REAL TIME SOLDIER HEALTH AND POSITION TRACKING SYSTEM

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IoT, ESP32, Biomedical Sensors, GPS Tracking, Analytics.

Introduction:
Modern military operations expose soldiers to extreme environmental stress and high workloads, rapidly affecting their physiological state. Traditional methods rely on periodic manual checks, which fail to provide continuous awareness of a soldier's condition. Consequently, complications like fatigue or stress may remain unnoticed until they become severe emergencies. The proposed system is a wearable IoT solution designed to monitor soldier health and geographical position in real-time. It utilises biomedical sensors, a GPS module, and an ESP32 controller to sample data periodically and update the location. This system enhances situational awareness, reduces medical response time, and increases safety and survivability in field environments.

Objectives:

1. To design a wearable embedded system for continuous monitoring of critical health parameters in real time.
2. To integrate a GPS module for accurate tracking of soldier movement and location.
3. To provide wireless communication for transmitting monitored data to a remote command station.
4. To implement threshold-based alerts for abnormal health readings or emergencies

Methodology:

The project involves integrating multiple biomedical sensors with an ESP32 microcontroller acting as the central unit. Sensors continuously collect vital signs like heart rate, body temperature, and blood pressure, while the GPS module retrieves real-time location. The ESP32 processes these signals, filters noise, and performs local threshold checks. Data is then encoded into JSON format and transmitted wirelessly to a monitoring server via Wi-Fi. Finally, cloud-based AI evaluates trends to detect abnormalities and triggers emergency notifications for the command centre when critical conditions are identified.

Result and Conclusion:

The Wireless Health Monitoring System was successfully developed and tested using ESP32 and various biomedical sensors. Hardware modules were evaluated individually and then integrated to confirm system reliability. Testing confirmed end-to-end data transmission and real-time alert activation for abnormal vitals. In conclusion, the system marks an important advancement in military healthcare by offering a proactive approach to soldier safety. By reducing medical response time through automated alerts and GPS tracking, it enhances both soldier survival rates and overall mission success.

References:

1. “IoT-based Real-Time System for Tracking and Monitoring the Health of Soldiers,” ICEARS 2023 (IEEE), 2023
2. R. Sharma, K. Patel, and M. Singh, “IoT-Based Wearable Soldier Tracking and Health Monitoring Device,” 2023 International Conference on Smart Electronics and Communication (ICOSEC), IEEE, 2023.
3. Park and M. Kim, “A Wearable IoT Framework for Continuous Heart Rate and Temperature Monitoring,” 2023 International Conference on Electronics, Information, and Communication (ICEIC), IEEE, 2023.

Future Scope:

The future scope of this project includes:

1. Integrating advanced machine learning models for predictive diagnostics to forecast issues like dehydration or heat exhaustion before they occur.
2. Implementing real-time satellite communication for uninterrupted data flow in remote terrains without Wi-Fi coverage.
3. Linking the system with battlefield drones to automatically navigate medical kits to a soldier's exact GPS coordinates during severe emergencies.