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Fishermen Rescue Mission

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Abstract: ***The basic idea of this project is to save the life of fishermen at sea. We do this by installing a module in the fisherman's life jacket. This module will be a transmitter which can transmit its current location. This module is made to be a floating module. Which is also waterproof. The person in the dangerous situation can press the button and the transmitter starts transmitting the location. The data is then transferred to the receiver via a network built by WLAN module which is also made by us. The WLAN module consists of the transmitter and the receiver and acts as repeater stations. These transmitters and receivers also contain the LoRa module. The LoRa module is Incorporated because of its long range communication specifications. The repeater station is placed buoy the help of buoys. Buoys are floating objects which are then anchored to make them stationary. The receiver is a portable one and dynamically we can get the location of the transmitter. Hence we can locate the person and then rescue them***

Keywords: LoRa, WLAN, GPS module,

I. INTRODUCTION

Nowadays there is a lot of effort on the study, analysis and finding new solutions to situation. Unsafe migration at sea continues to claim lives at sea despite Navy / Coast Guard rescue services rushing for rescue. It was reported that more than 2800 lives have been lost at sea till 30 Oct in year 2018 itself. To address the complexity of this humanitarian challenge, a meeting was hosted by IMO on 30 Oct 17 and attended by various international organizations from maritime industry including UN representatives. The challenges of rescuing large number of people in distress, providing food, shelter, sanitation, medical care are harrowing for rescue agencies. The project "Fishermen Rescue Mission" aims to rescue men lost at sea. We have seen the recent news about 24 missing fishermen who went missing in the Bay of Bengal in July. One of the fisshermen after 4 days was rescued and others are yet missing. We are planning to install a small module in life jackets which transmits its location. And this data transmitted by the module is routed by a network laid by us. This network is made by a long range connectivity (LoRa) which has a range about 5 km radius. This network covers as we plan a whole part of kerala coastal areas. This location which is received is handover to the rescue team. This module continuously transmits its location as it is a moving object. The receiving correspondingly receives the data and the receive of data continues till the person is tracked down. The receiving module willbe in hands of the coast guards.

II. MAIN OBSTACLES

The main obstacles that hinder the development of this concept are:

A. Connectivity

The main challenge faced by this concept consists in assuring the interconnectivity between the devices built by different manufacturers. The use of a single communication protocol is not a viable choice, in light of the various communication channels and related applications. Thus, the main goal is to ensure the interconnectivity of the various data formats on a worldwide scale.

B. Efficient energy management:

Most WSN modules are battery powered, and thus there is a constant need to reduce the energy consumption. Since the cost of these devices is rather low, the battery replacement cannot be considered efficient, as this operation would be more costly than the replacement of the entire module. Therefore, the battery life cycle should amount to decades. This entails the development of sophisticated communication strategies focused on energy efficiency. Another possible solution would be the improvement of the energy harvesting techniques.

C. Security

The provision of high security levels should definitely be taken into account. Thus, it is highly necessary to develop new authentication and encryption protocols that are able to use limited WSN node specific hardware resources.

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D. Complexity

The integration of the communication capabilities is also a highly complex task. Researchers are now looking for new ways to increase the efficiency and facilitate the programming of these modules. Fast-paced development: the IoT concept is an extraordinarily fast paced developing concept, hundreds of new nodes being added every day.

III.IMPLEMENTATION

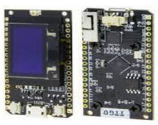
A. Data Collection

1) *LoRa:* LoRa (Long Range) is a low-power wide-area network (LPWAN) technology. It is based on spread spectrum modulation techniques derived from chirp spread spectrum (CSS) technology. LoRa uses license-free sub-gigahertz radio frequency bands like 433 MHz, 868 MHz (Europe), 915 MHz (Australia and North America) and 923 MHz (Asia). LoRa enables long-range transmissions (more than 10 km in rural areas) with low power consumption. The technology covers the physical layer, while other technologies and protocols such as LoRaWAN (Long Range Wide Area Net- work) cover the upper layers. LoRa uses a proprietary spread spectrum modulation that is similar to and a derivative of Chirp spread spectrum (CSS) modulation. The spread spectrum LoRa modulation is performed by representing each bit of payload information by multiple chirps of information. The rate at which the spread information is sent is referred to as the symbol rate, the ratio between the nominal symbol rate and chirp rate is the spreading factor (SF) and represents the number of symbols sent per bit of information. LoRa can trade off data rate for sensitivity with a fixed channel bandwidth by selecting the amount of spread used (a selectable radio parameter from 7 to 12). Lower SF means more chirps are sent per second; hence, you can encode more data per second. Higher SF implies fewer chirps per second; hence, there are fewer data to encode per second. Compared to lower SF, sending the same amount of data with higher SF needs more transmission time, known as airtime. More airtime means that the modem is up and running longer and consuming more energy. The benefit of high SF is that more extended airtime gives the receiver more opportunities to sample the signal power which results in better sensitivity. The Lora module is shown in Fig. 1. This Lora module is used for its long range communication specification and its another feature of very high energy efficency. This module can sent the data to another lora nodule with a communication range of 10km. This is used for senting the data across the sea to concerned authorities that is coast guard.

Fig.1. Natural Language to SQL Query Implimentation Diagram

B. TTGO LoRa32 SX1276 OLED

The TTGO LoRa32 SX1276 OLED is an ESP32 development board with a builtin LoRa chip and an SSD1306 0.96 inch OLED display.The board also feature several GPIOs to connect peripheral, PRG(BOOT) and RST buttons, and a lithium battery connector.ESP32 is a series of low-cost, low-power system on a chip microcontrollers. The SX1276 LoRa chip communicatees via SPI communication protocol, and it is internally connected to the ESP32. These component is used to build the transmitter which is installed in the life jacket. The TTGO LoRa32 SX1276 OLED is connected with battery, a switch ,antenna and NEO 6M GPs module. The circuit is shown here. The TTGO LoRa32 gets the geographical location from the NEO 6M GPS module



ZFig.2 TTGO LoRa SX1276 OLED

Which is here the data for further processing. The data is then transmitter to near by repeater station. The component is also used in the receiver module at the receivers end. It also contains a NEO 6M GPS module to take the geographical location of the receiver which is a portable module. And the 2 data's are transferred to mobile phone.

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C. NEO 6M GPS Module

The NEO-6m module series is a family of stand-alone GPS receivers featuring the high performance u-blox 6 positioning engine. These flexible and cost effective receivers offer numerous connectivity options in a miniature 16 x 12.2 x 2.4 mm package. Their compact architecture and power and memory options make NEO-6 modules ideal for battery operated mobile devices with very strict cost and space constraints. The 50-channel u-blox 6 positioning engine boasts a Time-To-First-Fix TTFF of under 1 second. The dedicated acquisition engine, with 2 million correlators, is capable of massive parallel time/frequency space searches, enabling it to find satellites instantly. Innovative design and technology suppresses jamming sources and mitigates multipath effects, giving NEO-6 GPS receivers excellent navigation performance even in the most challenging environments

Fig.3. NEO 6M GPS module.

D. Buoys

A buoy is a floating device that can have many purposes. It can be anchored (stationary) or allowed to drift with ocean currents. In this we used it as a stationary buoy that means anchored buoy to act as a stationary floating repeater station. The repeator station consist of a transmitter and a receiver which is coupled. The data that is received at the repeator station via the receiver is then transmitted using the transmitter installed in it. The data is Transfered to nearest repeater station and finally it is routed to the receiver module.

IV. DATA PROCESSING

The data acquired using GPS module is used for taking real time GPS locations of the users. The data is in the format of NMEA. These NMEA sentences are sent out at an interval called the update rate. NEO-6M GPS module updates this information once per second. But you can configure it for up to 5 updates per second. Here we use 1 update per second. The data is converted to byte array and used for further processing. Android phones are used for processing the values obtained. The processing includes the comparison of the two data. After the processing we get the distance between two location points and we get the angle between both the points.

These processing of the data is dynamic as the data received changes every 1 second. After processing the distance and the direction is displayed to the user at receivers end. The two points are plotted on a map for clear understanding. The distance between them and direction towards the other point is displayed on the map. This map can be on the phone. Figure 5 shows a skeletal structural diagram of the system.

The Geographical location of the destination point is obtained by the NEO 6M GPS Module. This NEO 6M GPS module is integrated into the transmitter module. The destination point is in motion so real time Geographical location is to be transmitted. This is done by configuring the NEO 6M GPS module in 1 update per second. The transmitter module sent out 1 packet per second. This data from the NEO 6M GPS module is sent as packets from the transmitter. The transmitter module contain a LoRa module which has a communication range of radius 5 km.

The data transmitted to the nearest repeater station. The repeater station also contain the LoRa. module. So the communication distance between two LoRa module will be of 10 km radius. The network is built by a LoRa connectivity. Which has a Lora transmitter and a receiver. The network is made by the use of buoys. Buoys are floating object. On the top of these buoys we attach the repeater module. The buoys are anchored to make it stationary. The location of the repeater station are calculated such a way that the minimum number of repeater station are needed to cover the area specified. Here we cover an area of 22 nautical miles (40 kms). These repeater station routes the data towards the receiver module.

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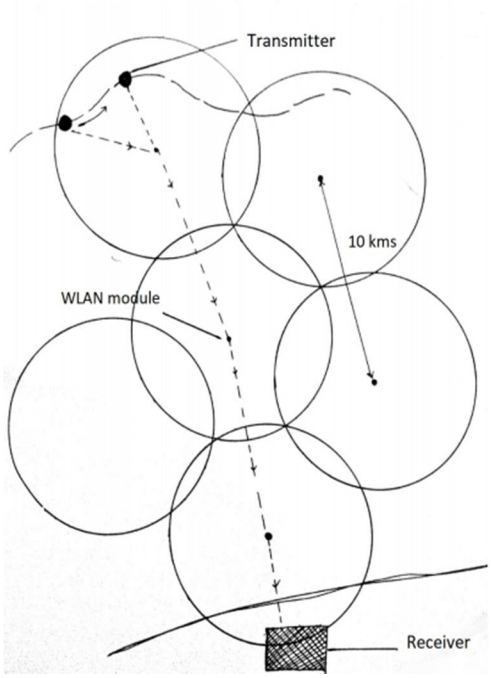

Fig. 4. Structure of network to be build.

The receiver module has two modes. The receiving mode and a waiting mode. As soon as the transmitter starts transmitting, the receiver will be in the receiving mode. The data will be received as packets. The data is retrived and is displayed in the receiver module on OLED screen of the receiver module. The Geographical location of the receiver module is fetched from NEO 6M GPS Module of the receiver module. Here we explain the header files used in our codes to configure the modules developed by us. The library le ”SSD1306.h” is a library for our Monochrome OLEDs based on SSD1306 drivers. This is a driver for SSD1306 128x64 and 128x32 OLED displays running on the Arduino/ESP8266 ESP32 and mbedos platforms. Can be used with either the I2C or SPI version of the display. This is the display that we got in the Transmitter and Receiver module. The library file ”wire.h” is Wire library allows you to communicate with I2C devices. The library le ”SPI.h” is library allows you to communicate with SPI devices(esp32), with the Arduino as the master device. Serial Peripheral Interface(SPI) is a synchronous serial data protocol used by microcontrollers for communicating with one or more peripheral devices quickly over short distances. It can also be used for communication between two microcontrollers. The library file ”lora.h” is used to communicate with lora module. include¡arduino.h¿ It is part of the IDE. It is the library for all the arduino specific stuff. The two datas that is currently in the Recevier module is passed on the phone via WiFi network. The ESP32 can connect to the WiFI network. So we connects the ESP32 the mobile hotstop. And ESP32 connect to a IP address this IP address is then fed to the android based application. In this application the datas changes automatically. As the receiver module receivers the data. The Geographical

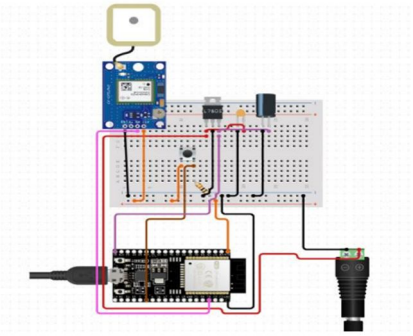

Fig. 5. curcuit diagram connecting ESP32 and NEO 6M.

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Location retrieval from receiver module is synchronized with the GPS module data retrieval. These two Geographical locations are transferred to the phone. These two Geographical locations are plotted in the by feeding it coordinates by coordinates to the map. As the data transferring is speeded up we get the motion display in the map. In android app we process the two Geographical locations to get the distance between them and the bearing angle of the first point

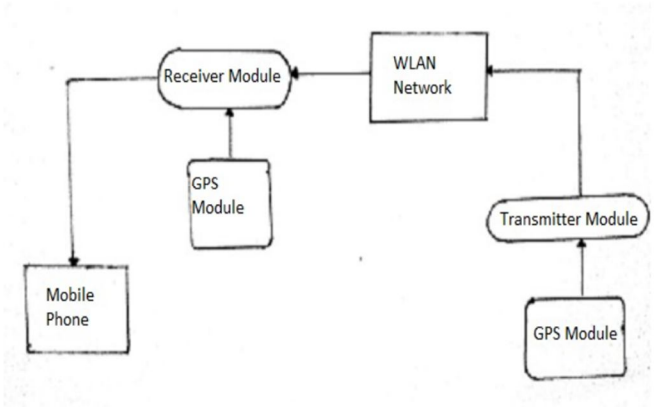

Fig. 6. Flow of data

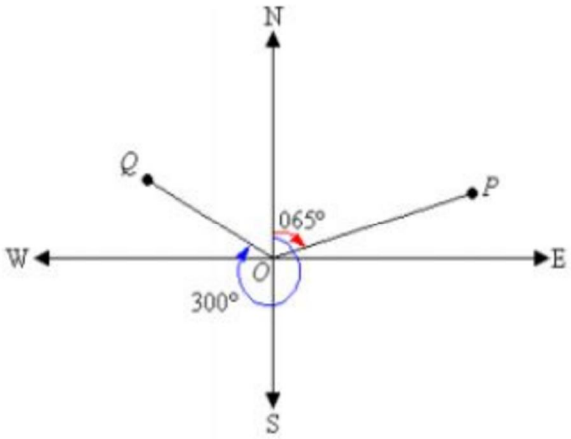

Fig. 7. Bearing Angle

Here Bearing angle is used to find the direction of men lost at sea. The four main directions of a compass are known as cardinal points. They are north (N), east (E), south (S) and west (W). Sometimes, the half-cardinal points of north-east (NE), north-west (NW), south-east (SE) and south-west(SW) are shown on the compass. North representing 0 or 360, East representing 90, South representing 180, West representing 270. The true bearing to a point is the angle measured in degrees in a clockwise direction from the north line. We will refer to the true bearing simply as the bearing.

V. RESULT

The proposed system will overcome all the issues. The module developed works efficiently and accurate. The android app shows the exact movement of both objects. This application is made to display the live location of the transmitter and it's a success. The system is very effective comparing it to the existing system for the rescue mission

VI. CONCLUSION

The unsafe migration at sea continues to claim lives at sea despite Navy/Coast Guard rescue services rushing for rescue. Here the proposed system overcomes all the issues. The module developed works energy efficiently and accurate. The android app shows the exact movement of the both objects. One of these objects is the victim and one is the rescue team. This app also shows the distance between both the objects and also is changing dynamically corresponding to the movement of the objects. The transmitter module and receiver will automatically stop when the geolocation of both the objects coincides. The receiver goes back to the waiting mode. Using of Ublox Neo 6m gps module makes the geo location more accurate and bearing angle is found to display the routing direction on the phone .The system is very effective comparing it to the existing system for the rescue mission.

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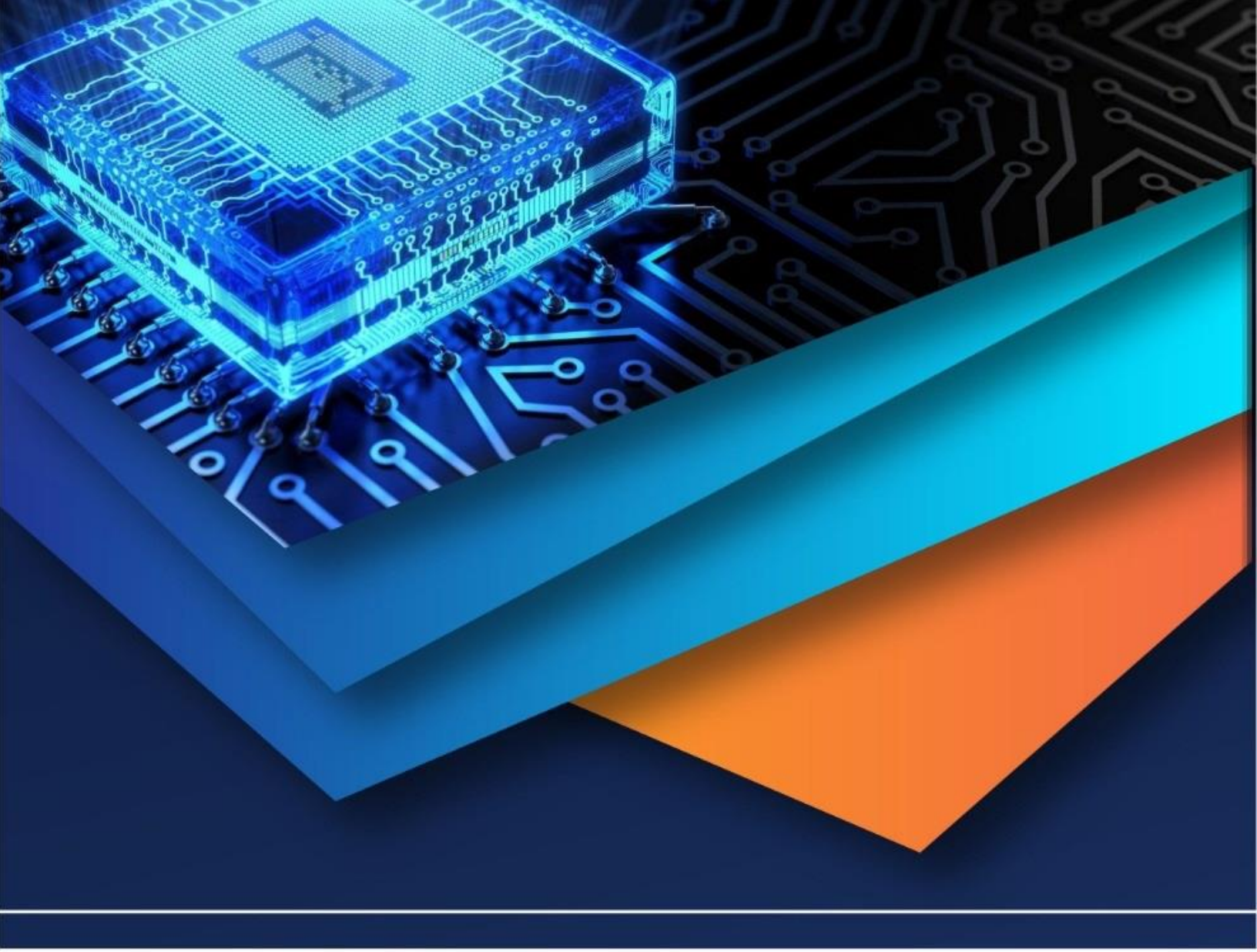

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