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Communication in black spot using lora technology

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***Abstract*---**The main theme of this paper is to develop an embedded based system to send messages from black spot area using LORA and GSM. Black spot is nothing but an area where we could not find any network signals. Even in cities also sometimes we may not have signals inside the room. Through such areas sending or calling is not possible. This black spot is used for security purposes. Military regiments are signal jammed areas where the communication is impossible, so the people there use this kind of communication. This project is also used in undercover operations where the communication takes place in this process. Here the project built is useful to create signals for sending messages in the black spot through the two different communication modules i.e., LORA and GSM. In the project work different frequencies for individual modules are likely to be used such as GSM (1800MHz) and LORA (2.4GHz). By using these two wireless communication devices we create communication link in between LORA and GSM by which a message will be sent in the form of SMS through the Bluetooth module. The paper work is developed using two embedded boards such that one module contains the Bluetooth module, Arduino, LCD and Lora modules. The other module contains controller 89C52 interfaced with LCD, LORA and GSM modules. The first embedded module should be placed at the black spot area and the other module in the signal (network) area. As signals are blocked in highly confidential zones, this application can be used to overcome the problem.

***Keywords*---**LoRa, Arduino, Microservice, Bluetooth.

1. Literature of Survey

LoRa is a communication scheme that is part of the low power wide area network (LPWAN) technology using ISM bands. It has seen extensive documentation and use in research and industry due to its long coverage ranges of up-to 20 km or more with less than 14 dB transmit power. Moreover, some applications report theoretical battery lives of up to 10 years for field deployed modules utilizing the scheme in wirelesssensor network (WSN) applications. Additionally, the scheme is very resilient to losses from noise, as well as bursts of interference through its forward error correction (FEC) scheme . Our objective is to systematically review the empirical evidence of the use-cases of LoRa in rural landscapes, metrics and the relevant validation schemes. In addition, the research is evaluated based on (i) mathematical function of the scheme (bandwidth use, spreading factor, symbol rate, chip rate and nominal bit rate) (ii) use cases test-beds, metrics of evaluation and (iii) validation methods. A systematic literature review of published refereed primary studies on LoRa applications was conducted using articles from 2010-2019. We identified 21 relevant primary studies. These reported a range of different assessments of LoRa with 10 out of 21 reporting on novel use cases. The authors conclude that more work is needed in terms of field testing, asno articles could be found on performance/deployment in Botswana or South Africa despite the existence of LoRa networks in both countries. Thus researchers in the region can research propagation models performance, the energy efficiency of thescheme and MAC layer as well as the channel access challenges for the region.

From baby monitors to cell phones, Bluetooth to remote control toys, RF waves are all around us. RF waves are electromagnetic waves, which propagate at the speed of light, or 186,000 miles per second (300,000km/s). The frequencies of RF waves, however, are slower than those of visible light, making RF waves invisible to the human eye. The frequency of a wave is determined by its oscillations or cycles per second. One cycle is one hertz (Hz); 1,000 cycles is 1 kilohertz (KHz); 1 million cycles is 1 megahertz (MHz); and 1 billion cycles is 1 gigahertz (GHz). A station on the AM dial at 98, for example, broadcasts using a signal that oscillates 98,000 times per second, or has a frequency of 98 KHz. A station a little further up the dial at 710 broadcasts using a signal that oscillates 710,000 times a second, or has a frequency of 710 KHz. With a slice of the RF pie licensed to each broadcaster, the RF range can be neatly divided and utilized by multiple parties.

2. Scope Of The Paper

The use of LORA is to communicate with the Master and the slave board consisting of slave lora and GSM module. Whenever we want to send information to any particular number, just enter the phone number and the message data through the mobile at the master side by which the same information will be received at the GSM side which contains Slave Lora paired to the Master. The received information will be displayed in the LCD at the slave side and the same message will be sent through the GSM modem to the respective number entered at the master module. The explosion in wireless technology has seen the emergence of many standards, especially in the industrial, scientific and medical (ISM) radio band. There have been a multitude of proprietary protocols for control applications, which bottlenecked interfacing. Need for a widely accepted standard

for communication between sensors in low data rate wireless networks was felt. As an answer to this dilemma Lora technology is designed. As Lora protocol provides simple and robust wireless applications, this device can send and receive the digital data. Lora is a specification for a suite of high level communication protocols using small, low-power digital radios based on an IEEE 802 standard for personal area networks. The radius of lora is about 10kms.

3. Proposed Theory

The mobile signals can be interfered with or obstructed, producing wireless “dead zones” “black spot” or “dead spots”. Wireless signals won’t penetrate these dead zones, so wireless devices won’t receive a signal within them. Wireless dead zones are easy to locate if you stroll around your house, apartment, or office. Once you’ve found them, you can experiment with a variety of solutions and fix whatever is causing the problem. A black spot is simply an area where the devices aren’t able to connect to the network. If you take a device into a black spot maybe you’re using a smart phone or tablet and walk into a place where there’s a black spot the phone will stop working and you won’t receive a signal.

Areas where mobile phones cannot transmit to a nearby mobile site, base station or repeater are known as dead zones. In these areas, the mobile phone is said to be in a state of outage. Dead zones are usually areas where mobile phone service is not available because the signal between the handset and mobile site antennas is blocked or severely reduced, usually by hilly terrain, dense foliage, or physical distance. A number of factors can create dead zones, which may exist even in locations in which a wireless carrier offers coverage, due to limitations in cellular network architecture (the locations of antennas), limited network density, interference with other mobile sites, and topography. Since cell phones rely on radio waves, which travel though the air and are easily attenuated (particularly at higher frequencies), mobile phones may be unreliable at times. Like other radio transmissions, mobile phone calls can be interrupted by large buildings, terrain, trees, or other objects between the phone and the nearest base s viders work continually to improve and upgrade their networks in order to minimize dropped calls, access failures, and dead zones (which they call "coverage holes" or "no-service areas"). So in order to communicate from the black spots where the mobile signals are not present, this project work is developed.

The master (transmitting) module is placed in the black spot zone and the slave (receiving) section at the network coverage zone, such that the communication can be done from the black spot through the Zigbee technology. So the master module is constructed using a PC keyboard to type the mobile number and message which will be transmitted by the controller through Zigbee transmitter. The normal RF (Radio Frequency) communication’s range is restricted to lesser distance. So the latest wireless technology (Lora) is preferred in this project work. One of the main form of communication that has been in use since 19th century is Radio wave communication. Radio waves have found its place in each and every field

whether is being medical, electronics or space. In general it exists in every system in one or the other form.

Radio Frequency communication has a ton of applications. It can be used in robots, home automation, special effects, or in any application that needs the wireless transfer of data. The data transfer speed varies based on the receiver and transmitter. As the project work mainly focus on the RF signals, it is important to have basic knowledge about them. The mode of communication for wireless technologies of all kinds, including cordless phones, radar, ham radio, and television broadcasts. RF technology is so much a part of our lives we scarcely notice it for its ubiquity. From baby monitors to cell phones, Bluetooth to remote control toys, RF waves are all around us. RF waves are electromagnetic waves, which propagate at the speed of light, or 186,000 miles per second (300,000km/s). The frequencies of RF waves, however, are slower than those of visible light, making RF waves invisible to the human eye.

The frequency of a wave is determined by its oscillations or cycles per second. One cycle is one hertz (Hz), 1000 cycles are 1 kilohertz (KHz); 1 million cycles is 1 megahertz (MHz); and 1 billion cycles is 1 gigahertz (GHz). A station on the AM dials at 98, for example, broadcasts using a signal that oscillates 98,000 times per second or has a frequency of 98 KHz. A station a little further up the dial at 710 broadcasts using a signal that oscillates 710,000 times a second or has a frequency of 710 KHz. With a slice of the RF pie licensed to each broadcaster, the RF range can be neatly divided and utilized by multiple parties.

4. Proposed Method

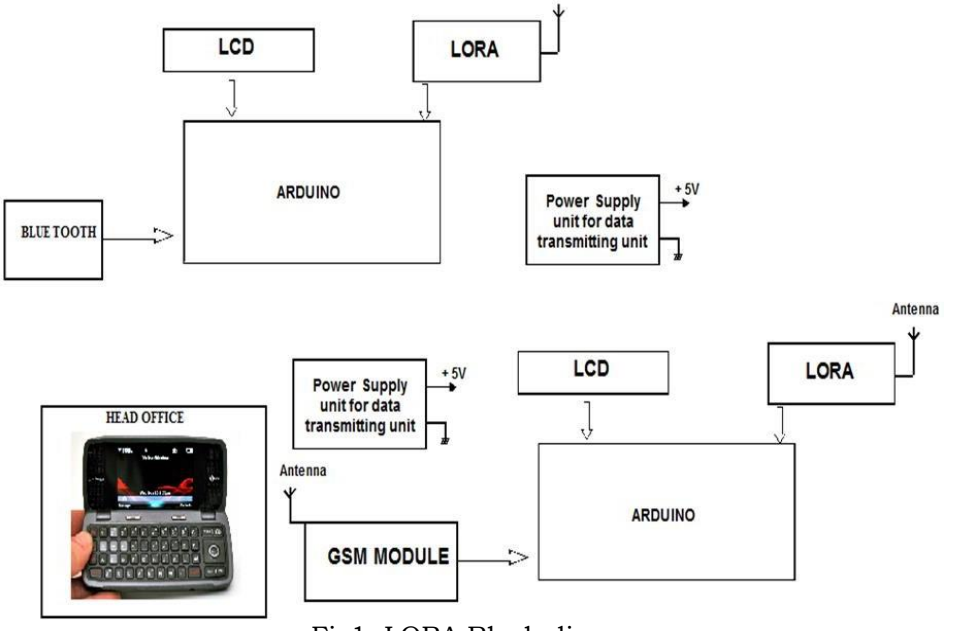

Fig1: LORA Block diagram

A debugger is a piece of software running on the PC, which has to be tightly integrated with the emulator that you use to validate your code. For that reason all emulator manufacturers ship their own debugger software with their tools, but also compiler manufacturers frequently include debuggers, which work with certain emulators, into their development suites. The µVision3 IDE from Keil Software combines project management; make facilities, source code editing, program debugging, and complete simulation in one powerful environment. µVision3 helps you get programs working faster than ever while providing an easy-to-use development platform. The editor and debugger are integrated into a single application and provide a seamless embedded project development environment.

µVision3 features include:

- The Device Database, which automatically sets the assembler, compiler, and linker options for the chip, you select. This prevents you from wasting your time configuring the tools and helps you get started writing code faster.
- A robust Project Manager, which lets you create several different configurations of your target from a single project file. The Keil µVision3 IDE allows you to create an output file for simulating, an output file for debugging with an emulator, and an output file for programming an EPROM -- all from the same Project file.
- An integrated Make facility with automatic dependency generation. You don't have to figure out which header files and include files are used by which source files. The Keil compilers and assemblers do that automatically.

5. Results

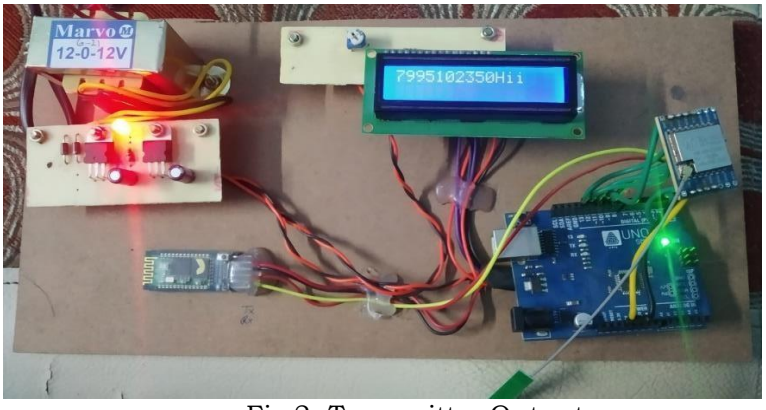

Fig 2: Transmitter Output

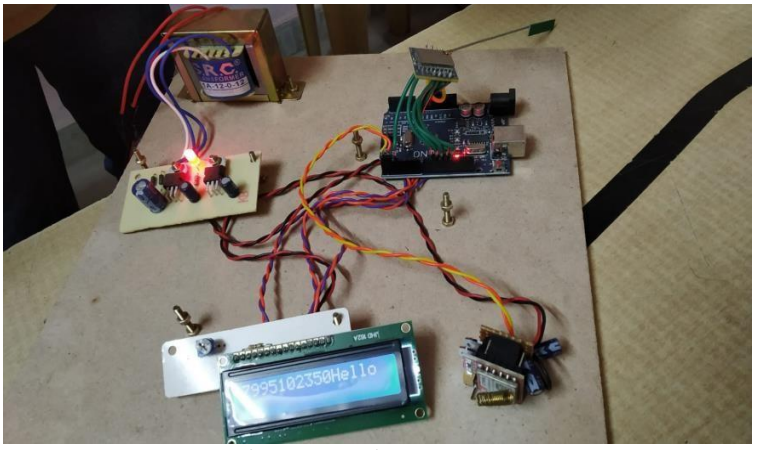

Fig 3: Receiver Output

6. Conclusion

In our daily life we are observing many situations where the signal is not available to make calls or sending messages. Previous existing systems are applicable in only where the signal is present. Hence, we are using this project to sending SMS in emergency situations when present in the block spot area The paper work "COMMUNICATION IN BLACK SPOT" is successfully designed developed tested and a prototype demonstration module is constructed, and the results are found to be satisfactory. While designing and developing this prototype module, we have consulted few experts, these professionals working at different organizations belongs to Hyderabad, helped us while building this module. Since it is a prototype module, much amount is not invested, the whole module is constructed with locally available components, and they are not up to the requirement. Some of the modifications must be carried out in design and is essential to make it as real working system. This project revealed that building a relatively low cost, high precision communication system in a black spot which is aimed to send and receive messages even without network coverage.

6.1. Future scope

To build the communication between the Black spot and remote area we are using LoRa technology. The Project is mainly consisting of LoRa Modules, Transmitter and Receiver. LoRa stands as Long Range that means the communication range is Large and works on the low power consumption. In communication system the range plays the major role. In communication system the range plays the major role. LoRa helps for the Long- range network. Two embedded developed boards are included in this project. The first is having Raspberry Pi and LoRa transmitter and the board is placed at black spot area. We connect a keypad to the board. The second board is having LoRa receiver, controller and GSM module, this board is placed at the remote area. Remote area is nothing, but the signals are present. GSM is arranged to transmit the message to the specified mobile. Whenever we wish to transmit the message, we text the matter using the keypad at Transmitter

board, The LoRa transmits the data to the reception board. GSM passes the passes the information to the Active center, if there is any emergency at that places, they can communicate with active center and the active center can reach them fast and easily.

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