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Smart Wearable Shoe for Tracking and Monitoring Army Soldiers

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Abstract

The Army is one of the major resources in our country. They are the protectors of the nation and guard its citizens in every possible way. At present, military surveillance and security are essential. Currently, in India, all parts of the defense system, namely, the military, navy, and air force, face the problem of following a soldier and his status. At present, knowing the status and location of each soldier, soldiers are informed by radio. However, it has been proven that these methods are not effective tracking methods. During the war, often heard about the problem of missing soldiers in the newspaper. To focus on this issue, decided to establish a proposed system that will automatically track the location of all troops. The work uses long-distance RF communication modules as LoRa modules provide long-distance connectivity. As the military moves around the city, the military base is transferred to the nearby LoRa and then transferred to a self-contained mobile app to track the military. Therefore, this work will help to successfully track the troops.

1. Introduction

Military service is one of the most difficult things to do in the world. A a soldier protects the honour of his country. They do not step back in the face of adversaries instead they give their best. No matter what their circumstances may be, they are determined to do so patiently. They have to do in an area with very bad weather conditions. No matter how hot or cold, they stay on the battlefield. Similarly, they do not even get enough bullet proof equipment to keep them safe. They are travelling every knock of the border to safeguard our country so it is difficult to track them. In traditional method, they are implanted RF tags under the skin to track them but it will not be able to track long distances. It requires internet or it is a tedious process to track to them. Because, if they are travelling near the sea or mountains, they will lose their connectivity. RFID is currently used in many industries such as production, healthcare, transportation and tracking applications that captures human life in the way of indoor smart living. Recent indication shows that human security threats continue to increase in developing countries especially towards vulnerable members of society that causes great distress to them and to their families.

However, surveillance of human beings is a serious contemporary concern, especially for government authorities and human rights organizations. An application is needed to track the activities of human as they commute between their homes and nearby locations. Fortunately, RFID technology is used in a wide variety of applications such as tracking people in indoor environments like safety of children while commuting to school and play area, taking care of elderly people, navigational assistance to visually impaired people and taking care of severe symptomatic patients [6-9]. Those applications were all based on RFID and some were embedded in technologies and other technologies such as GPS or Bluetooth. Moreover, RFID enables objects to be taken with their used or embedded tags. The methods used in the RFID

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archives to embed RFID tags with participants were not beneficial and potential restrictions were recorded, including embedded- tags, student bags, cards, bracelets, and keychains

They have been often feared to be miss- placed, used by prohibited users or get damaged. Therefore, the model used in this study is a human-based RFID system that uses a flexible skin-based method that does not leave the removal capability without tagging. Similarly, a large amount of leather in the form of RFID chips that can be used within a few millimeters between the skin and the label, is able to determine the width of the appropriate study areas. Unfortunately, some potential problems may be removed with tattoos skins which are used for prompt therapy of patients in real-time applications as these tags reduce the effectiveness of the RFID tag antenna, and reduces power available in chip. In this study, the extensive use of learning grades and circular polarization was incorporated into the consideration in the epidermal RFID tag to make appropriate human body applications. The main goal of this study is to develop a safety and security system for vulnerable member's of society.

2. Related Works

There are various surveys in the population tracking. The most popular techniques used to predict emotions. Measuring the safety and efficiency of Smart Metering against misconduct collectors [1]. Smart Grid allows two-way communication between smart meters and operating centers to gather real-time customer power consumption to advance the flexibility, reliability and efficiency of the power system. It brings major privacy issues to customers, because meter readings can expose customer activity in-house. Data encryption can prevent readings, which is why it increases data size. Secure data integration improves communication performance and maintains customer privacy, while failing to support strict billing, or providing integrity protection to public collectors, who may be physically hacked. The new security model is described as a permissive misconduct for collectors, in which unscrupulous collectors may initiate pollution attacks to damage power data. Under this model, the novel privacy rating system protects against attacks on security balance and smart grid efficiency. It achieves end-to-end security, data integration and integrity protection for unreliable collectors, who act as local means of collecting and consolidating the use and transfer of data in workplaces. As a result, misconduct collectors may not be able to access or corrupt customer power data. In addition, a dynamic payment system is based on the use of individual power stored by collectors through customer verification. Analysis shows that the proposed system gets smart safe and solid meters guaranteed charging for misbehaving taxpayers with low computers and high connectivity.

It can reach long distances, which is LoRa. Such technology can be used in a variety of urban systems that include multiple delivery devices while requiring free communication barriers. LoRa are smart-meters that transfer the amount of energy their families need at some point to the power grids. Successfully shared data by LoRa is used by compilers to create daily family profiles. Simultaneous interference from both LoRa and non-LoRa devices demonstrates the potential for connection termination and limited connection of the device. In addition, real-time data is used to compare sample-time and event-based strategies, showing recent benefits. Analysis used to assess gate width that detects intermediate closure opportunities leading to signal reconstruction with a given requirement. This analysis focuses on electric meters, which can be easily transferred to any other smart city application with similar needs, such as water measurement or traffic monitoring.

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Low Power Wide Area (LPWAN) networks are suitable for many applications that require low power consumption, support for high number of nodes, and a wide range of spreads [4]. LoRa is one of the most successful LPWAN technologies, as it enables strong long-distance communications and is proven to work on IoT applications, such as environmental monitoring and intelligent measurement. LoRa also promises Industrial Internet of Things scenarios, which is why its acquisition is hampered by MAC's law, LoRaWAN, which does not provide real-time data flow support. This work developed RT-LoRa, a mid-loading LoRa access strategy that provides real-time traffic support, thus enabling LoRa implementation of industrial IoT applications. This work described RT-LoRa, introduced a similar experiment in the IoT industry and provided specific guidelines for setting up the RT-LoRa network

The low-power wide area (LPWA) based LoRa physical layer has seen a lot of attention in recent years, from industrial and academic researchers [5]. While this popularity is rising due to this technology that demonstrates efficiency and low cost, unfortunately, due to their complexity, time algorithms and synchronization frequencies are required to find frames made with LoRa, in the form of small sample sizes well received, receiving little attention. The purpose of this work is to fill this gap and explain how solid framework acquisition can be made while focusing on the complex operation of the proposed algorithms. The main objective is to propose frame-finding techniques that work on receivers defined by ultra-low-power receivers.

Growing security concerns for people around the world, high demand for technology is needed to improve human safety [12]. The rapid development of RFID technology offers a better future for people with a solid location tracking with a variety of in-house applications, ensuring safe mobility and better monitoring. It can be used to reduce the rate of abduction, especially in developing countries where medical professionals are threatened with taxation. Therefore, various RFID solutions have been tested in many human tracking systems. However, these solutions are solved by disappearing, using restricted users or injuries as well as programs for failure of contact, disability, security or privacy concerns. Therefore, a comprehensive approach is proposed in this study to assess the suitability of epidermal RFID tags in an effective human tracking system. A certified model was developed that aims to improve people's safety by enabling them to obtain IDs using the RFID UHF tags with 868 MHz controlled speeds in developing countries. This study focused on key chip and antenna features such as power gain, polarization output, and distance learning to test the effectiveness of RFID tags for their suitability for epidermal applications for human safety. The method used is a home-based tracking system with easy-to-use middleware that is efficient and capable of ensuring the safety of people in the house.

A certified model was produced that aimed to enhance human’s safety by enabling them to obtain IDs using UHF passive RFID tags with regulated frequency of 868 MHz in developing countries. This study mostly emphasized on chip and antenna essentials such as released power gain, polarization, and read distance in order to assess the efficiency of RFID tags on their appropriateness for epidermal applications in human security. The results showed that the simulated tag had a high transmission rate with a corresponding factor of $\gamma = 0.6$, almost 1.57 dB power gain, and a reading distance of nearly 4 meters was achieved that indicated the suitability of the tag for use in human tracking systems. The mechanism then being implemented to a smart indoor human tracking system with a user-friendly middleware that worked well and able to guarantee indoor human security.

3. Existing System

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With the growth of human safety concerns around the world, high demand for technology is needed to improve people security. Rapid advancement in RFID technology offers the future of people with robust location tracking of a variety of indoor applications, which ensures safety and security. It is used to reduce the rate of kidnapping above development areas where medical professionals are threatened with rescue. Therefore, various RFID solutions have been tested on a number of human fraud schemes. However, these solutions are ached from either being vanished, availed by prohibited users or getting damaged as well as systems on the limitations of interferes, scalability, security or privacy concerns. Therefore, a wide range of archeology has been used in this study to assess the suitability of epidermal RFID tags in a smart indoor human tracking system. The model aims to improve personal safety by enabling them to access IDs using UHF passive RFID tags with a controlled frequency of 868 MHz on developing countries. This study focused on key factors such as power release, polarization, and distance learning to evaluate the effectiveness of RFID tags in their epidermal applications for human safety. The results showed that the marker produced had a high transfer rate with a corresponding factor of $\gamma = 0.6$, almost 1.57 dB power gain, and a reading distance of approximately four meters was found to impair the validity of the tag to be used in human activity programs. Smart indoor human tracking system is implemented with a user-friendly middleware that worked well and able to guarantee indoor human security.

4. **Proposed System**

In the present system, only personal tracking is done. The RFID tags used do not match the distance. There is no real time action as it should be covered under the skin only a distance of 4 meters. To overcome these problems, the Lora module is used to track the military. It is cheap and effective solution for tracking military personnel. A standalone mobile app is used to track employees without losing signal. It protects military personnel from being lost.

4.1 Working

A system is created which will automatically track the location of each soldier. This system uses long-distance RF communication modules as LoRa modules provide longer distance mileage communication. Part of the computer hardware includes small controls, GPS, LoRa modules, etc. LoRa modules can be distributed throughout the city for asset tracking. As the property moves around the city, the location of that property is transferred to the nearby LoRa and then transferred to a mobile application developed independently of the tracking. With this the user can trace his or her precious asset. Therefore, this system will help us to track lost property in a simple and effective way.

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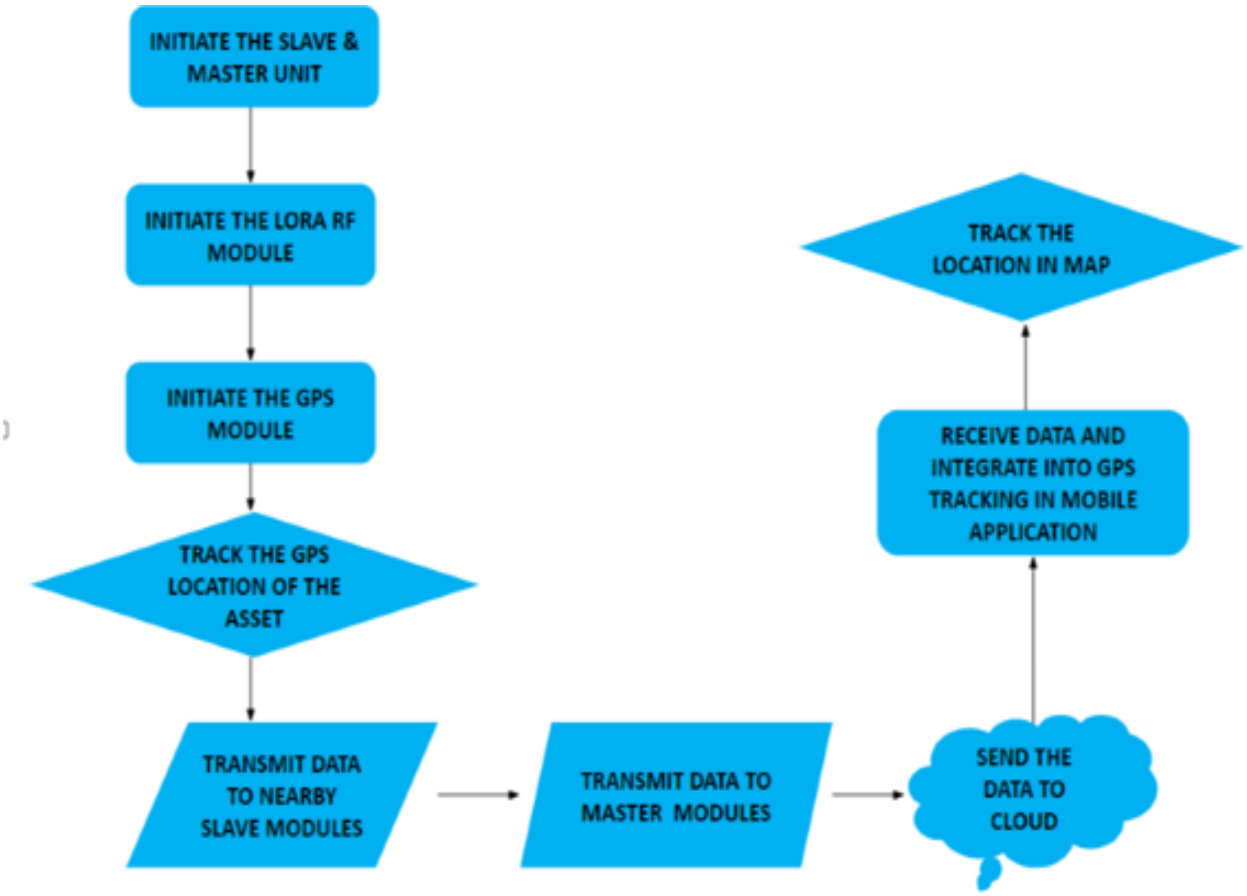

Figure 1. Flow diagram of the proposed method

4.2 Hardware Requirements

The power supply unit is used to convert Ac to low voltage DC which is controlled by the internal components of the hardware. Wi-fi module (ESP8266) is an integrated TCP / IP stack used to access any microcontroller to Wi-fi network. AVR microcontroller is used to detect multiple applications such as embedded systems. Additionally a GPS module used to track the location and position of a soldier. The Lora transmitter provides low-distance power and secure machine data transfer to IoT applications. Lora Receiver has good recipient sensitivity and a low error rate which means that low data applications can get a very long distance.

4.3 Software Requirements

Visual Studio is used to upgrade a computer program for windows. And CVAVR / Arduino is a code concept AVR built-in Arduino system is designed to work under windows exp, 7,8 & 10,32 bit and 64-bit operating systems. Extreme Burner is a full user interface that supports many clock resources for various applications. Android Studio is a development platform for Android app development.

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4.4 LoRa

LoRa is a wireless technology that affords low power, long distances and secure data transfer for M2M and IoT applications. LoRa is changing chirp spread spectrum based, which has low power features such as FSK mode variation. LoRa is used to associate sensors, gates, equipment, devices, animals, people etc without a cable in the cloud. LoRa Technologies works on many different bands in different regions: It operates at 915 MHz band in the United States, 868 MHz bands in Europe and 865 to 867 MHz, at 920 to 923 MHz.in Asia.

LoRaWAN is a Low Power, Wide Area (LPWA) networking protocol developed by LoRa Alliance, which wirelessly connects battery-operated 'objects' to online, regional or national networks, and identifying critical Internet needs for objects such as two way communication, security end, travel services and local activities. LoRaWAN uses an unlicensed spectrum on ISM bands to describe the process of communication and network design while the LoRa body layer creates long-distance communication links between remote sensors and network-connected gates. This protocol facilitates the rapid set up of public or private IoT networks where hardware and software are used.

4.5 Gateway Module

The ESP8266 is a low-cost Wi-Fi card with full TCP / IP power and MCU (microcontroller unit) manufactured by Shanghai Chinese manufacturer Espresso. The chip began to draw attention to western manufacturers in August 2014 in the form of ESP-01, developed by a third-party manufacturer, AI-Thinker. This small module permits microcontrollers to connect to a Wi-Fi network and make easy TCP / IP communication using Hayes style commands. However, at that time there were almost no English language texts on the chip and the instructions they received. The low price and the fact that there are very few things other than what we suggest is that it can ultimately be less expensive, attracting more hackers to explore the module, chip, and software in it, and translate Chinese texts.

4.6 Preprocessing

The Mega 328 has 1KB EEPROM. This things indicates whether the power provided to the micro-controller is detached, however you may keep the details and may provide results after the power supply has been removed. In addition, ATmega-328 has 2KB SRAM. There are a wide variety of features in the Mega 328 that makes the most popular device on the market today.

4.7 React Native App Development

React Native is an open-source framework that permits to develop a mobile application with JavaScript only. This new technology is easy to develop and have better user experience. The major difference of this framework is that React Native apps function as traditional apps. They are not varying from apps built on Objective-C, Java, or Swift and use the same UI building blocks as iOS or Android apps. But with React Native, building a mobile app is much faster and less expensive. The React Native framework is ongoing still, hence it may lack certain features in the main framework. React Native offers two types of third-party plugins to fill this gap. They are traditional modules and JavaScript modules.

5. Results and Discussion

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The below Figure 2 and 3 shows the complete hardware setup of the LoRA transmitter and receiver of the proposed system.

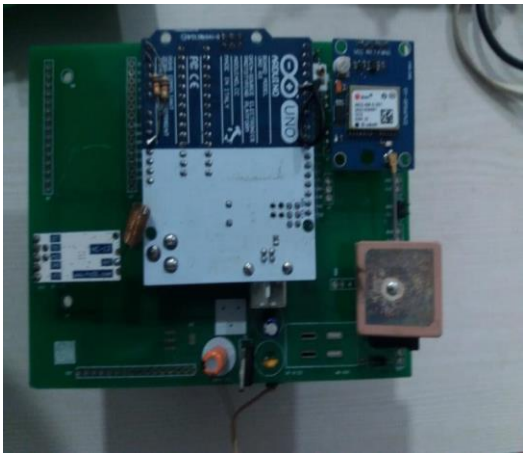

Figure 2: Lora transmitter setup

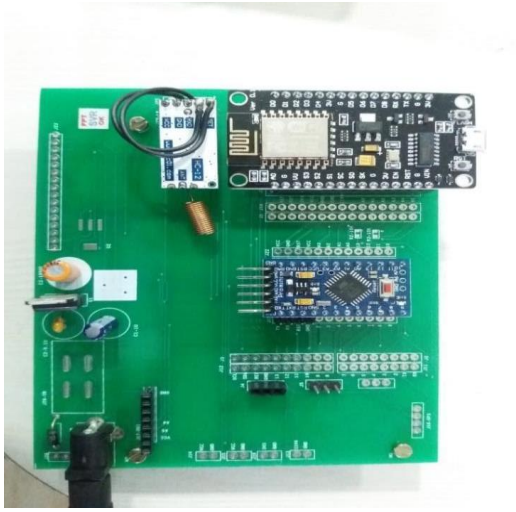

Figure 3: Lora receiver setup

A mobile application is developed using react native to notify the user of the current location of the asset. In Transmitter module, microcontroller is coded with the help of Embedded C to track the GPS location. When LoRa transmitter kit is placed in the outside environment, GPS will start to track the exact location where we are without the use of internet. It indicates the successful tracking of location by a blinking blue LED light. And then it sends the collected data to the receiver. Figure 2 shows the login page of the LoRa tracking application.

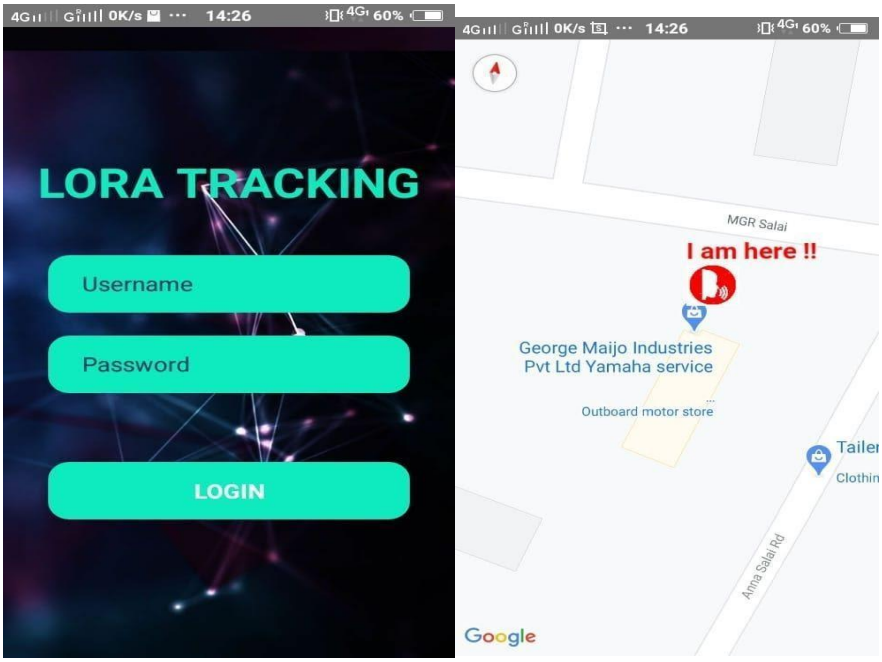

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Figure 4. Login page Figure 5 : Location page

Once the login credentials have been validated the current location of the asset is displayed to the user. Figure 4 and 5 shows the location page of the LoRa tracking application. Thus, from the above results and discussion, effective monitoring the location of the soldiers is done using LoRa setup and mobile application. Thus the system is successfully implemented the scope of the work.

6. CONCLUSION

The proposed system is used to protect and monitor military personnel by effectively tracking them. This also helps one to view the current location with a mobile app created using the native reaction. Therefore, this work reduces the number of cases of loss of property, thus saving a lot of money.

7. FUTURE WORKS

In the foreseeable future, the use of Lora's security technology and could further advance the tourism industry with greater accuracy. In this field they have many opportunities to develop or transform this project in many ways. Therefore, this work has a practical scale in the future where this idea can be converted into a computer product in a cheap way.

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