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Smart Tracking and Monitoring using LORA

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Abstract: Nowadays soldier security and safety have become a concern. Presently in India, all section of the defense system i.e., army, navy and air force are facing a problem of tracking the soldier. At present, to know the status and location of each soldier, soldiers are communicated over the radio line. But it has been proved that these methods are not efficient methods for tracking. During the time of war, we always hear the problem of missing of soldiers in the newspaper. On focusing this problem, we have decided to develop a system that will automatically trace the location of each and every soldier. This project utilizes LoRa modules which provide long distance communication in terms of kilometers. The hardware component includes micro-controller, GPS, LoRa modules, etc. The LoRa modules can be distributed across the city for tracking of the asset. As the asset moves around the city, the location of that asset is been transmitted to a nearby LoRa which is then transmitted to the mobile app developed independently for tracking the asset. By this the user can have a track of their valuable asset. This uses an independent mobile app for tracking the personnel without any signal loss. Thus, this project will help us in tracking the lost asset in an easy and effective manner.

Keywords: LoRa, Tracking, Monitoring, Location, RF communication, Mobile application.

I. INTRODUCTION

The unprecedented technological advancement has improved the lifestyles of human beings and devised the number of innovative technologies for object identifications. RFID is currently leveraged in many industries such as production, transportation and tracking applications that captures human life in indoor smart living. The RFID-based and some were incorporated with other technologies such as GPS or Bluetooth. In fact, RFID enables objects to be tracked through their attached or embedded tags. The mechanisms used in the above RFID applications to embed RFID tags including embedded-cloths tags, bracelets, cards. They have been often feared to be miss-placed, used by prohibited users or get damaged. With this concern, an application is required to track the movements of human as they commute between their homes and nearby locations. LoRa is already deployed in millions of sensors, according to the LoRa-Alliance. Some of the main components that serve as the foundation for the specification are bi-directional communication, mobility and localization services. This project is to track the location of the Military people and to eliminate the need of internet to track the people using very cheap and effective mobile application tracking.

II. EXISTING SYSTEM

The rapid advancement in RFID technology offers an auspicious future to people with robust location tracking for a wide variety of indoor applications, ensuring safer commutes and better monitoring. Thus, various RFID solutions have been tested in a number of 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. However, these solutions are suffered from either being vanished, used by prohibited users or getting damaged as well as systems on the limitations of interfaces, scalability, security or privacy concerns.

A. Drawbacks of Existing System

- 1) RFID tags are used which are less distance transmissible.
- 2) Not real time applicable as it should be integrated under the skin.
- 3) Only a distance of 4 meters is achieved.

III. PROPOSED SYSTEM

The proposed system utilizes long distance RF communication modules such as LoRa modules which provide long distance communication in terms of kilometers. The hardware component includes micro-controller, GPS, LoRa modules, etc. The LoRa modules can be distributed across the city for tracking of the asset. As the asset moves around the city, the location of that asset is been transmitted to a nearby LoRa which is then transmitted to the mobile app developed independently for tracking the asset. By this the user can have a track of their valuable asset. Thus, this project will help us in tracking the lost asset in an easy and effective manner.

Advantages of proposed system

- 1) In this system, an independent mobile app for tracking the personnel without any signal loss.
- 2) Cheap and effective solution for tracking the military personnel
- 3) Protects the military personnel from getting lost.

A. Block Diagram

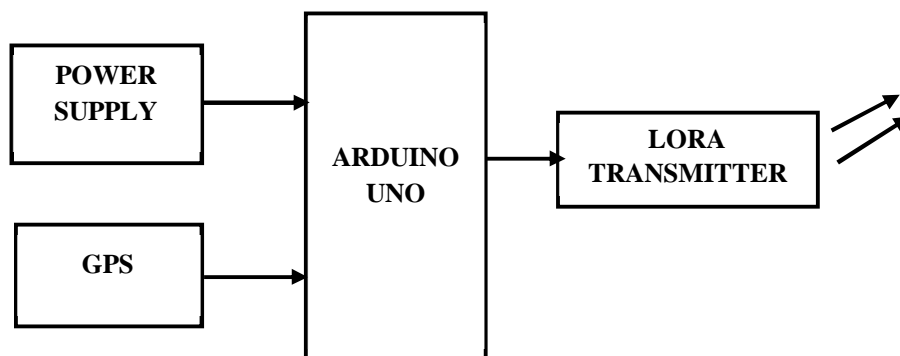


Figure. 1 Block diagram of the transmitter module

The above figure 1 represents the transmitter part of the system. Here, Arduino UNO acts as a microcontroller and the other hardware components includes the GPS and LoRA transmitter. When the power supply is on the GPS tracks the location and the information is given to the microcontroller. The program is set in such a way that the updated data is passed to the LoRA transmitter which is an output here.

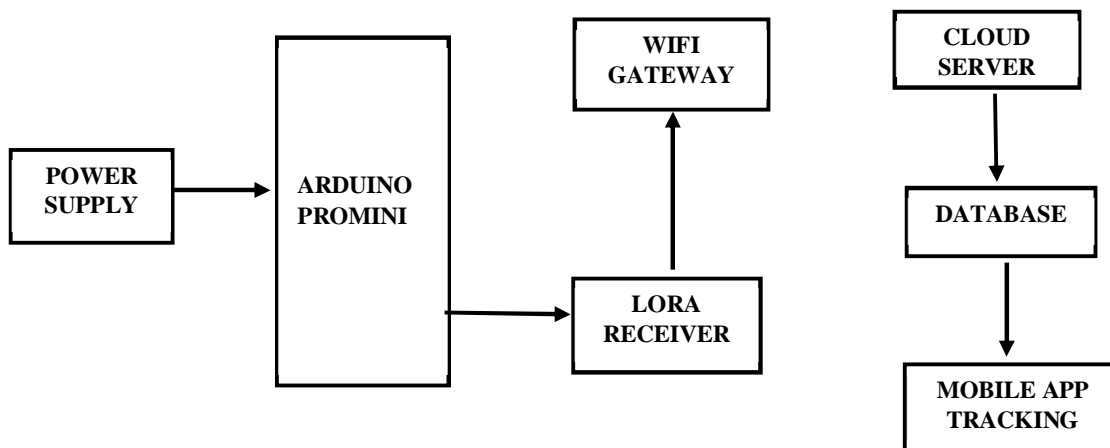


Figure. 2 Block diagram of Receiver module

The above figure 2 represents the receiver module in which it gets the input from the transmitter part. When the input is given Arduino promini which acts a microcontroller gets on and the data is received by the LoRA receiver. From the receiver the data's are being passed to the Wi-Fi gateway. When the Wi-Fi gets good signal all the data's are being pushed to the cloud server from which the data's can be easily tracked by using the mobile application created.

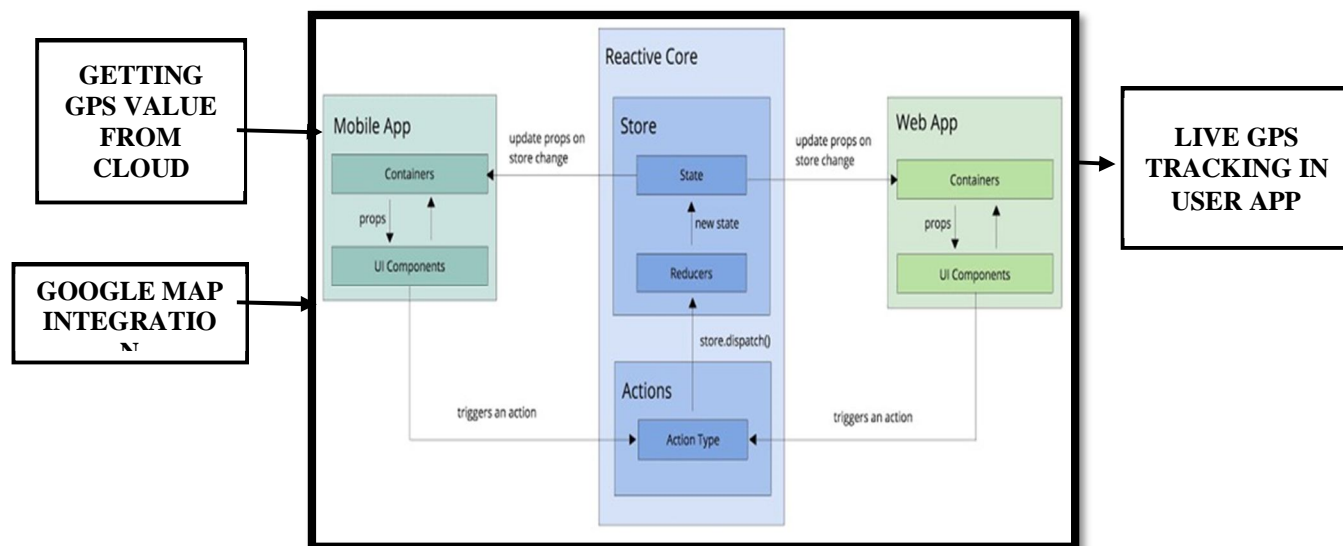


Figure. 3 Internal architecture for the mobile application

The above figure 3 represents the internal architecture of the mobile application created. The google map is inbuilt in the application so that the database obtained from the Wi-Fi gateway to the cloud is being easily seen in the mobile application.

B. Flowchart

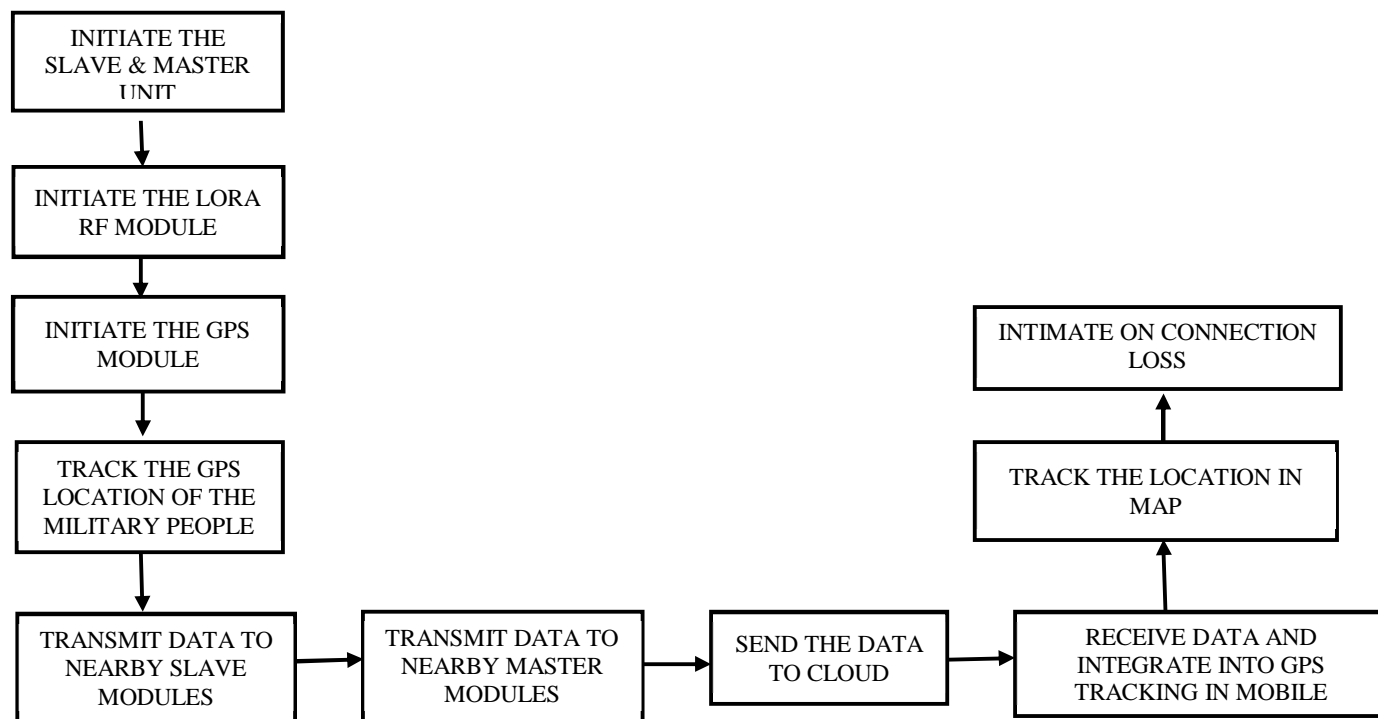


Figure. 4 Flowchart of the system

The above figure 4 represents the flowchart that includes the step by step process in which in our proposed system, when the power supply is on the master and slave circuits get activated which initiates the LoRA module. Then the GPS is initiated and the location is tracked. Then the data is finally received to the master modules from all the slaves and all the data's are pushed to the cloud. Now the received data is integrated with the map which is being tracked and seen through the mobile application.

IV. RESULTS AND DISCUSSION

The software that is used in the project is mainly C based Visual Studio and Android Studio.

A. Transmitter Prototype

The transmitter setup consists of the ARDUINO UNO as microcontroller, GPS, LORA transmitter and a power supply. The input is given as in the form of power supply. When the power supply is ON the GPS gets activated and tracks the location. The tracked location is programmed in such a way that the location is passed to the LoRA transmitter. The below figure 5 represents the image of the transmitter setup.

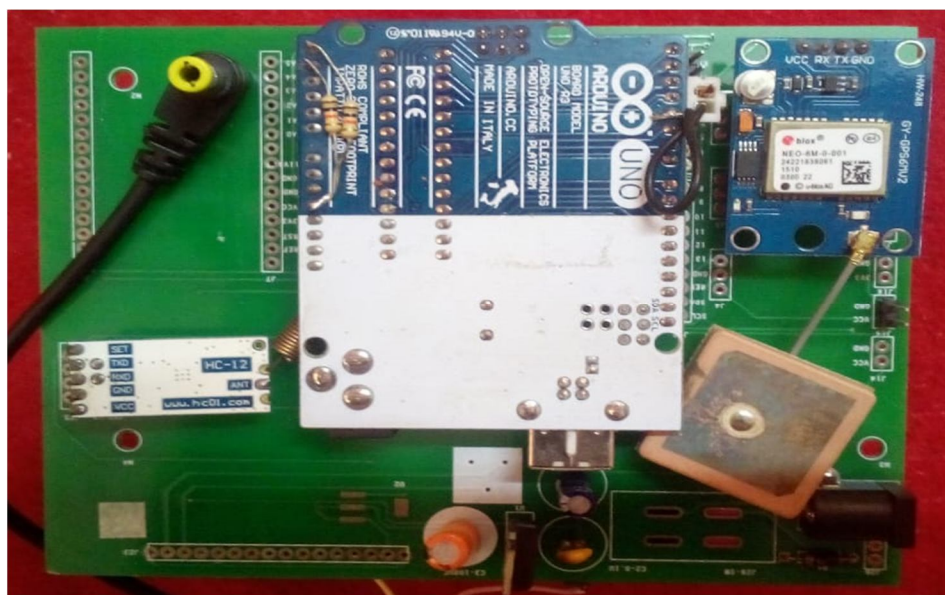


Figure. 5 Transmitter setup

B. Receiver Prototype

The information from the transmitter is now being transferred to the receiver. In the receiver setup when the power supply is given the LoRa receiver gets the updated tracked location from the LoRa transmitter. The Arduino Pro Mini acts as a microcontroller in which the program is set in such a way that the LoRa receiver gives the information to the Wi-Fi gateway. Then the data from the Wi-Fi gateway is pushed to the cloud when it gets good connectivity. Then the location can be seen through the mobile application created. The below figure 6 represents the receiver setup.

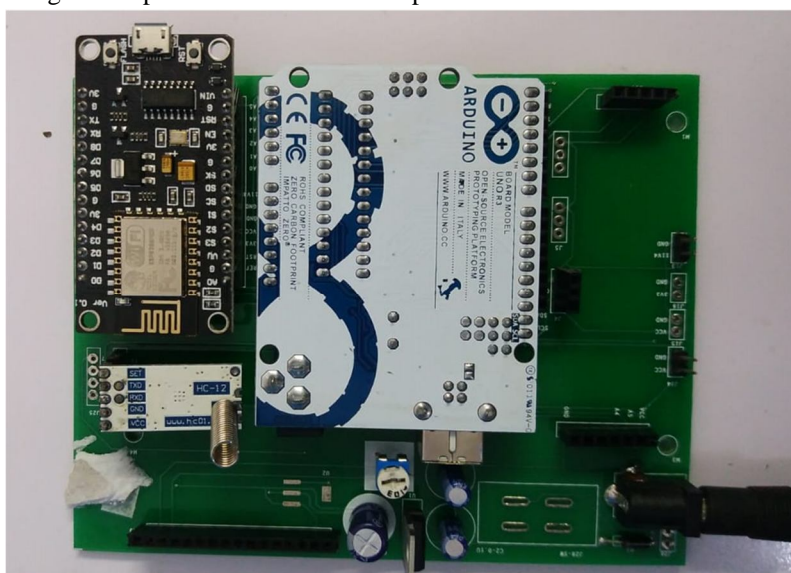


Figure. 6 Receiver setup

C. Mobile Application Output

By using the above hardware setup the working process is done and the result of this which means the location can be seen by using the mobile application created. When the app is being opened its shows the home page where it asks for the username and password. If the username or the password entered is wrong, it gives an alert message to enter the correct password and username. But by entering the correct username and password it will be logged in. The below figure 7 shows the home page where it asks for the login credentials.

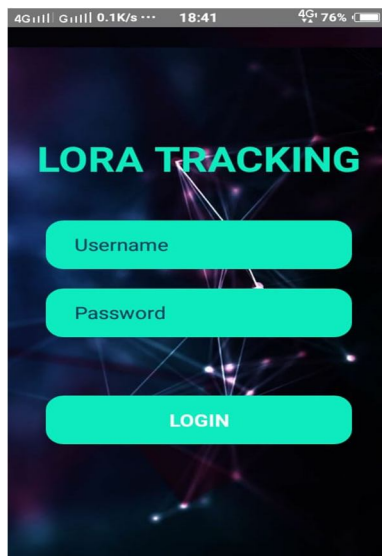


Figure. 7 Log in page of the application

The login credentials for this application are as follows,

- 1) *Username*: Lora
- 2) *Password* : lora

By entering the correct username and password the tracking page of the mobile application will be opened where the google map is inbuilt. Now the location of the asset or the user can be tracked accurately since the location is pushed to the cloud by the Wi-Fi gateway in the receiver. The tracked location is denoted by 'I AM HERE' in the tracking page on the application. The tracking can be done for many person by using this single app by entering their particular ID number. The figure 8 shows the tracked location.

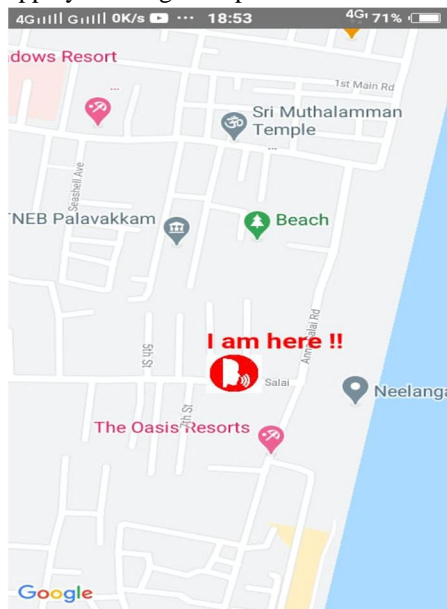


Figure. 8 Obtained tracked location

V. CONCLUSION

The conclusion of this study suggest that knowledge of specific domain improves the results. This project has been implemented on android platforms. Also, different attributes have been added to the project which will prove to be advantageous to the system. The requirements and specifications have been listed above. Using the GPS system, the application will automatically display the maps and routes to the different locations and also track the person using client server technology. It uses remote server as database. Due to this the records can be easily manipulated on the device itself and the server burden gets reduced. The software developed will reduces the complexity involved in maintaining. The application is portable which ensure its adaptability for use on different computer terminals with different operating systems and standards.

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