Bharat Dal Suraksha - To Aware the Life of Soldier

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A R T I C L E I N F O

A B S T R A C T

A Military is the most vital asset for any country where manpower is considered as most effective resource. The success of a military operation depends on deliberate planning, secure and uninterrupted communication, and conservation of manpower till the last. The aim of this paper is to develop an efficient system for operation commander to deploy or positioning the soldiers and to aware the status (dead or alive) of soldiers during a military operation. The system is equipped with bomb detection; once the presence of bomb/Metal is detected it beeps the sound and alerts the soldiers. To attain this objective, here firstly a conceptual framework is proposed to develop a system named Bharat Dal Suraksha. Secondly the conceptual framework is implemented comprising both the hardware and software parts. Finally, an evaluation study was conducted to assess the usability and effectiveness of the proposed Bharat Dal Suraksha system with 4 participants (military personnel). The Bharat Dal Suraksha system assist for accurate deployment of the troops during operation, help to observe and guide movement of own troops, keep aware about the soldier's status (dead or alive). The evaluation study found that the Bharat Dal Suraksha system performs with high accuracy, while test-participants opined that the Bharat Dal Suraksha is a usable, useful, and efficient system.

Keywords— Military Application; Positioning; Military operation; Bomb detection; Mobile application; Usability; Sensors.

I. INTRODUCTION

Indian military system uses many different communication devices for inter commando offices and between different troops to different but among any of these methods will not supporting to trace the activities of the soldiers and also tracking the position of the soldier.

Tracking the position and health parameter of the soldier is very important information required military base station to take the decision about the particular zones that how many soldiers are in active position and still what are the requirements of soldiers. The health parameter like heart beat and body temperature are the important parameter of the soldier health to decode that the actual condition of the soldier. We are using a GSM GPS technology with interfacing microcontroller

unit which communicate with satellite and GSM band network to sense the actual tracking longitude and latitude information of the soldier position. To monitor the health parameter, we are using a real time heart beat pulse sensor which is connected of the thumb finger on the soldier and the average heart beat pulses calculate and in case for any abnormal parameter found it send an immediate information to the base station.

1.1 Existing System

In the 21st century, Information and Communication Technology (ICT) has influenced our society in such a way that people cannot think a single aspect of our life without the technology. Like all other sectors of ICT, software systems are also used in military. History says that the successful armies of the world used the best technologies of their time. Development a soldier locating system (Loc Soldiers) for commander to know the real-time position of the soldiers [1], shift or adjust the position of his troops as per the battle field demand, and to search and locate injured, dead or missing soldiers once the operation is over.

Military Forces need to deal with diverse and unexpected situation arousing from the thick of the battle. A decision may lead to win or lose the battle. Enriched information from different and multiple platforms enhances the decision making. Battlefield scenario develops laterally and vertically in a scalable environment. Commanders and troops traverse the length and breadth of such environment. A military application thus demands versatile use in multiple platforms. Muhammad Nazrul Islam1, Sahrima Jannat Oishwee2 has proposed the applicability of IDM for implementing a multi-channel military application [4]. To attain this objective, we have developed a multi-channel (web and mobile) military application following each step of IDM. Finally, the application was evaluated to assess the performance and usability standard with eleven military personnel.

Sijo Thomas, Dr. Aruna Devi has proposed the design and implementation of the unmanned ground vehicle (UGV) for surveillance and bomb diffusion using haptic arm technique aims [3] at developing an advanced technology for safety, security, and ease of use. The project is an efficient system for controlling a robot with the motion of the user's hand, thus provides a virtual reality for the user in order to detect and diffuse the robot, and reduces the loss of life in hostile situations.

SeokJu Lee, Girma Tewolde, Jaerock Kwon developed and tested a vehicle tracking system to track the exact location of a moving or stationary vehicle in real-time [5]. They have described the design and implementation of our 2014 IEEE World Forum on Internet of Things (WF-IoT) vehicle tracking system. An in-vehicle device, a server and a Smartphone application are used for the vehicle tracking system. In this work, the in-vehicle device is composed of a microcontroller and GPS/GSM/GPRS module to acquire the vehicle's location information and transmit it to a server through GSM/GPRS network.

Xinfeng BA, Ping Wang [2], has proposed that vital sign covers many aspects, such as heart rate, blood pressure, body temperature, etc. In this paper, the soldier status only includes PR obtained from pulse. The system adopts the positioning, short message communication technology based on Beidou satellite navigation system to realize the soldier positioning, vital signs acquisition, two-way short message communications between the soldiers and C2 center. Beidou system is independent development all weather, all time all-terrain, no communication gray zones positioning and communication system

1.2 Proposed System

At present, operation commander along with all party commanders perform reconnaissance before an operation. Basing on reconnaissance data, operation commander asks troops to take position. Action party is the main action group where commander is located. They are located bank of contor2. Reserve party is near pond2. They are for aiding any party who needs troops or support. Second in command is also located at this point with reserve party. Holding party is detailed to

engage the troops of enemy and make them pinned down. Taking this advantage main/action party carry out their main task. Cut off parties are assigned to protect the area of operation from outside help. They prevent enemy reinforcement to come into aid. Sentry disposal are there to take out the enemy sentries silently so that surprise is achieved. At present to conduct a military operation, commander can never be sure that parties have taken position at commander's desired location. Moreover, commander may need to readjust the position of different parties in any phase of the operation. Therefore, this work aimed to develop such a tool that will facilitate the commander firstly to monitor live movement of troops to make sure troops have taken position at commander's desired location. Secondly, to provide necessary correction of the positioning of soldier.

If any soldier missed to reach in the post-operation meeting point, that soldier location can be identified. It might be happened that the missing soldier is wounded in action, killed inaction, or lost his/her direction towards post-operation point. In such cases, the tool will assist to carrying out a rescue operation efficiently. The proposed system is highly useful in the all areas that require safety and it provides virtual reality in surveillance and diffusion. The system is equipped with bomb detection; once the presence of bomb/Metal is detected it beeps the sound and alerts the soldiers. The proposed system is highly useful in the all areas that require safety and it provides virtual reality in surveillance, helps the commanders to guide the soldiers in the combat.

II. METHODOLOGY

A robust accurate positioning system with seamless indoor and outdoor coverage is highly needed tool for increasing safety in emergency response and military operation. GPS-based positioning methods mainly used to field rescue. The position and orientation of the rescuer and the trapped is acquired using GPS chip. Using the GPS data of both the units the relative distance, height and orientation between them are calculated from the geometric relationships based on a series of formulas in Geographic Information Science (GIS).

Using this technology, we are doing the navigation between two soldiers. the data will be sent wirelessly by RF Transceiver. This device can do accurate coordination via wireless communication, helping soldier for situational awareness. GPS module have serial interface. Receiver information are broadcast via this interface in a special data format. This format standardized by the National Marine Electronics Association (NMEA).

Tracking the position of the soldier is very important information for the military base station to take further decision that still how many soldiers I that position required and what exact position of each and every soldier so that the soldiers can move according to the instruction provided by the base station. The existing method uses the limited range of communication for the whole troop and this method does not provide the individual soldier positions. Similarly, the health condition of the soldiers is very important to decide the soldier live status and even this information in the present system not providing to the base station. We are using an innovative method to solve the limitations of the present method and with the help of GSM GPS technology with a programmable microcontroller possible monitor all the parameters of the soldiers and immediate take the necessary action.

The system is equipped with bomb detection mechanism. Once the presence of bomb/Metal is detected by robot, it initiates commands to the authorized officials. Thus, the system provides high security for the life of the bomb detection scord. The proposed system is highly useful in the all areas that requires safety and it provides virtual reality in surveillance.
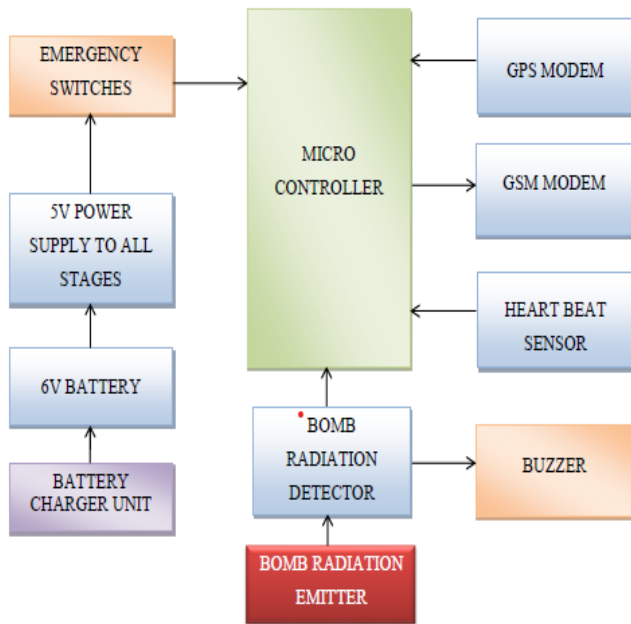
Figure 1: Block Diagram of Soldier Units

III. WORKING PRINCIPLE

The project is designed to improve soldier safety during missions. It includes a heart rate sensor, GPS-enabled device, photodiode-based bomb detection sensors, an LCD display, and a GSM module. The heart rate sensor continuously monitors the soldier's pulse rate and displays the data on the LCD display. The heart rate sensor detects any changes in the soldier's pulse rate, and if the rate exceeds a certain threshold or falls below a certain level, an alert is triggered to the soldier's device.
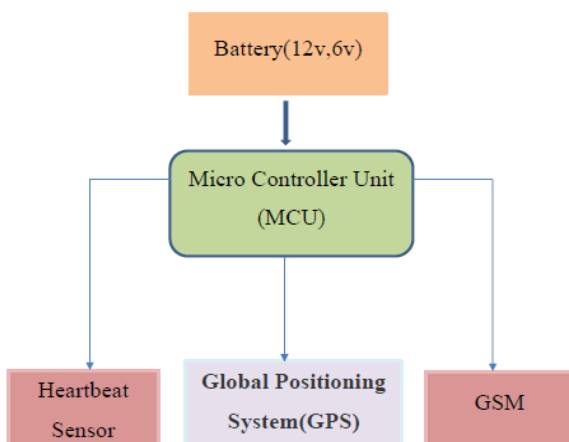

Figure 2: Flow chart of Working Process

The GPS-enabled device tracks the soldier's location in real-time and sends location data to the ATmega32 MCU, allowing the system to accurately determine the soldier's location and movement during a mission. The photodiode-based bomb detection sensors detect the presence of infrared rays from nearby explosives, and the ATmega32 MCU processes the data to trigger an alert to the soldier's device if a bomb or mine is detected nearby.

Bomb detection sensors scan the area for any explosive devices. If the soldier experiences any health issues or is in any danger, he can press the panic button, which triggers an alert to the ATmega32 MCU. The ATmega32 then processes the emergency signal and sends an SMS alert with location data to the base station. The base station receives alerts and location data from the soldier's device and communicates with the ATmega32 MCU to provide appropriate instructions or updates.

The GSM module is used to send SMS alerts to the base station, and the system is powered by a 6V battery for the GPS and heart rate sensor and a 12V battery for the GSM module. Overall, the soldier tracking system provides real-time monitoring of the soldier's health and location.
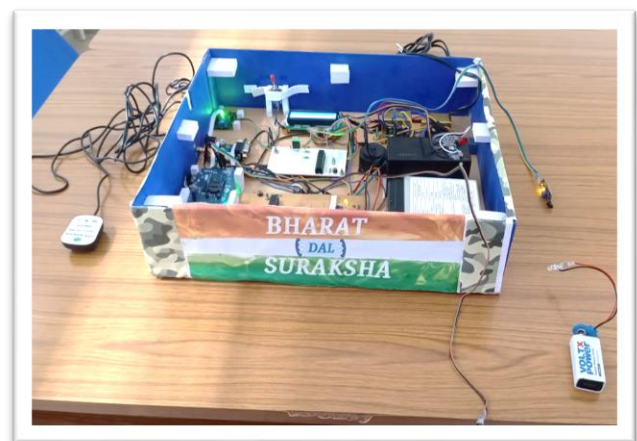
IV. RESULTS AND DISCUSSION

Figure 3: Working Model

The heartbeat sensor with LCD display continuously monitors the soldier's pulse rate and provides real-time

data on their health and wellbeing. By detecting any abnormalities in pulse rate, this technology can trigger an alert to the soldier's device and base station, ultimately increasing soldier safety and improving mission outcomes.

Figure 4: Heartbeat Sensor

The GPS and GSM modules with LCD display are vital components of the soldier tracking system. The GPS module calculates the soldier's location, which is displayed on the LCD display, allowing for continuous tracking and monitoring.

Figure 5: GPS and GSM Module with LCD Display

The GSM module sends SMS alerts to the base station in case of any abnormalities detected by the heartbeat sensor or bomb detection sensor, and the LCD display provides a user-friendly interface for soldiers to view their location and other vital information. Overall, these components increase soldier safety and improve mission outcomes. The entire document should be in Times New Roman or Times font. Type 3 fonts must not be used. Other font types may be used if needed for special purposes.
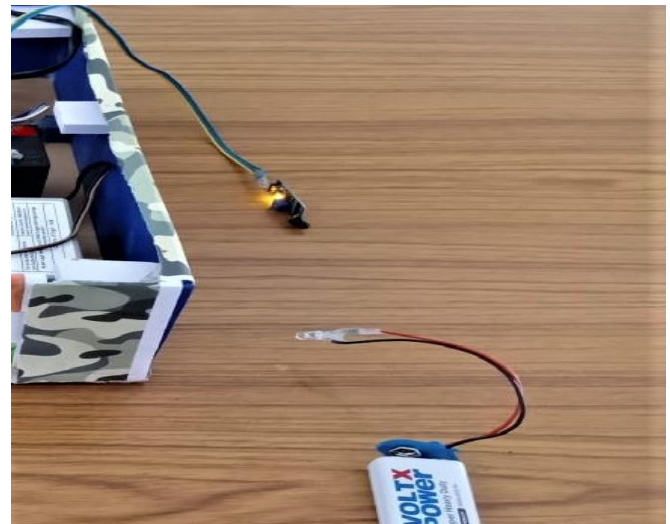

Figure 6: Bomb Detection Object

The bomb detection sensor is an essential component of this project. It works by detecting explosive materials using a variety of technologies, including X-rays, infrared radiation, and chemical sensors. A photodiode is used to detect infrared radiation, which is emitted by many types of explosives. By detecting explosives in real-time, the bomb detection sensor provides critical information to soldiers, allowing them to take immediate action and avoid any potential threats. This technology significantly enhances soldier safety and mission outcomes by reducing the risk of injury or death from explosive devices.

Figure 7: Panic Button

The panic button is a key feature of the soldier tracking system, providing soldiers with a quick and easy way to alert the base station in case of an emergency. The button is typically located on the soldier's device can be activated with a single press. When the panic button

is pressed, it sends an alert to the microcontroller unit, which processes the data and sends an SMS to the base station via the GSM module. The SMS typically contains the soldier's location information, allowing the base station to quickly respond to the emergency. By providing a reliable and easy-to-use alert system, the panic button enhances soldier safety and ensures that emergency responses can be initiated quickly and efficiently.

The GSM module is typically mounted with a SIM card that is registered with the base station phone number. When the heartbeat sensor detects an abnormality in the soldier's pulse rate or when the panic button is pressed, the microcontroller unit sends an SMS alert to the base station phone number via the GSM module.
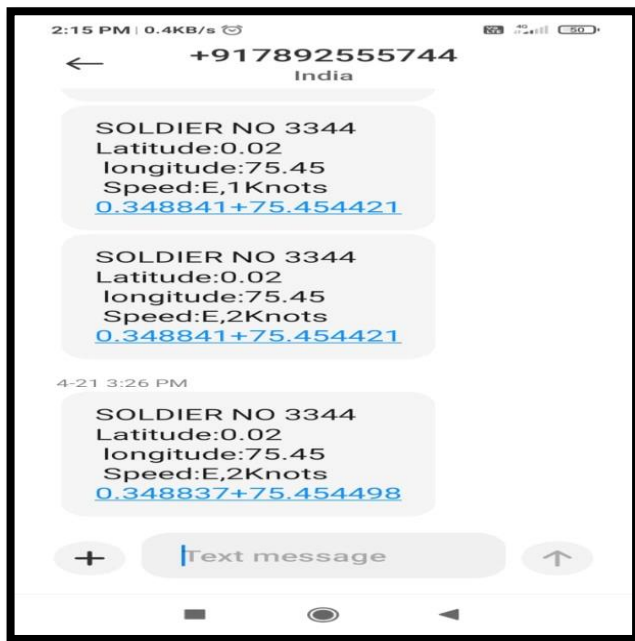

Figure 8: Received SMS

The SMS typically contains the soldier's location information, allowing the base station to quickly respond to the emergency. By using a registered SIM card, the system ensures that only authorized personnel receive the location information and other sensitive data, maintaining security and confidentiality. Overall, the GSM module with a registered SIM card is a critical component of the device providing a reliable

and secure communication link between soldiers and the base station in case of emergencies.

FUTURE SCOPE

The future scope of the project includes the integration of AI and ML, biometric authentication, environmental sensors, AR, and improved battery life. These developments could improve the system's accuracy, security, situational awareness, and operational efficiency, ultimately enhancing soldier safety and mission outcomes.

V. CONCLUSION

Our Bharat Dal Suraksha, the soldier tracking system is an advanced tool designed to enhance the safety and security of soldiers during missions. The system continuously monitors the soldier's pulse rate, location, and the presence of nearby explosives, providing real-time data and alerts to the soldier's device and base station. By utilizing advanced technologies such as GPS, heart rate sensors, photodiode-based bomb detection sensors, and GSM modules, the system is highly reliable and effective in any situation.

The proposed device for soldiers is a comprehensive and effective solution that can significantly improve the safety, effectiveness, and situational awareness of military operations. By utilizing a range of sensors to monitor various environmental conditions and physiological parameters of soldiers, including heart rate and body temperature, the device can determine whether a soldier is alive or dead and report their status to commanders in real-time.

Additionally, the device includes GPS and motion sensors to provide accurate location tracking, an emergency button to alert commanders to potential dangers or risks, and the ability to detect mines and bombs buried underground. By providing real-time monitoring of soldier status and location, as well as detecting potential threats, this device can help to save lives and enhance mission success. Overall, the proposed device has the potential to revolutionize

military operations and provide a significant boost to the safety and effectiveness of soldiers on the battlefield.

VI. REFERENCES

[1]. Muhammad Nazrul Islam1, Md Rabi-Ul Islam2, S. M. Rafiqul Islam3, Shahid Ahsan Bhuyan4 and Farhan Hasib5(2018) - "Loc Soldiers: Towards Developing an Emergency Troops Locating System in Military Operations"

[2]. Xinfeng BA, Ping Wang (2012) - "Design of Soldier Status Monitoring and Command and Control System Based on Beidou System"

[3]. Jasvinder Singh, et al., (2019) - "Global Positioning System (GPS) and Internet of Things (IoT) based soldier positioning and health signal system"

[4]. Muhammad Nazrul Islam1, Sahrima Jannat Oishwee2, Shifat Zaman Mayem, A S M Nur Mokarrom, Md Abdur Razzak, ABM Humayun Kabir (2017) - "Developing a Multi-Channel Military Application Using Interactive Dialogue Model (IDM)"

[5]. SeokJu Lee, Girma Tewolde, Jaerock Kwon (2014) - "Design and Implementation of Vehicle Tracking System Using GPS/GSM/GPRS Technology and Smartphone Application"

[6]. Sijo Thomas, Dr. Aruna Devi (2017) - "The design and implementation of the unmanned ground vehicle (UGV) for surveillance and bomb diffusion using haptic arm technique aims"

[7]. Akshay Gondalic, et al., (2018) - "IoT Based Healthcare Monitoring System for War Soldiers using Machine Learning".

[8]. William Walker A L, et al., (2018) - "A mobile health monitoring".

[9]. AfefMdhaffar, et al., (2017) - "IoT Based Health Monitoring via Lora WAN"