International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 02 | February - 2024 SJIF Rating: 8.176 ISSN: 2582-3930

IOT BASED HEALTH CARE MONITORING SYSTEM FOR ARMY SOLDIERS

Dr K Helen Prabha[1], Shaik Khaniya[2], Vaddi Harshitha[3], Thumati Archana[4], Vootla Jaya Sai Lakshmi[5]

[1]*Electronics and Communication Department, R.M.D ENGINEERING COLLEGE*
Kavaraipettai, Tamil Nadu , India.
hodece@rmd.ac.in

[2]*Electronics and Communication Department, R.M.D ENGINEERING COLLEGE*
Kavaraipettai, Tamil Nadu , India.
uec20406@rmd.ac.in

[3]*Electronics and Communication Department, R.M.D ENGINEERING COLLEGE*
Kavaraipettai, Tamil Nadu , India.
uec20431@rmd.ac.in

[4]*Electronics and Communication Department, R.M.D ENGINEERING COLLEGE*
Kavaraipettai, Tamil Nadu , India.
uec20310@rmd.ac.in

[5]*Electronics and Communication Department, R.M.D ENGINEERING COLLEGE*
Kavaraipettai, Tamil Nadu , India.
uec20442@rmd.ac.in

Abstract—***Military is the backbone for the countries to restrict the entry of terrorists and maintain peace inside the country. They use plenty of electronic gadgets to fight the terrorists and protect the border. During critical conditions, they may get attacked. But due to lack of first aid during such time may cause them their life. Even though they have communication medium it is impossible to monitor their body condition. So some soldiers can get physical illness during these conditions. It is not possible for the militants to continuously monitor the condition of the soldiers. In this paper we present a modern wearable technology that enables continuous recording of soldiers condition with the help of embedded sensors integrated in the jacket that would provide maximum convenience and the opportunity to monitor both the body parameters as well as environmental parameter and the location of the solider.***

Keywords— **Wearable, IOT , Embedded C , Real time monitoring , ESP32 .**

I. INTRODUCTION

In the dynamic landscape of modern warfare, the well-being of armed forces is of paramount importance. The traditional approach to healthcare in military settings often faces challenges in timely and comprehensive health monitoring of soldiers deployed in diverse and challenging environments. The nation's security is covered and kept by army, cortege and air-force. There are numerous enterprises regarding the safety of the dogface. Dogfaces in battleground frequently lose their lives due to lack of connectivity, it's veritably vital for the army base station to known the position as well as health status of all dogfaces. To avoid life- hanging situations, it's helpful to continuously cover dogfaces suffering from harsh conditions. The Wireless Sensor Network(WSN) plays a pivotal part in health monitoring, since it enables us to connect detectors to collect dogfaces' health and environmental data and process it to help critical events. Major exploration is being done by some of the world's largest colours like Russian and U.S. Army to figure wearable bedded device which could cover the physical and environmental factors of dogfaces, like in TALOS Exoskeleton (Tactical Assault Light Operator Suit) design which involves 56 pots, 16 governments agencies, 13 universities, and 10 public laboratories for exploration and development purpose [1]. In-depth analysis regarding smart wearable apparel has been handed by Scataglini etal[2]. about the operation and significance of smart wearable apparel in the Army.

A comprehensive survey has been provided by Islam et al[3]. which provides information regarding the impact of IoT on e-health monitoring, monitored parameters and provided services. Existing IoT-based health monitoring systems suffer from three main constraints. First, they often make use of relatively high cost communication links, such as 3G/4G [4,5]. Second, they typically do not deal with data privacy issues . Third, most of them do not analyse monitored health parameters to prevent critical situations[6,7] . Few of the existing ideas include wearable physiological outfit's, detectors, transmission modules. Accordingly, with the operation of the attack, it's conceivable to execute a minimum trouble element to insure the important mortal life on the war zone.

One of the important and vital places in a country's defence is played by the army dogfaces. Every time Dogfaces get erred or injured and it's time consuming to do search and deliver operations.[8] A WSN- grounded environmental and

health monitoring approach in which detector data is reused using robust and stable algorithm enforced in regulator. These reused data are also transferred to the base station via low- cost, low power and secure communication links handed by a LoRa network structure rather of cellular networks, since, they're either absent or doesn't allow data transmission in warzone or remote areas.[9] They concentrated on covering environmental factors similar as temperature, moisture, air pressure, air quality; physical factors similar as stir, position, geographic position and health parameters like ECG(electro cardiograph), blood oxygen position, body temperature.

Presently, a state's army is considered a vital tool for its security. thus, tracking and covering the health and position of a dogface becomes necessary to ensure their safety. In recent times, a lot of technological advances be in the field of detectors. One of the popular areas exercising detectors is developing mortal healthcare system to cover vital body signals. The network of similar detectors that are used to cover vital mortal signal for health care is called BodySensorNetwork(BSN) also, a small GPS module can be used to track a person's position.[10]

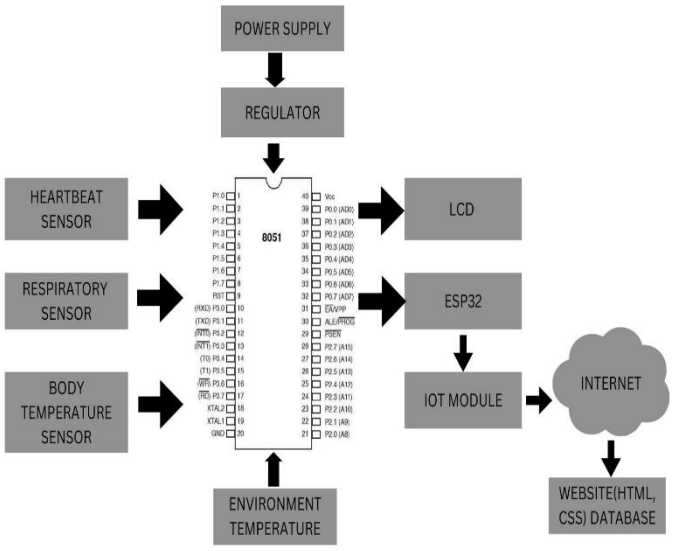


Fig. 1 Basic block diagram

II. PROPOSED SOLUTION

The system consists of two units a soldiers unit and base station unit. The soldiers unit is integrated into the soldiers vest as shown in fig 2.

A) SOLIDERS UNIT

In this unit a ESP32 microcontroller is used to collect the data from different sensors attached to the soldier's body through the jacket. Along with them a GPS sensor is placed to track the location. This sensor provides NMEA(National Marine Electronics Association) raw data, which is used to extract the coordinates of the soldier. The beat sensor is placed directly on skin just below the sternum. With each heart pulse the detector signal varies. This variation is converted to electrical pulse. This signal is amplified and triggered through an amplifier which outputs +5V logic level signal. The output signal is also indicated by a LED which blinks on each heartbeat. If the heart beat displays a value < 170 and >=60 then the person is in normal state. If heart beat records to >170 then the solider must be wounded.

The respiratory sensor is placed around the abdomen area. At rest the average respiratory rate is around 12 to 20 breaths per minute. During physical activities the rate may go from 20 to 40 breaths. If the values are generated greater than 40 then the person must be having difficulties in breathing and assumed to be in critical state. The temperature sensor is placed closer to the heart source. The normal body temperature of the human is 37°C.

Another Temperature sensor is placed outside of the jacket to measure the environment temperature. A Gps module is used to track the location of soldier. In order to connect all the sensors with ESP32 proper wiring is done. The positive terminal (VCC) of the sensors are attached to 5v of ESP32 and negative terminal(GND) is attached to ground of the micro controller. And the analog pin to analog input on the microcontroller.

Similarly, in the case of environmental temperature sensor. For the GPS module along with those connections we need to connect the TX pin to digital input of micro controller and RX pin to digital output of microcontroller. Now the micro controller setup is connected to the LCD through IOT . The ESP32 acts both as a microcontroller and IOT module as shown in fig 2.

B) BASE STATION UNIT

After all the sensors are connected and placed in the jacket. Each sensor communicates with the ESP32 to provide data, and this data is then formatted and displayed on an LCD screen. The Pulse Sensor library can be used to obtain heart rate readings, while the DHT and additional DHT libraries can be employed for temperature readings. With the Pulse Sensor library, the ESP32 can capture heart rate data, offering insights into cardiovascular health. Temperature readings from DHT sensors provide information about the body's thermal state, and the respiratory rate sensor monitors breathing patterns. The inclusion of a GPS module enables location tracking, which can be crucial for applications in the military or emergency response scenarios. A respiratory rate sensor provides information about breathing, and a GPS module, using the TinyGPS++ library, provides location data asshowninfig3.

The ESP32's setup function initializes the sensors and sets up serial communication with the GPS module. Additionally, the display is configured, ensuring proper functionality. The loop

function reads data from each sensor and displays it on the LCD screen. This process repeats at a regular interval, allowing real-time monitoring of multiple health parameters. It's essential to note that this is a generalized overview, and the actual implementation may vary based on the specific sensors, LCD, and libraries you are using. Careful

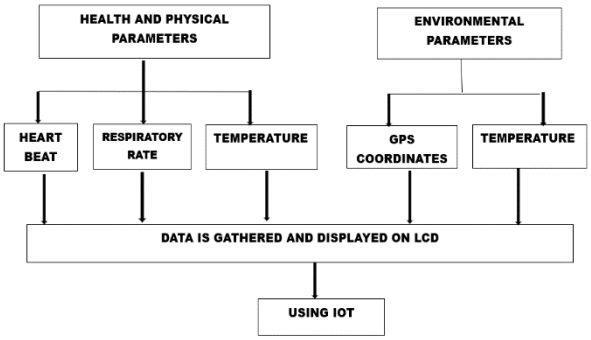


Fig 2

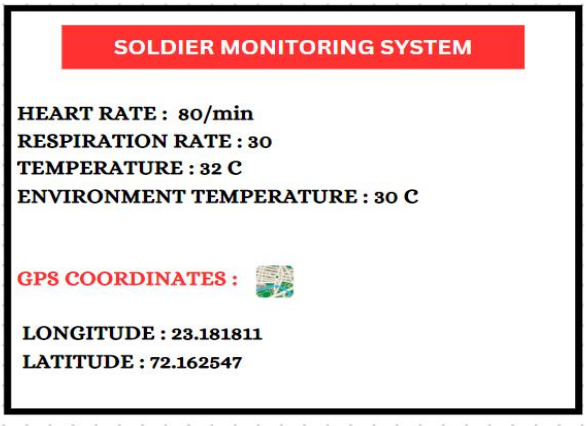
Microcontroller setup

attention to the datasheets, documentation, and compatibility of each component is crucial for successful integration and accurate data representation on the LCD.

III. Results

The LCD serves as an intuitive interface, displaying relevant health metrics such as heart rate, temperature, respiratory rate, and geographic coordinates. Users, including military personnel or healthcare professionals, can easily access this information, enabling prompt decision-making and intervention if necessary. The system's real-time monitoring capability aids in identifying anomalies, potential health issues, or emergencies. Additionally, the integration of the ESP32's wireless capabilities can facilitate data transmission to remote servers, allowing for centralized monitoring and historical data analysis.

This connectivity opens up possibilities for telemedicine applications, where healthcare professionals can remotely assess a person's health status. A versatile and practical health monitoring system that leverages IoT technology to provide timely and valuable information for individuals in various contexts. This system demonstrates the potential for combining sensor data, wireless communication, and user-friendly displays to create effective health monitoring solutions.



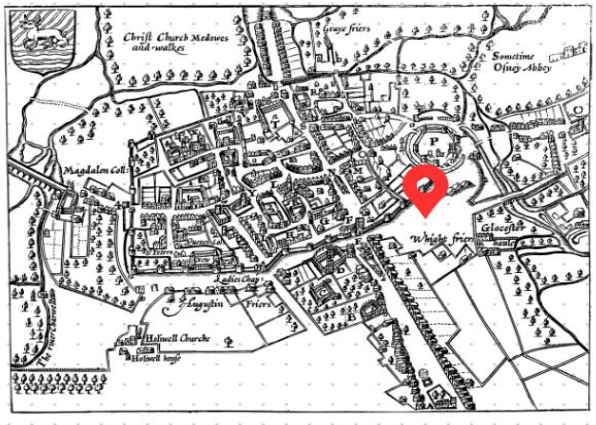


Fig 3a Output displayed at base station, 3b Map points out the location of the soldier .

IV. Conclusion

The IoT-based health monitoring system represents a paradigm shift in military healthcare, emphasizing proactive, data-driven approaches to safeguard the well-being of army soldiers. This innovative system not only enhances the effectiveness of military operations but also demonstrates a commitment to ensuring the health and safety of those who dedicate their lives to serving their nations.

The paper involves careful selection of sensors, appropriate microcontroller or Arduino boards, and the implementation of communication protocols. Libraries specific to each sensor facilitate the integration process, and additional features such as biometric authentication, machine learning, and advanced location tracking can enhance the system's capabilities.[9]

As technology evolves, future implementations could incorporate wearable devices, sensor fusion technology, telemedicine integration, and energy-efficient sensor networks. These advancements aim to provide a more comprehensive and proactive approach to health monitoring, enabling rapid response to emergencies and predictive analytics to identify potential health issues before they escalate. However, it is crucial to address ethical considerations, privacy concerns, and security aspects in the development and deployment of such systems. Ensuring the confidentiality and integrity of health data, as well as obtaining informed consent from military personnel, are paramount.

In summary, an IoT-based health monitoring system for army soldiers holds immense potential for improving healthcare

support in military settings. Continuous innovation and collaboration between technology developers, healthcare professionals, and military personnel will be essential to create robust, reliable, and ethical solutions that meet the unique challenges faced by soldiers in the field.

REFERENCES

[1] S. D. Guler, M. Gannon, K. Sicchio, A brief history of wearables in Crafting Wearables: Blending Technology with Fashion, Berkeley, CA:Apress, pp. 3-10, 2016.

[2] S. Scataglini, G. Andreoni, J. Gallant, "A Review of Smart Clothing in Military", Workshop on Wearable Systems and Applications, 2015.

[3] S. M. R. Islam, D. Kwak, M. H. Kabir, M. Hossain, and K. S. Kwak, "The internet of things for health care: A comprehensive survey," IEEE Access,vol. 3, pp. 678–708, 2015.

[4] L. You, C. Liu, and S. Tong, "Community medical network (CMN): Architecture and implementation," in 2011 Global Mobile Congresss (GMC), Oct 2011, pp. 1–6.

[5] G. Yang, L. Xie, M. Mantysalo, X. Zhou, Z. Pang, L. D. Xu, S. Kao-Walter, Q. Chen, and L. Zheng, "A health-iot platform based on the integration of intelligent packaging, unobtrusive bio-sensor, andintelligent medicine box," IEEE Trans. Industrial Informatics, vol. 10, no.4, pp. 2180–2191, 2014.

[6] M. U. Ahmed, M. Bjorkman, A. Causevic, H. Fotouhi, and M. Lind´en,"An overview on the internet of things for health monitoring systems," in 2nd EAI International Conference on IoT Technologies for HealthCare,October 2015, pp. 1–7.

[7] R. S. H. Istepanian, S. Hu, N. Y. Philip, and A. Sungoor, "The potential of internet of m-health things "m-iot" for non-invasive glucose lesensing," in 2011 Ann. Int. Conf. of the IEEE Engineering in Medicine and Biology Society, Aug 2011, pp. 5264–5266.

[8] D. Kumar and S.Repal, "Real Time Tracking and Health Monitoring of Soldiers using ZigBee Technology: a Survey,"

[9] International Journal of Innovative Research in Science, Engineering and Technology, vol. 4, no.7, pp. 5561-5574, Jul. 2015.G. Raj and S. Banu, "GPS Based Soldier Tracking And Health Indication System With Environmental Analysis"International Journal of Enhanced Research in Science Technology& Engineering, vol. 2, no. 12, pp. 46-52, Dec.2013.

[10] V. Ashok, T. Priyadarshini, and S.Sanjana, "A Secure Freight Tracking System in Rails Using GPS Technology" Second International Conference on Science Technology Engineering and Management (ICONSTEM), Chennai, India Mar. 2016, pp.47- 50.