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Tracking System for Soldiers

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Abstract: The overall health and performance of military personnel can now be improved with the Soldier's Health Monitoring and Position Tracking System, which is employing new technology in an integrated way. With a health monitoring and position tracking function, military commanders will now have full situational awareness, as, additionally using real-time monitoring of health and accurate position tracking, they can obtain the following health indicators (heart rate, temperature and blood oxygen levels) for each soldier, as well health status of individuals enlisted to implement the mission they are working on (mission parameters proscribed in terms of performance metrics), either by alerting them of a potential health problem at the command centre (i.e., soldiers in the field are always monitored) which can be acted upon from the command centre that is exercised in response to abnormal health indicators. The system relies on new global positioning (GPS) and inertial navigation systems (INS) to accurately report each soldier's position in the field, and the geographic data acquired can track and disseminate their health information in real-time. The integrated capability of geo-spatial information and health monitoring information gives commanders the full picture of the troops' health status and location. Commanders and their command teams, with the health and tracking information provided by the system, can make informed decisions and health status of soldiers based on real-time health monitoring and positional data, and, through the System's user interface, be visible with an intuitive dashboard. The data is relayed through the Internet of Things (IoT) to the command centre. Specific components of the proposed system include gearbox modules, portable physiological monitoring devices, and sensors and senders.

Keywords: Health,Position,Tracking, GPS (Global Positioning System), Monitor.

I. INTRODUCTION

Knowing the exact location of soldiers on field operations can save time and resources when using military and defense operations. The cost of searching manually for soldiers is too great and can be inconclusive. Commanders must receive correct information as soon as possible and in a manner that is most useful to their role in communicating to field units.

To provide the most accurate information means the development of a complete soldier tracking technology solution including hardware, communications, and software systems. There is tech that can locate soldiers to within +/- 300m. Reliable self-monitoring hardware can be configured for various geographic and environmental conditions and can be installed in various operational scenarios. Die in -field communications systems can obtain location from base and provide this information quickly to the systems operator.

Some communications systems like Supervisory Control and Data Acquisition (SCADA), can perform remotely controlled response operations and provide a rapid means to coordinate fast responses. SCADA can produce soldier location listing/verification information from sequence of event data, alerts and location logs. The central computer software can collect location data and reduce operators response time by systems normally reporting "distance to soldier" from the base station. Field personnel will be able to succinctly use this data to identify soldier locations from the operational maps and field drawings. Some not a lot of people are not able to tell if someone is dead or alive if they are disabled.

II. LITERATURE REVIEW

This process applies GPS in a soldier tracking system's architecture to provide accurate location of a soldier that is on the battlefield. At several points in the battlefield communication network architecture, there are other devices (e.g., nodes, routers, gateways) that sense high frequency signals or a location ping generated by a soldier moving from one location on the battlefield to another. Each of the devices in the field detects what and when one or more devices activated the device to record the time in specific timestamps of when the first location signal was received at each of the location detection devices.

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Sine there are only one or two GPS signals transmitted for each soldier detected at each point in the operational network, if time-stamps are compared from tracking points the soldier's location can be determined using each timestamp within a 300 meters accuracy. The authors of the paper emphasizes the importance of real-time tracking and why knowing the exact location of soldiers is critical in military operations since it potentially minimization of time response and heightening operational danger. Routing soldiers through a battlefield that has not been reasoned through in military planning otherwise is treacherous task due to metrics such as slow update rates and just the challenge of differentiating between other units' positions in the operational environment. The authors of the paper proposes a soldier tracking scheme based upon position measurements taken at correlation with one another in chronological order as dictated by using GPS related technology.

The soldier's tracking will include positional coordinates to be compared at each of the checkpoint having the option of either movements of possible enemy attacks or alerts. In turn, the system can identify the closest position in the operational network to the soldier's position the attack happened at. Then a review of the absolute differences in the degrees and the combined angle of the degree of which all or multiple paths to correlate threshold and recall every time they reported to the location identify a soldier's path of where his movement existed. This scheme moves the entire architecture and quality of tracking potential.

III. METHODOLOGY

The apparatus incorporates core health monitoring components, which include heart rate and temperature sensors, and a pressure sensor, to a Raspberry Pi Controller. A temperature sensor can simply and accurately measure the body temperature, while the heart rate sensor systematically captures information on the user's cardiovascular activity. The data acquired by these sensors are carried out in a Raspberry Pi controller, which serves as the core apparatus for health monitoring. Once the temperatures and heart rates have been identified, the next step involves obtaining the location information via GPS integration and obtaining the exact location via the GPS. This location information is communicated through a GSM module that relays the exact location, along with the health metrics and alerting or updating pre-defined contact numbers. In cases of elevated or abnormal temperature or heart rate, the system not only relays the health metrics , but provides the exact location of the individual; thus providing targeted measures and improving response efforts. This combined approach of sensors and communication modules contributes to a greater possibility for improved health response and location-based assistance through the synergy of the health monitoring system.

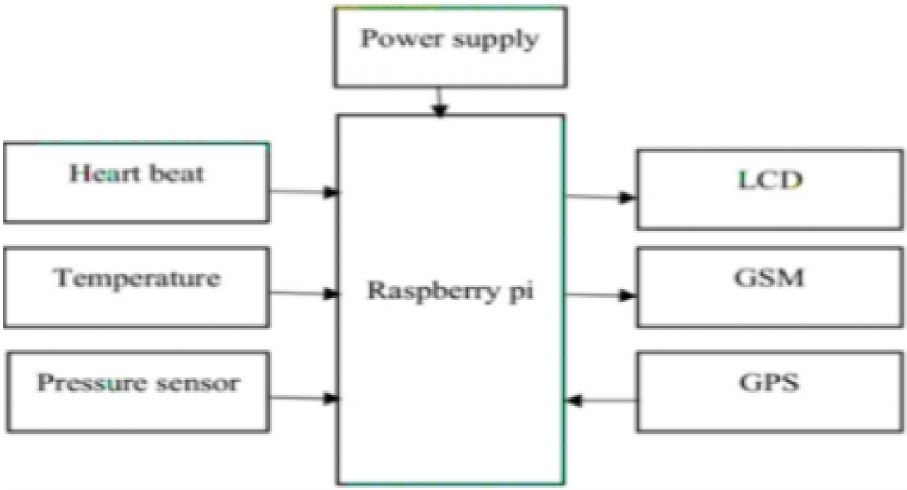

Fig. 1:- Block Diagram

A. GLOBAL POSITIONING SYSTEM (GPS)

Introduction to GPS: The Global Positioning System (GPS) is a radio-location system based on orbiting NAVSTAR satellites. These systems provide 24/7 information on three-dimensional position, velocity, and time for users at or near the earth's surface (and sometimes above). The first system GPS, which was made freely and blatantly available to all civil users, has become NAVSTAR. Applications include portable destination guidance on where the user is, trajectory tracking of vessels, as well as systems used in automotive wireless communication devices that give the driver personal

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and promotional information, receive messages from the driver. GPS technology is used in many applications, including marine, environmental, navigation and numerous applications for tracking and monitoring.

B. GSM (Global System for Mobile communications)

Is the easiest mobile telephony standard in the world, originally from special mobile Group. This made international nomadic arrangements between mobile phone operators. A subscriber could use their mobile phones anywhere in the world. When compared to the original specification, Global System for Mobile Communication (GSM) transmit both signaling and speech channel as in digital technologies. As a result, GSM is actually a 2nd generation (2G) mobile phone system. It was obvious in the acceptance of the GSM standard, due to the facilities, for both end users who may benefit from the ability to travel and swap carriers without changing their phones, and networks operators. GSM also exploited the introduction of the Short Message Service (SMS), or more commonly known as text messaging, which is low-cost, based on other mobile phone principles. Most 2 Generation GSM systems operate in the 900 MHz or 1800MHz bands. Where either of these bands have already been harmonised, it was 850 MHz and subsequently the 1900 MHz band. Under some limited circumstances it has harmonised bands of 400 and 450 MHz in few countries? Since it was used for First Generation systems in the past. Most of 3G networks throughout Europe operate in the 2100 MHz range. One of the main elements of GSM is Watch is called the Subscriber Identity Module or SIM Card. In this way user keep this information even after switching phones. Instead, if user wishes to change operators, user needs only to change the SIM card, without changing the holding device.

C. EASY PULSE (TCRT1000)

EASY PULSE – HEARTBEAT SENSOR: The new version uses the TCRT1000 reflective optical sensor for photoplethysmography. The use of TCRT100 simplifies the build process of the sensor part of the project as both the infrared light emitter diode and the detector. which carries both sensor and signal conditioning unit and its output is a digital pulse which is synchronous with the heart beat. The output pulse can be fed to either an ADC channel or a digital input pin of a microcontroller for further processing and retrieving the heart rate in beats per minute (BPM).

D .COMMUNICATION BETWEEN SOLDIER AND BASE STATION:

In our project, we used GSM module (SIM800L) to transmit data. The GSM specification offers a multitude of base frequency carrier bands. Most GSM 2G networks operate in the 900 MHz or 1800 MHz frequency bands. In some countries, where the 900 and/or 1800 MHz bands have already been assigned, the 850 MHz and 1900 MHz bands are used.

The circuit diagram describes a Real Time Tracking and Health Monitoring System for Soldier. The key element of this circuit is a Programmable interface controller PIC 18F25K20. The major component used in this circuit are LM35, Easy Pulse v1.1 ,GSM module, GPS modem ,keypad, LCD and some discrete components. PIC 18F25K20 control and co-ordinate the functioning of the circuit. Two 22pF capacitor are connected to PIC 18F25K20 to prevent the clock signal from damping. The quartz crystal connected to the pin 13 and 14 of the microcontroller. The PIC will perform the job as scripted to it. The programming Language is C. The PIC18F25K20's function in our project is to collect segmental data from body temperature sensor LM35, easy pulse v1.1, GPS modem and forward this information to base via GSM module. This voltage was fed to an analog to digital converter(ADC) of microcontroller which can convert the analog 22 value to a range of 0-255 (digital value). It was connected to port1 (port A) of the PIC, i.e. to the 3rd pin. This information was sent to the PIC and then on to the base station via GSM.The heart beat sensor uses Easy Pulse v1.1. The heart rate measuring system (sensor), HRM-2511E was manufactured by Kyoto Electronic Co., China and it operates in communication mode. In transmission mode brightness is emitted towards skin, and sensor is placed on other side of skin so interact with the light that has fallen on light sensor. There is an IR LED and light detector positioned on two opposite sides located in front of each other in the sensor casing. A graph of this variation against time is referred to as a photoplethysmographic or PPG signal. The PPG signal contains a large DC component which correlates to the total blood volume of the skin being monitored, and the AC component correlates to the heartbeat. The AC component which conveys dynamic information effector times the pulse is orders of magnitude smaller than the DC component. This AC component is amplified and filtered and the AC signal is converted to a series of strong pulsations our train. This output pulse train from Sensor is inputted into microcontroller at 2nd pin on microcontroller. Where microcontroller calculates heart beat display output on LCD and send to GSM.

IV. FLOW CHART

1.Start

The system has powered on or initialized.

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2.GSM, GPS on
The GSM (Global System for Mobilcommunications) and GPS (Global Positioning System) modules are both activated.

3.GSM waits for request
The system is in idle state and waiting for someone to request the location (usually a command or signal from a user).

4.Valid? (Decision Point)
The system checks if it received a valid request:

No → Loops back and waits for a valid request.
Yes → Proceeds to next event.

5.GPS on (get coordinates)
The GPS module retrieves the current location coordinates (latitude and longitude).

6.GSM gets data and sends
The collected coordinates is sent via the GSM Module (usually using SMS or data packet).

7.User received data
User receives the data

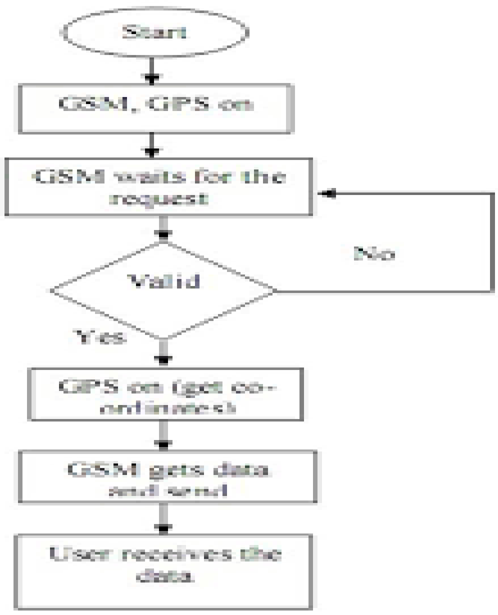

Fig.2:- Flow chart for Tracking system for soldiers

V. RESULT

Developing a soldier health and position tracking system using a Raspberry Pi 4 seems to be an exciting idea! You would need some sensors for health-metric (like heart rate, temperature, etc.) monitoring, GPS for position tracking, and camera for video recording. Then you would program the Raspberry Pi to gather the information, process the information, and send the data via e-mail. The proposed method presents a functional, effective and inexpensive way to regulate soldier's body temperature in different environmental conditions. The method incorporates unique warming and cooling methods that provide different temperature scenarios. The method operates simply, allowing soldiers in the field to apply, ease of use. The cost-effectiveness of the method is based upon the use of technology efficiently and the applicable readily available resources. The method presents an opportunity for the health of staff soldier because it applies a warming and cooling method, so comfort can be maximized, and an effective environment for work can be created. The flexibility of the method allows for all scenarios of temperature range for temperature control, given that

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military operations depend on dynamic activity. In conclusion, the proposed method presents an effective and inexpensive way for regulating soldier body temperature, while comforting to the soldiers overall health and operational effectiveness around the different climates experienced.

VI. CONCLUSION

The GPS tracking system is a high volume tracking system and provides high accuracy on the location of soldiers. The tracking system only tracks the network to which it is connected, not the individual units that are common with typical tracking methods. The method characterized in this paper uses a composite index to perform high volume routines providing detection, direction discrimination and classification of soldiers, and each soldier's location. The overall method proved to provide accurate soldier's locations. The extensive simulation studies suggest that the overall tracking method is not adversely affected by the various network and tracking circumstances.The speed and stability of the response decision time of the scheme is quick and stable, and on average is less than half of a cycle. The method presented provides a cheap and easy approach for soldiers to regulate body temperature in different environments. The proposed solution cleverly integrates new heating and cooling systems so that all temperature ranges can be used. The simplicity of the system will allow soldiers in field scenarios to access the system for related cases of use easily. The method has a cost-effective approach by using efficient technology and existing resources. The adoption of the approach ensures soldier welfare with both heating and cooling methods available thereby improving comfort and operation. The approach has the flexibility to be applied across assorted temperature ranges addressing the changing nature of military situations. Ultimately, the proposed method provides an efficient and cost-effective solution to maintain soldiers' body temperature for the health and operational effectiveness of soldiers in different climates.

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