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Emergency Messaging System using Chirp Spread Spectrum Protocol

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Abstract: *Communication is essential for everyone. Its more essential when it comes to military operations, many of these operations takes place in remote areas which are off grid for network, this makes it harder to communicate with team members or base, using normal satellite calling in target areas may increase the risk of tracking by enemies, for basic communication army personnel use hand gestures this is not ideal when they are far away from line of sight. making it difficult to communicate properly in peak time. For solving this we propose you with our solution to make a device that can be used to communicate without need of external tower or satellite up to 18km.*

Keywords: Wireless communication, Mesh network

I. INTRODUCTION

Effective communication is critical in emergency situations and military operations because it allows individuals to coordinate their actions, share important information, and make informed decisions. In emergency situations, clear and concise communication can help to reduce confusion and chaos and can even save lives. For example, in a natural disaster, first responds and emergency personnel need to be able to communicate with each other and with affected individuals in order to assess the situation, provide assistance, and evacuate people to safety.

In military operations, communication is also critical for coordination and decision-making. Military units need to be able to communicate with each other in order to effectively execute their mission, and commanders need to be able to communicate orders and information to their subordinates. In addition, military personnel may need to communicate with civilians and other stakeholders in order to achieve their objectives and maintain stability in an area.

Overall, effective communication is essential for ensuring that individuals and organizations can respondeffectively to emergencies and carry out their missions successfully.

II. LITERATURE SURVEY

1. "Performance analysis of chirp spread spectrum system under mobility scenario" by Saud Althunibat Cognitive Radio is an intelligent programmable radio that can sense the RF environment and share this information to access the spectrum holes opportunistically that fulfills the user communications requirement.
   Limitations: Require more data transfer rates not ideal for low bandwidth.
2. "A Study of LoRa: Long Range & Low Power Networks for the Internet of Things" by Aloys Augustin LoRa is a long-range and low-power telecommunication system for the "Internet of Things". The physical layer uses LoRa modulation, a proprietary technology with a MAC protocol. LoRa WAN is an open standard with specification available free of charge.
   Limitations: LoRa is thus well suited to low-power, low- throughput and long-range networks.
3. "Performance analysis of chirp spread spectrum system under mobility scenario" by Marwa Qaraqe CSSM exhibits promising error performance under very low signal-to-noise ratio values. Thereby, CSSM has been adopted in systems that generate low data traffic over long distances, such as low-power wireless networks.
   Limitations: CSSM can be used to transfer data at ease and ideal for long ranges.

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4. "Data transmission in a fault-tolerant quantum bus architecture" by Robert Koenig .This scheme generates a maximally entangled state of two qubits using a depth-6 circuit consisting of nearest-neighbor making it redirect the data to non-received area bits.
   Limitations: This architecture is reliable data transfer but frequency need to be high.

III. PROBLEM STATEMENT

Communication in remote off grid areas is not possible for military personnel. Military operations occur in remote areas ranging from dense forest to freezing ice lands, availability of signals in these regions is zero, using satellite for communication puts enemy radar on alert, traditional ways of communication is hand gestures which are limited to line of sight. off grid refers to areas where normal radio signals can't reach and services are unavailable. The walkie talkie which is current communication media is also trackable with frequency radar.

IV. PROBLEM STATEMENT

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V. EXISTING SYSTEM

Currently, we have few technologies for off-grid communication such as satellite communication and walkie-talkie based on radio frequencies, military personnel have been using these since the beginning, and satellite communication is being implemented within smartphones. But these have high usage costs. Walkie talkie uses radio frequency with different bands these make it easy for enemies to know the communication with frequency tuning. An affordable way to have both security and off grid communication can be achieved with Lora communication.

VI. PROPOSED SYSTEM

Lora module is an independent radio transmitting device which can be used for off-grid communication and other low data rate applications.
The ability to transfer small packets of data efficiently stands as the main reason for using Lora as the communication. Lora system enables users to communicate natively with the help of mesh network, paired with microcontroller for splitting packets interfacing with user. Normal android devices having Bluetooth serial can be connected to Lora networks which enables users to interchange text messages without need of external antenna or towers.

VII. OBJECTIVES

- To enable communication in remote areas with LoRa technology with the help of chirp spread spectrum.
- To efficiently design low-cost devices for communication.
- To help army personnel with team communication and secure location tracking.
- To create a robust device that can handle any disaster and send text message up to 18km.

VIII. METHODOLOGY

We use LoRa technology for transferring the data among the devices LoRa is a low-power long-range signal transmitting modem that can transfer bits of data at a rate of 845hz and bit per second speed varied according to distance.
The device contains a main microcontroller and Lora board with serves an antenna for communication, device operates via battery and can be charged with a solar or dc power source.
The device also contains a GPS modem that provides the longitude and latitude coordinates of the devices.
Devices are made ip68 rated for water and dust proof making it possible to use in harsh conditions.

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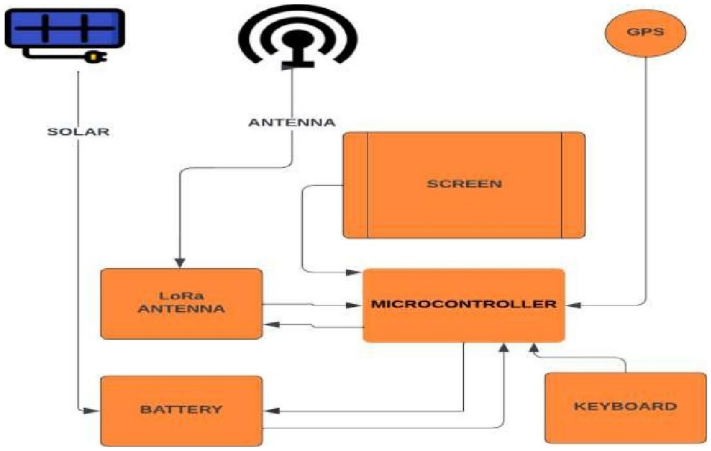
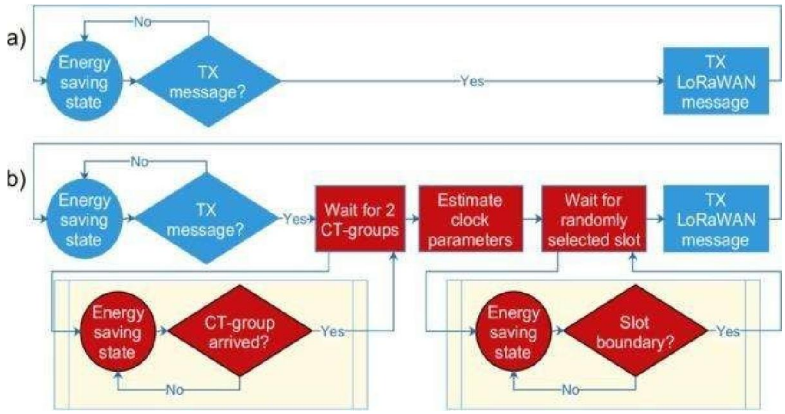


Fig 1: Device Design

IX. SYSTEM ARCHITECTURE



Our system architecture is based on chirp spread spectrum technology, Chirp makes it possible to determine location via distance-based methods, rather than other common techniques that rely on less accurate calculations based on received signal strength.

This can precisely measure the distance between transceivers by calculating the time it takes for signals to travel amongst the devices. In certain scenarios the X, Y, and Z coordinates of a device's location can be detected, adding an additional dimension to the localization chirp can provide. Based on the use case or application, the exact distance-based calculation technique can differ.

X. CONCLUSION

After conducting a survey and analysis, we have concluded that having a means of remote communication is essential for survival during disasters when normal radio signals are not available. To achieve this, we require proper communication devices. Our project involves designing a device capable of transmitting data over a distance of 18 km. To achieve this, we have decided to use Lora technology, which is renowned for its ability to transfer data over long distances with low power consumption. We will be using chip spread spectrum technology for the modulation of text messages. This technology enables us to divide the text message accurately into packets required for transmission over the required distance.

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