International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 06 | June 2020 www.irjet.net p-ISSN: 2395-0072

BOAT LOCALIZATION AND WARNING SYSTEM FOR IDENTIFICATION OF BORDER

A. Abinaya[1], M. Nivedha[1], S. Swedha[1], K.M. Dhanalakshmi[2]

[1] U.G student, Department of Electronics and Communication Engineering, S.A. Engineering College, Chennai – 77.
[2]Associate Professor, Department of Electronics and Communication Engineering, S.A. Engineering College, Chennai – 77.

Abstract - *The Received Signal Strength Indication (RSSI) is used to provide location-based positioning and timing details. RSSI is a value of measurement which helps us to determine how the device can acknowledge a signal from an access point. It is an indication of the radio power level which helps us to localize and track any moving object. This method focuses on implementing border identification system for all mechanized boats. In the proposed system the fishermen will be given an alert when they reach the threshold region. We have a transmitter and receiver section in our proposed system. The transmitter section consists of an Arduino Microcontroller, RSSI LoRa transceiver, voice playback circuit, DC motor and a relay module. The receiver section includes an Arduino Uno, and a LoRa transceiver. As the fishermen move deep into the sea, the range of RSSI decreases gradually. When they reach the threshold region an alert will be given with the help of APR9600 circuit.*

Key Words: **RSSI, LoRa, mechanized boats, fishermen, localization.**

1. INTRODUCTION

The marine border is an imaginative division between countries that create dispute for many fishermen. Some fishermen tend to cross these borders which are considered as an offence. In order to mitigate this issue, we have implemented a warning system which will provide an alert when the fishermen are about to cross the maritime border. The distance from the shore to the border will be predetermined. Received signal strength Indicator is an indication of the radio power level that is being received by the device. The RSSI LoRa module is placed both at the boat(transmitter) and the Harbor (receiver). Both the module will be paired with one another. When the fishermen go deep into the sea the value of RSSI reduces from its maximum range. When they reach the threshold region the value of RSSI will be low and an alert will be given with the help of an APR voice playback circuit and a buzzer. Even after the subsequent alerts, when the fishermen cross the threshold region the motor of the mechanized boat will be turned off. Choosing a microcontroller is an essential process in designing the hardware of an embedded system. We should make sure that it meets the needs of our system and it must be cost effective. The speed, packaging, power consumption, memory are some features to be taken care of. Here, Arduino Mega 2560 microcontroller is used because it can provide many peripheral interfaces. This microcontroller is already pre-programmed which simplifies the process of uploading the programs to the on-chip flash memory. LoRa is preferred as it provides a long-range communication which is derived from chirp spread spectrum technology. LoRa chipsets have geolocation capabilities which permit long range connectivity in different fields. It offers secured data transmission for M2M applications. In this project, SX1278(Ra-02) module is used along with Arduino development platform. In LoRa networks gateways are used to handle several devices simultaneously. An APR 9600 voice playback circuit is deployed so that recorded sound is retained even when the module is removed from the power supply. The microcontroller is programmed using Embedded C, which is the most popular programming language in software field for developing electronic applications.

2. RELATED WORK

In the earlier stage the wireless networks were used by systems and applications to locate and track the

nodes in the network. In order to safeguard the fishermen from crossing the border GPS mobile device with GPS instrument were used. The alert was given using the voice playback circuit in their regional language. RF module was used to differentiate between normal and warning zones.

2.1 Global Positioning System

The values of latitude and longitude points of the maritime border will be pre-determined and this value will be stored in the microcontroller. The position of the boat measured using GPS and the value is compared with the stored value. If the value exceeds then the alert is sent to the fishermen. The accuracy is high but the memory required for saving each value of latitude and longitude will be more.

Fig -1: Marine borders based on latitude and longitude points

2.2 RFID

A Radio frequency identification is a technology which is composed of tags. The physical identification and the information regarding the boat and the fishermen is included in the RFID tags. These tags are tuned for a particular value of frequency and each tag will have unique ID numbers. The database is the main part which contains all the information and should be maintained properly for security purposes. The materials like metal and liquid can impact signal which may lead to interference of signals. The implementation will be difficult.

2.3 ZIGBEE

RSSI ZigBee is used to identify the border and to provide alert when a poacher is found within the protected sea water area. It is a low power and low-cost wireless networks. It provides a two-way communication between the transmitter and the receiver. But the main disadvantage is that it provides a short-range communication like Bluetooth and Wi-Fi.

Fig -2: Zigbee transmitter section

3. PROPOSED WORK

In our proposed system, the distance of the boat is measured by using the Received Signal Strength received from the slave RSSI LoRa(transmitter). Whenever the boat reaches the pre-determined threshold region the APR 9600 voice playback circuit will alert the fishermen in the boat. A buzzer alert will also be given to the fishermen. The LCD is a display unit which is used to print the status from received from the microcontroller. Even after the alert if the boat moves towards the border, then the motor of the boat will be automatically turned off. The motor is tripped off with the help of the relay module.

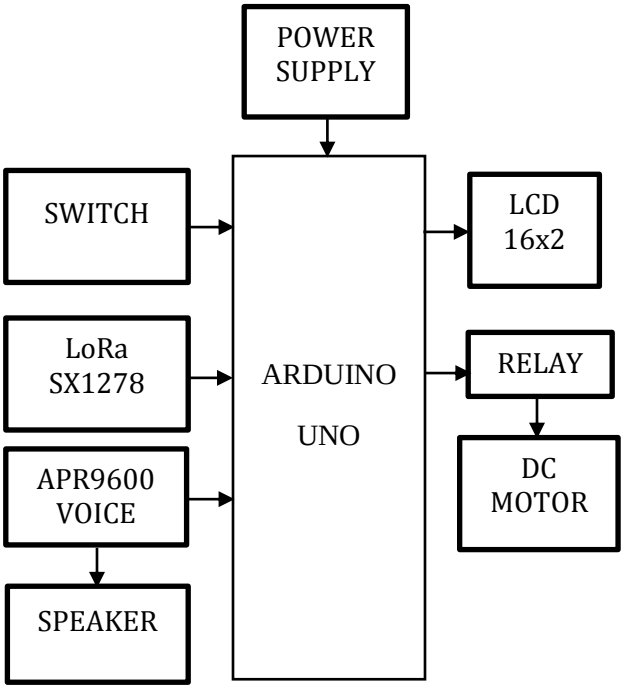

Fig-3: Block diagram of the transmitter section.

The above figure shows the block diagram of the transmitter section. This setup is fixed in the boat along with the fishermen.

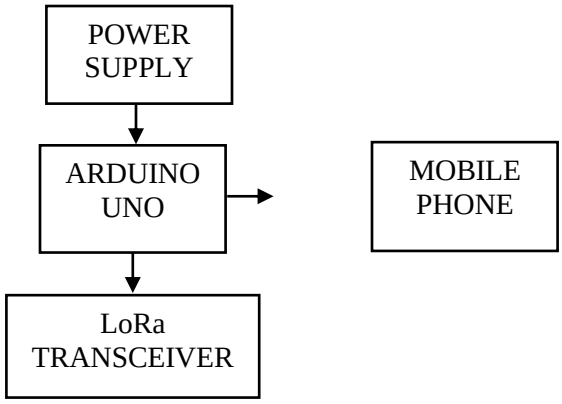

Fig-4: Block diagram of the receiver section

The receiver setup is shown above. This section consists of an Arduino Uno, a LoRa transceiver and a mobile phone.

The microcontroller is programmed with the help of the Arduino software Integrated Development Environment using Embedded C programming. Embedded C is preferred due to high reliability, portability and scalability. The Arduino software connects the hardware to upload programs and to communicate with them.

4. HARDWARE

The system design consists of both hardware and software system. The various hardware systems are explained as follows,

4.1. ARDUINO UNO

UNO is an Atmega 8-bit AVR family microcontroller. It is a simple development board which is inexpensive, flexible and easy-to-use for several applications. It has several inbuilt components. It can transfer data with computers and can communicate with other devices. It runs in MAC, linux and windows operating systems.

The instructions are given by in-circuit serial programming.

Fig-5: Arduino Uno Module

This board offers an automatic reset option which does not require physical press of the reset button. Each and every time when a new connection is made, the board is made to reset.

4.2 LORA TRANSCEIVER

LoRa is a long-range spread spectrum modulation technology which is derived from chirp spread

spectrum technology, which enables communication over a long range of kilometres.

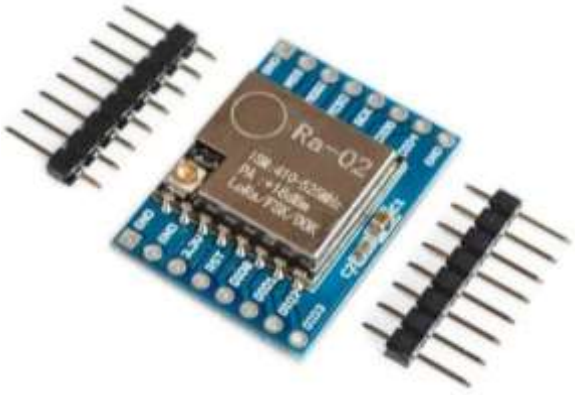

Fig-6: LoRa SX1278 Ra-02 module

These modules have geolocation capabilities used for locating and positioning a device. The Ra-02 module have IPEX antenna and the programmable bit rate is upto 300 kbps. It offers secure data transmission for all M2M and IOT applications.

4.3 APR33a3 VOICE

An APR33a3 voice IC is a sound storage technique. It is a single chip used for high-quality voice recording and playback solution which is managed by on chip circuitry.

Fig-7: APR33a3 voice module

It has user selectable messaging and automatic power down option. It does not require any battery backup.

4.4 LCD DISPLAY

16x2 character LCD display is a basic 16 character by 2-line display which is used to display both normal and custom characters. It displays black text on green background.

It has built-in controller. LCD display is simply programmable, inexpensive. It can display special characters and even animations.

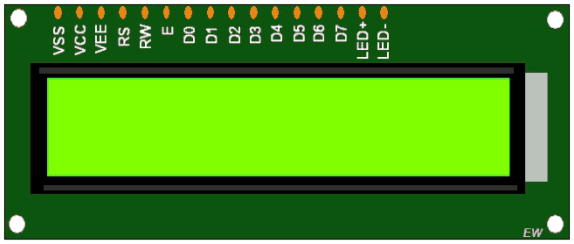

Fig-8: 16x2 LCD display

Every single character is displayed in a 5x7 pixel matrix. There are 2 registers namely, Command and Data. The command register is used to store the command instructions and the data to be displayed is stored in the data register.

5. SOFTWARE

The Arduino mega 2560 and the Uno board are programmed by using embedded C. The embedded c is an extension of c and c++ languages used for different embedded systems.

The Arduino boards are programmed by In-circuit serial programming. The firmware source code is available in the repository of Arduino. This development environment contains an editor with menus and buttons for functions. The toolbar buttons allow us to edit, verify and upload programs.

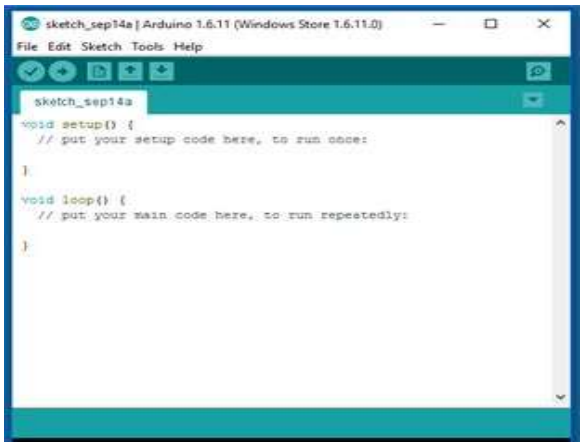

Fig-9: Arduino IDE

6. FUTURE SCOPE

In future, the Sigfox technology can be used to determine the digital RSSI value with which the localization of boat with better precision can be obtained. The average range of Sigfox is about 50km. It is a narrow band technology which uses a standard radio transmission method. In this technology we can use bi-directional command and control functionality.

Fig-10: Sigfox Integration

7. RESULTS AND DISCUSSIONS

In this paper we have developed an alert system for fishermen with the help of RSSI technology and LoRa module. In this work, a low-power RSSI based boat localisation was built using LoRa SX1278 module. Our proposed system has the following results: 1. It provides voice alert with the help of APR 9600 module. 2. The motor of the boat is turned off automatically when it crosses the threshold region. 3. The status will be displayed in the LCD display.

8. REFERENCES

[1] B.Kamalakannan, K.Naresh, P.Sakthivel "Protecting fishermen's by detecting and warning them while crossing sea borders using GSM and RFID technologies" Online International conference on Green Engineering Technologies(IC-GET) 2016.

[2] C. Viji, S. Dhanalakshmi, K.Abinaya and V.Gayathri. "Fishermen alert system for border crossing "Asian Journal for Applied Science and Technology (AJAST), May 2017.

[3] S.Ranjith, Shreyas, K. Pradeep kumar, R. Karthik "Automatic Border Alert system for fishermen using GPS and GSM techniques" Indonesian Journal of Electrical Engineering and Computer Science, July 2017.

[4] Wongeun choi, Yoon-Seop Chang "Low-power LoRa signal-based outdoor positioning using fingerprint algorithm" International Journal of Geoinformation, November 2018.

[5] P.Maragatha vijayashanthi, S. Monisha "Border Alert system for fisherman with boat speedometer using RSSI" International Journal of Emerging Technologies in Engineering Research (IJETER), March 2017.

[6] Hussein Kwasme, Sabit Ekin "RSSI based Localization using LoRa Technology" Institute of Electrical and Electronics Engineering(IEEE).