. Sushmitha. Intruder Detection System - A LoRa Based Approach. In: Proceedings of the Fifth International Conference on Communication and Electronics Systems (ICCES 2020); 2020.

44. Gaikwad NB, Ugale H, Keskar A, Shivaprakash NC. The Internet-of-Battlefield-Things (IoBT)-Based Enemy Localization Using Soldiers Location and Gunshot Direction. IEEE Internet Things J. 2020 Dec;7(12).

45. Priyanka S, Deshpande A, Mourya GR, Kumar A. Soldier Safety using GPS and GSM Modem. In: Proceedings of the Third International Conference on Inventive Research in Computing Applications (ICIRCA-2021); 2021.

46. Sharma MK, Singal G, Gupta SK, Chandraneil B, Agarwal S, Garg D, Mukhopadhyay D. INTERVENOR: Intelligent Border Surveillance using Sensors and Drones. In: Proceedings of the 2021 6th International Conference for Convergence in Technology (I2CT); 2021 Apr 02-04; Pune, India.

47. Kumar CA, Ajmera S, Kumar B, Srikar D, Prasad SVS, Datta JR. Real-time embedded electronics using wireless connection for soldier security. In: International Conference on Advancements in Smart, Secure and Intelligent Computing (ASSIC); 2022.

48. Devi SS, Lakshana S, Pavithra SV, Roshini SR. LoRa based Smart Soldier Jacket. In: Second International Conference on Augmented Intelligence and Sustainable Systems (ICAISS 2023); 2023.

49. Lloyd DG, Saxby DJ, Pizzolato C, Worsey M, Diamond LE, Palipana D, Bourne M, Cardoso de Sousa A, Mannan MMN, Nasseri A, Perevoshchikova N, Maharaj J, Crossley C, Quinn A, Mulholland K, Collings T, Xia Z, Cornish B, Devaprakash D, Lenton G, Barrett RS. Maintaining soldier musculoskeletal health using personalised digital humans, wearables and/or computer vision. J Sci Med Sport. 2023;26(Suppl 1):S30-S39.

50. Vadivel M, Vimal SP, Sivakumar VG, Vijaya Baskar V, Selvi M. Internet based Defence Surveillance Robot to Prevent Intruder Activities and Auto Combat System using SONAR Technology. In: International Conference on Innovative Data Communication Technologies and Application (ICIDCA-2023); 2023.

VIT®
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

School of Computer Science Engineering and Information Systems
M.Tech (Integrated) Software Engineering
WINTER 2023-2024
Course Project- Implementation Review (Final) Evaluation Sheet

Title: SOLDIER HEALTH MONITORING & TRACKING SYSTEM

Team Name: CTRL ALT ELITE

Project Team

S.No	Register Number	Student Name	Signature	Guided By
1	21MIS0015	ABINESH KUMAR KV		Dr. R.K NADESH
2	21MIS0287	YOHAN KRISHNA B K		
3	21MIS0310	LOHITH KUMAR M		
4	21MIS0359	RUTHIKA J		
5	21MIS0361	KELVIN SAMUEL S		

Team Member(s) Contribution and Performance Assessment

Components	Student 1	Student 2	Student 3	Student 4	Student 5
Implementation & Results - (30)					
Contributed fair share to the team Project -(05)					
Cohesive Presentation-(05)					
Documentation Hard/Soft - (05)					
Q & A – (05)					
Total / 50					

Student Feedback (Student Experience in this Course Project)	Evaluator Comments

Name & Signature of the Evaluator(s)