WARRIOR TRACING AND WELLNESS SUPERVISING SYSTEM USING DIGITAL MAP AND ZIGBEE

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Abstract:
Today's world has emerged with so many changes but the war between nations remains the same. There is no protection for warriors at army ground. The warriors are the backbone of our nation. Concerning the warriors safety there are many instruments to view their health status as well as ammunitions on the warriors. The project is based on monitoring of warriors. It is able to send parameters of warriors in real time. It allows us to monitor warrior's health parameters (temp, heartbeat, position) in real time. Here the parameters of warriors are measured continuously (temp, heartbeat) and wirelessly transmitted using Zigbee. This project provides a solution for enhancing the reliability and flexibility by improving the performance and power management of the warrior monitoring system. In the current proposed system the warrior's health is continuously monitored and the acquired data is analyzed at a centralized ARM microcontroller. If a warrior's health indication falls below the threshold value, an automated sms is sent to the base unit of army display system using a standard GSM module interfaced with the ARM microcontroller. Here, we are using Zigbee for wireless transmission. The base unit can get a record of a particular warrior's information by just accessing the database of the warriors on his PC which is continuously updated through Zigbee receiver module. In addition we are going to track warriors location by using GPS. Digital mapping is a collection of data is compiled and formatted to form a virtual image. The primary function of this technology is to produce maps that give accurate representations of a particular area, detailing major road arteries and other points of interest. The proposed system also allows to calculate distances from place to place.
Key Words: GPS, GSM, Zigbee Module, Lcd Display, Iot, Digital Map, Temperature & Heartrate Sensor.

Introduction:
The protection of infantry warrior in the future promises to be one of the most technologically advanced modern warfare that we have ever came across. The challenge was to integrate the components into a lightweight package that would achieve the desired result without being too bulky and cumbersome or that needs too much power. Communicating with the base unit is the fundamental challenges in military operations and also the proper navigation between warrior's organizations plays an important role for careful planning and co-ordination. So this paper focus on tracing the location of warrior by GPS, which is useful for control room unit to know the exact location of warrior. Along with this High-speed, short-range inter warrior wireless communications is possible using zigbee wireless communication. The zigbee consists of the Temperature sensor & Heart Rate Sensor.

Literature Survey:
This paper proposes an idea of tracing the warrior such as calculating their speed, distance, height and health status of warriors during the war, which then enables the warlord to plan the war strategies. This system allows GPS (Global positioning system) tracing of these warriors. It is done with M-Health. The M-health is defined as mobile computing, medical sensors and communication technologies for health care. By zigbee we can achieve low cost, high reliable, high secure, and long life battery and wide range two way communication.

Implementation Methodology:
Warrior Unit:
This unit contains two types of body sensor networks namely temperature sensor and heart rate sensor. These sensors are used to sense and diagnose the health parameters of warriors. Temperature sensor will sense the body temperature of warrior and transfer that sensed data to microcontroller which is measured in ˚F. The heartbeat sensor will sense the pulse rate or heartbeats of warrior and transfer it to the microcontroller for processing and hence count it in beats per minute (BPM) The GPS module is used to trace the location of warriors at any time and from anywhere and then the GPS receivers are space based satellite navigation systems which will provide location and time based information in all weather conditions from anywhere on earth or near the earth. The data that is coming from GPS receiver is passed to microcontroller via IC MAX232, which converts the RS-232 voltage level data to equivalent TTL/CMOS voltage level data and vice versa. The IC MAX232 is a dual driver/receiver whose function is to convert typically RX, TX, CTS, and RTS signals. All data that comes from these Sensors and GPS receiver are processed using ARM7 microprocessor embedded with LPC2148 microcontroller. A microprocessor is defined as a single integrated circuit (IC), which is also a multipurpose programmable device that will take digital data as input, then processes it according to the instructions stored in the memory and thereby
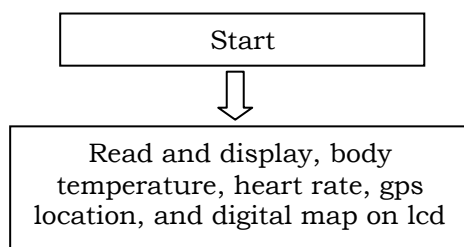
provide results as output. The ARM (Advanced RISC machine) processors are the ones which is based on reduced instruction set computing (RISC), that requires fewer transistors than typical complex instruction set computing (CISC) based processors. In addition, an alphanumeric LCD display is also used to display the health parameters (i.e. body temperature and heartbeats) and location information of the warrior.

Base Unit:
The block diagram of Base Unit in GPS and IoT based warrior tracking and Health Supervising System is show in the fig below. Mainly this block diagram consists of the following essential blocks.

- Microcontroller
- Max232
- GSM Module
- PC (Server).
- Digital map.

In this module, we have come up with an idea of tracing the warrior and to deliver the health status of the warrior during the war, which then enables the warlord to plan the war strategies. Additionally, the warrior can also ask for directions to the army base unit if he feels he is lost. By using, the location sent by the GPS, the base station can eventually guide the warrior to safe place. In order to find the health status of warrior we use a body temperature sensor and pulse rate sensor. These sensors will measure the body temperature and the pulse rate of warrior and will be stored in μc memory. These signals, travelling at the speed of light, are intercepted by your GPS, which calculates how far away each satellite is based on how long it took for the messages to arrive. These sensors will help to sense physical parameters & informs to Base Station through GSM. This unit is carry by the warrior. Here is the schema chart of base unit

```
┌─────────────────────────────┐
│            Start            │
└─────────────────────────────┘
              ⇓
┌─────────────────────────────┐
│   Read and display, body    │
│  temperature, heart rate,   │
│  gps location, and digital  │
│        map on lcd           │
└─────────────────────────────┘
```

It creates a database that contains information about the warrior. Warlord is use to monitor the status of the warrior from base unit. In addition to this, if there is any abnormality in the status of warrior, it intimates with a message. This unit upon receiving the SMS, the VB s/w shows the warrior's location on Google maps based on the GPS co-ordinates and also the health status is displayed. In this way, the army officials can keep a track of all their warriors using digital map.

Description:

Zigbee:
ZigBee is defined as IEEE 802.15.4. It is low power, low data rate supporting wireless networking standard, which is used for two-way communication between the sensors and the control system. It is a short-range communication standard like Bluetooth and Wi-Fi, covering range of 10 to 100 meters. The difference is that Bluetooth and Wi-Fi are high data rate communications standard that supports transfer of complex structure like media, software etc., whereas ZigBee Technology supports transfer of simple data like that from sensors. It also supports low data rate of 250 kbps and the operating frequencies are 868 MHz, 902 to 928 MHz and 2.4 GHz. ZigBee Technology is used for applications requiring low power, low cost, low data rate and long battery life.

Communication Using Zigbee:
Transfer of data is typically between a Coordinator and Device or from Peer to Peer and the data Transfer between a Coordinator and Device is done by two methods that is Beacon Enabled and other is Non Beacon Enabled. In Beacon Enabled Networking, we us contention free channel access method. Here the Coordinator will be able to allocate a time slot for device, called as Guaranteed Time Slot (GTS) so that all devices in that network need to be synchronized in nature. This is made sure by sending a Beacon signal from coordinator to each device (node), such that each device synchronizes its clock. However, this get end up by reducing the battery life of all devices when not in any other task than synchronizing their clock. Once the device has been synchronized, it can able to transmit data to the coordinator by the use of Carrier Sense Multiple Access with Collision Avoidance (CSMA-CA) method, wherein type of occupying signal is determined, or during the GTS allocation period. On sending a request, the Coordinator replies back an acknowledgement. For the transfer of data from the Coordinator to the device, intimation is sent with the Beacon message to the particular device. The device then receives this intimation and responds a data request message. The Coordinator then sends an acknowledgment of this data request receipt and then transfers the corresponding data. In Non-Beacon Networking, the Coordinator do not transmit any Beacon message.
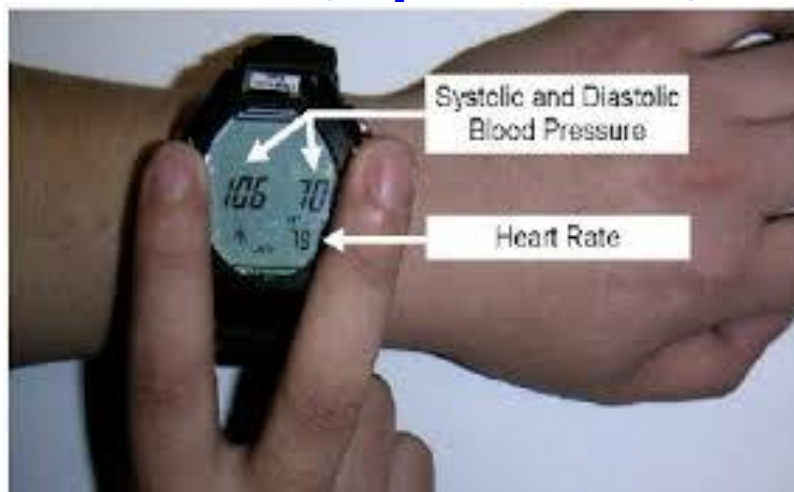
Figure: Zigbee Implemented Watch

But each device individually transmits the data by CSMA-CA method in the same frequency channel. The device transmits data as soon as the channel is clear. For the transfer of data from a Coordinator to device, the device first sends a data request message to the Coordinator and then the latter transmits the data message with a null length payload, on availability of data. For the data that is not in pending, the Coordinator sends an acknowledgement intimating no data pending.

Digital Map:
The digital maps always depends on a wide range of data that rely on time. The information of digital maps is an accumulation of satellite imagery and street level information. Maps are to be updated in a frequent manner to provide users with the most accurate replica of a location. While there is a wide spectrum on companies that specialize in digital mapping, the basic premise is that digital maps will accurately portray roads but we have used for locating warrior's position.

GPS Navigation Systems:
The principal use by which digital mapping has grown in the past decade has been its connection to Global Positioning System (GPS) technology. GPS is the backbone behind digital mapping navigation systems.

Figure: GPS Navigation

How it Works:
The coordinates, position and atomic time obtained by a terrestrial GPS receiver from GPS satellites orbiting Earth interact with each other to provide the digital map programming with points of origin in addition to the destination points needed to calculate the distance. This information obtained is then analyzed and compiled to form a map that provides the easiest and most efficient way to reach a destination. The device operates in the following way:
- GPS receivers will collect data from at least four GPS satellites orbiting around the Earth, by calculating position in three dimensions.
- The GPS receiver then utilizes position to provide the GPS coordinates, or exact points of the latitudinal and longitudinal direction from the GPS satellites.
- The points, or coordinates, output an accurate range of around"10-20 meters" of the actual location.

- The beginning point, that is entered through the GPS coordinates, and the ending point, (address or coordinates) input given by the user, are then entered into the digital mapping software.
- The mapping software outputs a real-time visual representation of the route. The map then moves along the path of the driver.
- If the driver gets diverted from the designated route, the navigation system uses the current coordinates to recalculate the route to the destination location.

IOT:

IoT is defined as the network of interconnected devices that is appended with the sensors, software, network connectivity and other necessary electronics that allows these devices to collect and exchange data makes them more responsive. Internet of Things is an architectural framework, which allows the integration, and data exchange between the physical world and computer systems over the existing network infrastructure. Internet-of-things support the interaction between "things" and also allow for more-complex structures like distributed computing and the development of distributed applications. Newer platforms are being developed, which add more intelligence.

Result:

The program developed and implemented on ARM 7, according to the above mentioned algorithm has been compiled and thus loaded to the microcontroller board successfully. The zigbee can successfully detect the pulses, heartbeat and temperature at a close proximity. The GPS shows the location of the warrior by digital map.

Figure: Warrior Unit

Conclusion:

From this above mentioned wireless embedded system, we conclude that we are able to transmit data that is sensed from remote warrior (warrior unit), to army control room by ZigBee transceivers as a wireless transmission technology. This system provides health supervising for warriors by heartbeat sensor to sense heartbeats and temperature sensor to sense body temperature of the warriors. In addition, this system is completely integrated and can track the location of warrior at anytime and from anywhere on the earth by GPS receiver. Also, it helps the base unit to keep track of the warriors using digital map. This system provides the location information and health parameters of warrior in real time to the army control unit. Due to the use of wireless ZigBee technology, this system is very useful to military forces during wars, search and rescue operations, etc. as it can be used in war field without any network restrictions. Thus, this system provides high level of security and safety to our warriors. Our future scope is to append bomb detector sensor with our proposed system. It detects the bombs around the surrounding area of a particular soldier and intimate the warrior with an alarm.

Figure: Digital Map

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