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IOT based Soldier Health Monitoring and Position Tracking System

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Abstract: ***An Internet of Things-based system for tracking a soldier's position and health during combat operations is one technological advancement that makes it possible to monitor a soldier's whereabouts and health in real time. The system goals are to protect soldiers and improve their effectiveness in combat. The system utilizes various sensors and devices such as heart rate monitors, temperature sensors, GPS, and accelerometers to gather data on the soldier's vital signs and movements. This data is then transmitted wirelessly to a central monitoring system, which analyzes it and provides real-time feedback to the commanding officers. By monitoring soldier's vital signs, the system can quickly identify any health issues that may arise, such as fatigue or dehydration, and alert the appropriate medical personnel. The system also tracks soldier's positions and movements, allowing commanders to make informed decisions about deployment and resource allocation. All things considered, a position tracking and health monitoring system for soldiers based on the Internet of Things is a useful instrument for ensuring their safety and wellbeing in combat.***

Keywords: IOT, GPS, GSM, Temperature sensor, heartbeat and SPO2

I. INTRODUCTION

A piece of state-of-the-art equipment dubbed the IoT-based system for tracking the position and monitoring the health of soldiers assists in real-time monitoring of military health and position. The system regularly monitors the vital signs and whereabouts of soldiers in the field to guarantee their safety and wellness.

The system allows soldiers to use wearable devices and sensors to track their heart rate, oxygen saturation, and body temperature. These sensors gather information, which is then sent to a central server where it is analysed and processed to give each soldier's health condition in real time. The device offers real-time location tracking of soldiers using GPS in addition to health monitoring.

In order to monitor the soldiers' movements and assure their safety, the commanding officers use this information. Multiple layers of encryption are used throughout the system's design to safeguard the data sent between the sensors and the central server. It can be applied to a range of military tasks, such as combat operations, drills, and peacekeeping missions.

Overall, the IoT-based system for tracking the position and monitoring the health of soldiers is an effective tool for boosting the safety and well-being of soldiers in the field and it marks a significant advancement in military technology.

II. LITERATURE REVIEW

Shraddha mahale [4] submitted a work named GPS and GSM modem are employed by the ARM7-LPC2148-based soldier position tracking and health monitoring system. we can able to track the position of soldier in the battlefield and can be offer medical treatment to soldier in emergency as early as feasible. Pavan Mankal [1] The work that was recommended was dubbed "IOT Based Soldier Position Tracking and Health Monitoring System". He offers a strategy devised expressly to fulfil the expectations placed on battlefield safety by armed troops. Finding soldiers' specific locations on the battlefield is the key purpose of the offered strategy. Numerous physiological indications and vital signs, including heart rate, temperature and saturation of oxygen, are used to predict an individual's life expectancy.

Mahammad Eliyaz [2] recommended producing a paper titled "Health Monitoring and Tracking System for Soldiers" using LabVIEW". They offer technique which is developed for military application. This technology continually monitors the health-based concerns and specific position of soldier throughout combat time. Soldier always lost life in war field owing to bad communication. It is necessary to know the health state as well as position or the base station. Pavan Kumar [3] "Health Monitoring and Tracking of Soldier Using GPS" was the study that he was suggested. He put a lot of stress on recognising the soldier's location and physical condition in their advised strategy. The base station will be able to detect the soldier's exact position using GPS-provided SMSs, and their health condition will be established using GSM-provided SMSs. Additionally, they utilised a Google Map, which reveals the soldier's whereabouts.

Pratik Kanani [5] suggested a paper named "GPS Neo6m, Arduino, and GSM Sim800L for Real-time Location Tracking in Healthcare: A Use for Critical Health Patients the IOT gadget at the heart of their planned project would precisely pinpoint the latitude and longitude that is, the patient's location in relationship to the base station room. Medical staff and center personnel may also determine the patient's exact location and provide the necessary medical care by using Google Maps and online apps on the server.

III. METHODOLOGY

A. Block Diagram

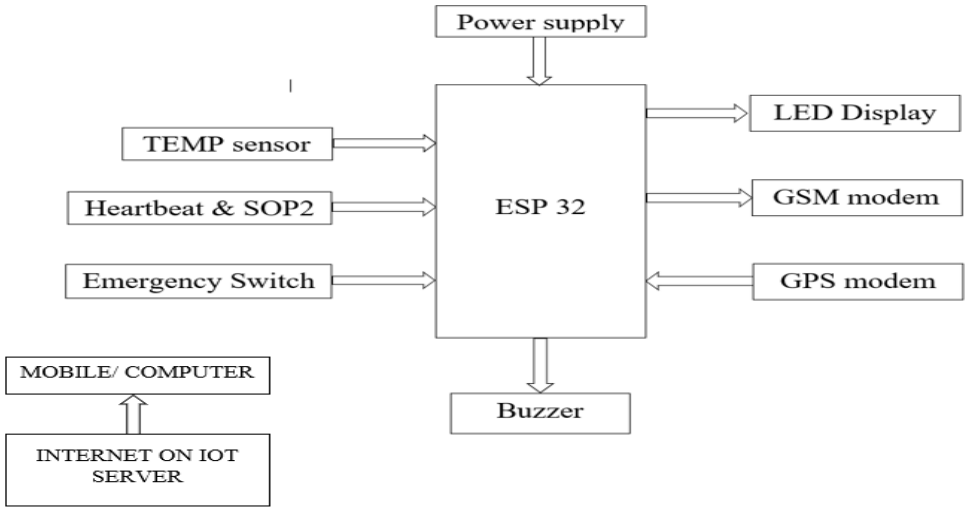

Fig. 1 Block Diagram of Soldier Unit and Server Unit

B. Hardware Design

The main hardware components of proposed system are: ESP32, GPS, GSM, temperature sensor (LM35), Heart beat and SPO2 sensor (Max30100).

1) *ESP 32*: ESP WROOM32 WIFI + BLE Module serves as the foundation for the ESP32 Development board. Powered by the most recent ESP-WROOM-32 module, it is a small, minimalist system development board that fits neatly into a solderless breadboard.

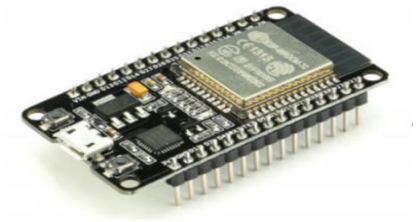

Fig. 2 Block Diagram of Soldier Unit and Server Unit

2) *GPS:* A level-2 heading must be in Italic, A global positioning system uses satellites to determine an object's precise location. Around the receiver's four satellites on the ground will show the soldier's location. The GPs output can be sent to a server or base station.

Fig.3 GPS Modem

3) *GSM:* Global system for Mobile Communication that is known as the GSM is used to send information of the soldier like the hearth beat, body temperature and oxygen level to the base station.

Fig.4 GSM Modem

4) *Heartbeat and SPO2 sensor:* The MAX30102 is a combined pulse oximetry and heart-rate monitor module. It is used in the measurement of blood oxygen saturation levels and heart rate.

Fig.5 MAX30100 Sensor

5) *Temperature sensor (LM35):* The Lm35 temperature sensor can be used to measure the body temperature of soldiers. It is simple to figure out the output voltage and get a temperature reading in Celsius.

C. Final Setup

The final setup connections are shown in figure 6.

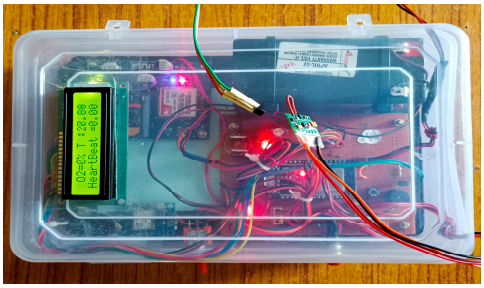

Fig. 6 Final setup connections

IV. EXPERIMENTAL RESULTS

An efficient security and safety system, the smart soldier system is created by combining the latest developments in wireless and embedded technology. This system will be very beneficial for soldiers for secret mission. From this project the safety and security of soldiers are fulfilled by the GPS by tracking the position of soldiers anywhere on earth. GSM may help to soldier to communicate with base station by pressing the emergency switch which results in sending of soldier report to the base station and server. In this manner, smart soldier system is very use full for soldiers in battle field.

Fig.7 Soldier report at the base station

Fig 7 shows the full soldier report which will be displayed at base station given by the system. By clicking on link, we will go on Google Map.

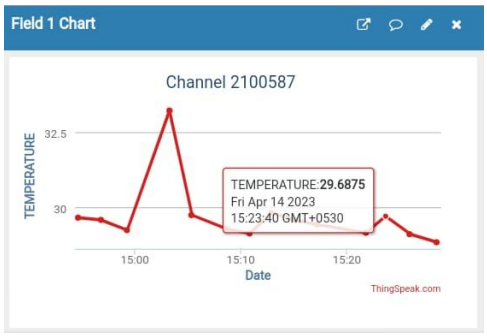

Fig. 8 Graph of Temperature Sensor

Fig 8 shows the graph of soldier body temperature on Thing Speak server and monitored by the commanding officers at base station.

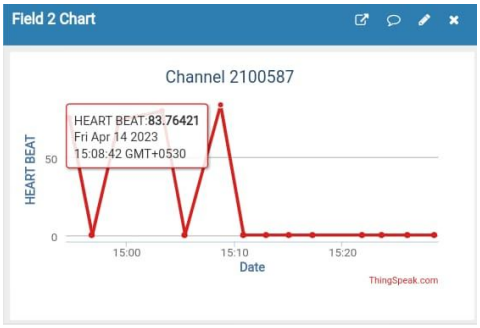

Fig. 9 Graph of heart beat Sensor

Fig 9 shows the graph of soldier heart beat on Thing Speak server and monitored by the commanding officers at base station.

Fig. 10 Graph of oxygen level Sensor

Fig 10 shows the data of oxygen level sensor which indicates the oxygen level of soldier.

Fig. 11 Graph of Longitude coordinate

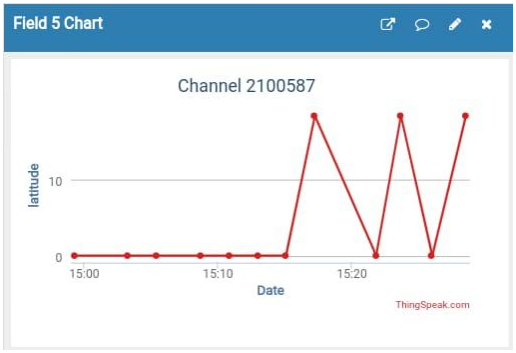

Fig. 12 Graph of Longitude coordinates

Fig 11 & 12 shows the longitude and latitude coordinates of actual position of soldier. These coordinates taken by the four satellites which is used to get actual physical location of soldier.

V. CONCLUSION

The security and efficiency of military operations can be significantly increased by implementing an Internet of Things system to track the movements and health of soldier. By utilizing sensors and other IoT devices, soldiers can be tracked and monitored in real-time, allowing for quick and accurate responses in the event of an emergency. Additionally, the system can offer useful information on the health and performance of soldiers, enabling more efficient training and improved performance all around. However, it is important to consider the privacy and security implications of such a system, as well as the potential for technical difficulties and malfunctions. Armed forces could benefit significantly from an Internet of Things (IoT)-based system for tracking force position and health, but it would need to be properly implemented and monitored.

VI. FUTURE SCOPE

The future scope of the system is vast, with many advancements on the horizon. Utilizing edge computing, sensor fusion, machine learning, predictive analytics, and smart wearables, the system can enhance accuracy, speed, and safety, ensuring the health and well-being of soldiers. Edge computing can enable real-time data processing, while sensor fusion can provide more comprehensive views of soldiers health and positions. Machine learning algorithms can analyse large data sets for insights, and predictive analytics can help anticipate health risks. Smart wearables can also offer real-time feedback and training. Together, these advancements will help optimize soldiers' health and improve decision-making processes for commanders.

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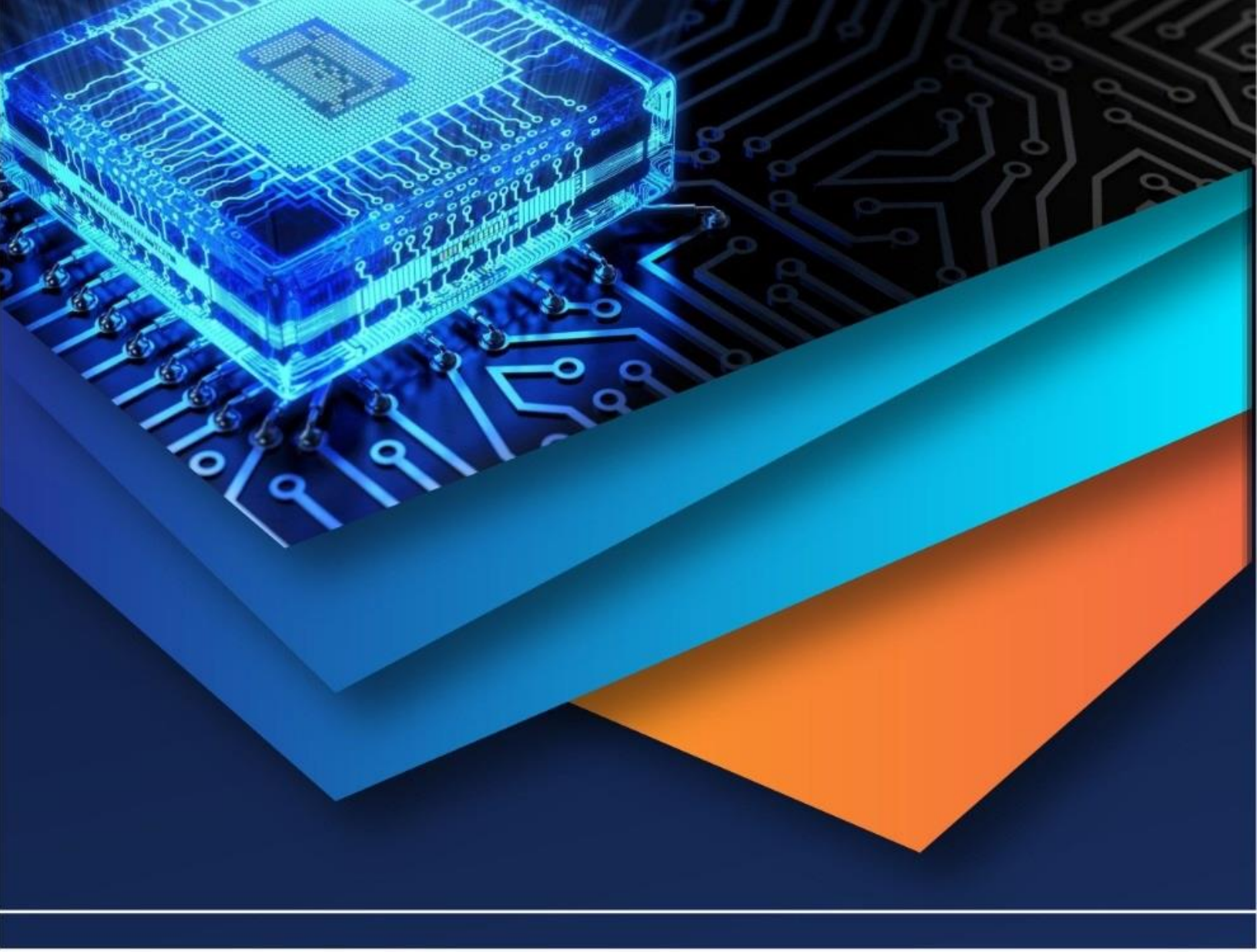

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