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SEA – WAY BORDER ALERT SYSTEM USING RSSI

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***Abstract*— The " SEA-WAY BORDER ALERT SYSTEM USING RSSI" is the subject of this article. Many fishermen have been arrested recently by border patrols from neighboring countries. The inability to clearly define marine borders is a major factor in this. In this work, the microcontroller (Arduino Uno) equipped with the microprocessor ATmega328p is used to acquire and process data from the sensors. The NEO-6MMGPS receiver module is used to sense the location of the boat. The ESP8266 Wi-Fi module transmits the acquired GPS coordinates to the IoT cloud. The navy can then keep tabs on the data in this way. Once the buzzer has recognized that the boat's current GPS location is within the warning zone, the motor's output is cut in half. The primary concept is to notify fishermen at sea using an Arduino Uno microcontroller and a NEO-6M GPS receiver module.**

***Keywords*— Arduino Uno · ATmega328p · NEO-6MMGPS · Global Positioning System(GPS) · NEO-6M GPS · Internet of Things (IoT)**

I. INTRODUCTION

It is well known that the Indo-Sri Lankan maritime border presents significant challenges. The lack of fishermen's familiarity with maritime boundaries is a major contributing factor. We had developed a strategy to deal with this problem in order to get out of it. When fisherman cross into Sri Lankan territory illegally, the Sri Lankan navy often shoots them. The lack of a clearly definable maritime border is a problem that can be fixed by installing an adequate monitoring system that sends out IoT-based alerts to fishermen. The NEO-6M GPS receiver module is used in this planned study, and it precisely monitors the vessel's latitude and longitude using data relayed from satellites in orbit and ground stations on the ground. The ESP8266 Wi-Fi Module, like the GPS receiver module, takes a serial port or TTL-level signal and converts it into an embedded module that acts as a Wireless Network communication protocol stack and a TCP/IP protocol stack. To send its position data to the Internet of Things cloud, this traditional hardware device with an ESP8266 Wi-Fi module may connect to the internet via Wi-Fi. An Arduino Uno microcontroller, a NEO-6M GPS receiver module, an ESP8266 wireless module, an LCD display unit, and an engine control unit are all part of the hardware interfaces. In order to aid in the tracking of boats on their way to the Indo-Sri Lankan border, the proposed work makes use of a liquid crystal display (LCD) to show the fishermen and the base station the current latitude and longitude of the boat's location. Using an ESP8266 Wi-Fi module, the coordinate data is uploaded to the Internet of Things cloud. NMEA strings (National Marine Electronics Association) can be parsed for data like latitude and longitude. Border patrol provided the GML file (Geography Markup Language) used to match the boat's present location to known points of interest. The disruption caused by fishermen violating maritime borders can be avoided with this system in place.

II. LITERATURE SURVEY

In this [1], we see how it is feasible to prevent the opposing country's navy from shooting and capturing unarmed fishermen. This can be prevented with the use of GSM (Global System for Mobile), the LPC2148 Arm microcontroller, and RFID (Radio-Frequency Identification) embedded technology. There are three different border lines that have been drawn. The final state boundary will be the international border between the two countries and the two existing boundaries prior to then. The Indian authorities will keep an eye on the first two border crossings. At the first two checkpoints, the fisherman are notified by a speaker (a buzzer) and an LCD display. There is a backup plan in case the warning system fails. When the boat reaches the third border, the engine shuts off automatically. The government can finally recognize the importance of fishermen's information. In order to protect fishermen, the authors of this study [2] created an embedded system-based gadget that uses GPS and radio frequency technologies to report the fishermen's locations to border officials. The idea proposes using a buzzer to alert the fisherman. Pressing the built-in panic button activates the device's recording capabilities. When an alarm is sent to the coast guard's app, they can tune in to the live feed. Because of the precarious nature of fishermen's incomes, unintentional border crossing is seen as a major transgression. When already-struggling fishermen are shot and their boats stolen, the situation appears to worsen dramatically. The inability to clearly demarcate maritime borders between countries is at the root of this issue. The term "maritime border alert system" is used to describe a system that protects fishermen and their vessels by alerting them to the proximity of the border. A variety of technological tools, including the Global Positioning System, the Universal Mobile Telecommunications Network, and ultrasonic sensors, are employed for this goal. An inexpensive maritime border crossing warning system is provided to fishermen as part of the [3]framework.

People on both sides of the border can use the [4] app to plot the most direct route to their destination. The border patrol will receive the alert and relay it to the other ships' human operators of the other devices. When problems arise due to enemy ship forces, the app will let you know where the affected devices are and what's wrong with them. This software can be used as an incident management tool to help keep the peace in a variety of settings. This is prepared mostly for Tamil fishermen who are employed on the borders. An automatic warning system that sounds off in the event of any problems will be supplied with this apparatus. This is created in such a way that the application may be readily utilized by all the people in the vicinity. Device tracking is key to the app's functionality. Even non-readers will have no trouble using this. With the use of GPS modules, sensor components, and communication topologies, the authors of [5] propose a system to virtually define maritime borders utilizing computer indicator systems for marine vessels and fishermen's boats. Both the Border Intrusion Detection System and the Dot Matrix Communication System are discussed as components of the whole. Clearly delineating borders in the ocean, either visually or with the help of electronic technology, is necessary if a long-term solution to the problem is to be found. In addition, a practical communication plan is put in place to ensure that the control center receives data quickly and the fishermen receive usefull,signals.

When the outskirt is approached or crossed, the system sends out a warning message and uses RSSI to track the location of the boat in real time. It also provides reliable route and timing facilities to global clients on a consistent substructure, regardless of whether they are on or near Earth. In addition, the RSSI data is relayed to a costal sentinel, and the fuel supply to the watercraft's motor is modulated to increase its speed. Therefore, sentinels on the shore can benefit and provide supplementary benefits to fishermen, encouraging them to stay inside the confines of the perimeter [6].

3. EXISTING SYSTEM

While there are certain works that address the highlighted problem statement, the likelihood of receiving inaccurate results makes them unreliable. Those works also lack complete embedded systems; for instance, in some systems there is no proper data monitoring system, and in other systems the alert information is not sent properly to the control unit, i.e., the alert message is sent only to the boat but not to the

centralized data hub [8]. There is not yet a system in place that includes the engine control unit. There's a warning sign and a no-go area at this boundary. So, when the boat enters the warning zone, just before it crosses a national border not currently tracked by the system, an alarm message will be delivered. If the existing system for fisherman border security warning is highly accurate, the number of fishermen caught by people from other countries must be lowered. However, foreigners continue to capture the fishermen. On March 25, 2021, the Sri Lankan Navy seized two boats and arrested twenty Indian fishermen for illegally fishing in Sri Lankan waters.

CIRCUIT DIAGRAM

The whole circuit diagram of the proposed system is shown in Figure 1. Step-down transformers, bridge rectifier circuits, and smoothing filters are used to convert AC power into DC before it enters the system. A microcontroller-linked LCD displays an alarm message. The Rx pin on the Arduino controller is wired to the GPS receiver module. The transistor is acting as a switch between the alarm buzzer and the engine speed reduction motor. The Tx pin on the Arduino controller communicates with the IOT module, in this case an ESP8266 Wi-Fi module.

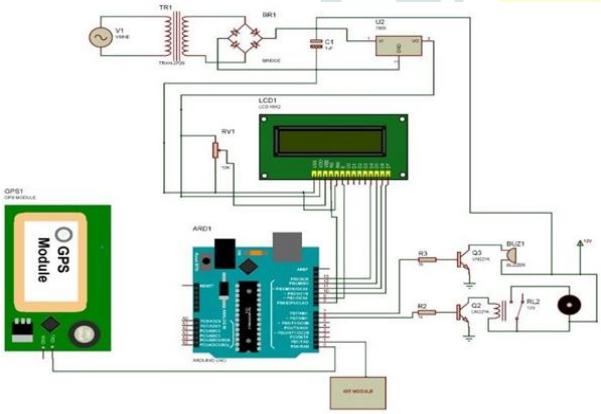

Figure 1: Existing Model.

4. PROPOSED MODEL

Figure 2 shows a functional block schematic of the whole proposed system. The suggested system utilizes an Arduino Uno as the microcontroller. It features 14 digital I/O and 6 analog I/O pins. A resonator operating at 16 MHz, and six PWM output pins are included. It's not just sturdy; it's also dependable. The system is controlled by an Arduino Uno.

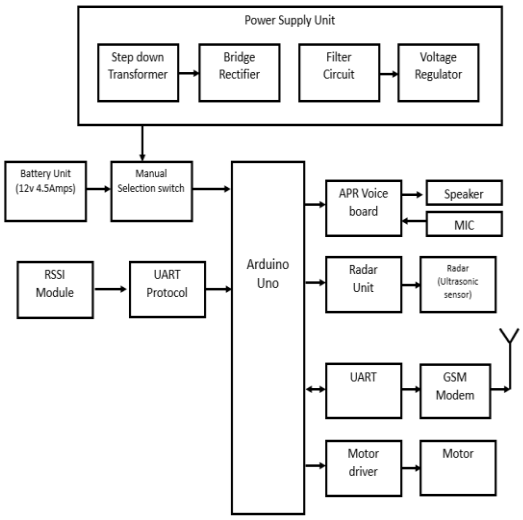

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Figure 2: Block diagram

The GPS receiver module is the controller's input. And the NEO-6M GPS receiver module in particular. The NEO-6M chip inside is quite potent. This NEO-6M chip can follow up to 22 satellites to determine precise global coordinates. Since fishermen often spend months or even years at sea, this low-power chip is ideal for their navigation system. Trilateration is the basis for how GPS receivers calculate their positions. A GPS receiver can pinpoint its location by measuring its distance to a constellation of satellites. These satellites send data about their location and the exact time as radio waves, which will be recorded by the GPS receiver to map the boat's location. This GPS receiver uses data from the three satellites that are the farthest away to calculate the ship's precise location. This entire procedure is called trilateration. The ESP8266 Wi-Fi module is used to allow the microcontroller to upload and download data from the cloud. The SOC and TCP/IP protocols are already integrated into this cheap Wi-Fi chipset. To facilitate centralized data monitoring, the GPS location data is transferred to the IOT cloud. The microcontroller constantly checks the ship's GPS data for illegal border crossings. Along the coasts of different countries, there are different zones designated as warning zones and no-go zones. The ship's Engine Control Unit (ECU) will throttle back to half power if it detects that it is in a danger zone. The electromagnetic solenoidal valve is a component of the electronic control unit. The fuel injector flow rate is regulated by this. In addition to slowing the engine down, an alarm will sound and an alert message, complete with GPS coordinates, will

appear on the LCD screen. So, the fishermen will be halted just at the border of the warning area. Our naval forces can protect our fishermen with the help of the centralized data monitoring unit.

5. RESULT AND DISCUSSION

On the LCD, the GPS unit periodically displays the boat's latitude and longitude. GPS delivers constant positioning, navigation, and timing services to users on a continual basis every day and night. GPS systems can be used to safely record positions at sea. The boat's latitude and longitudinal degree can be calculated by comparing the prior maritime restricted position with the current position. A warning message will be sent to the boat's LCD screen if the vessel approaches the prohibited zone. The alerts are being transmitted using a GSM modem. Then t The GPS modem will constantly transmit a signal that pinpoints the fishermen's location based on latitude and longitude. After that, the output is read and shown on the LCD. The same information is transmitted to both the fisherman's mobile device and the sea border security system. Data obtained from a GPS receiver can be stored in an EEPROM. The LCD display, GSM modem, and GPS receiver are examples of hardware that communicates with the microcontroller. More and more uses are being found for the global positioning system (GPS). Global users may rely on its accurate positioning, navigation, and timing services around the clock, day or night, no matter where they are located on or near the planet. Programmable Interface Controllers, or microcontrollers, are electronic circuits that may be instructed to perform a wide variety of operations. You can find them in practically any kind of electronic gadget, from alarm systems to computer control systems to phones. Microcontrollers can be purchased as either pre-assembled circuits or as kits for DIY assembly at a low cost. The Arduino's RX and TX pins allow the microcontroller to receive data from the GPS receiver. In addition to coordinates, the received data includes a wealth of other information. The current position's latitude and longitude are extracted independently from other GPS data. Latitude and longitude data for national boundaries are compared with the present positions. At first, the latitude is compared with the stored latitude, which identifies if the present place is positioned near the boundary. Separate text files include the latitude and longitude coordinates for each boundary. The behavior of the Arduino board can vary depending on the text files that are used. The current GPS coordinates are compared to previous measurements. The latitude S1 is compared to those already in the database. The neighboring pairs of latitude and longitude (X1, Y1, and X2, Y2) are obtained from a table and compared in real time to see if the latitudes match.The GPS modem will send out a signal that will calculate their latitude and longitude and show them exactly where they are at all times. After that, the output is read and shown on the LCD. The same information is transmitted to both the fisherman's mobile device and the sea border security system. Data obtained from a GPS receiver can be stored in an EEPROM. The LCD display, GSM modem, and GPS receiver are examples of hardware that communicates with the microcontroller. More and more uses are being found for the global positioning system (GPS). Global users may rely on its accurate positioning, navigation, and timing services around the clock, day or night, no matter where they are located on or near the planet. Programmable Interface Controllers, or microcontrollers, are electronic circuits that may be instructed to perform a wide variety of operations. You can find them in practically any kind of electronic gadget, from alarm systems to computer control systems to phones. Microcontrollers can be purchased as either pre-assembled circuits or as kits for DIY assembly at a low cost. The Arduino's RX and TX pins allow the microcontroller to receive data from the GPS receiver. In addition to coordinates, the received data includes a wealth of other information. The current position's latitude and longitude are extracted independently from other GPS data. Latitude and longitude data for national boundaries are compared with the present positions. At first, the latitude is compared with the stored latitude, which identifies if the present place is positioned near the boundary. Separate text files include the latitude and longitude coordinates for each boundary. The behavior of the Arduino board can vary depending on the text files that are used. The current GPS coordinates are compared to previous measurements. The latitude S1 is compared to those already in the database. The neighboring pairs of latitude and longitude (X1, Y1, and X2, Y2) are obtained from a table and compared in real time to see if the latitudes match

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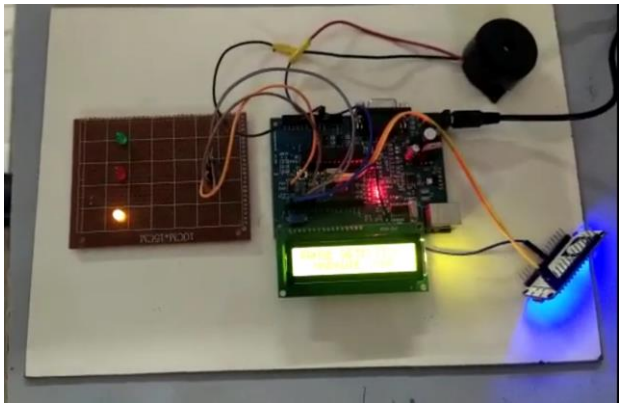

6. CONCLUSION

In the earlier days, there was no proper mechanism to designate the border. The fishermen cross the border without realizing it, which could have disastrous consequences. This is the case because adequate methods of identification do not exist. These are the issues plaguing the current system. By overcoming this, it is feasible to introduce fresh concepts for determining the border. An automatic warning system that sounds off in the event of any problems will be supplied with this apparatus. This is planned so that everyone in the area can use the program with minimal difficulty. People can now feel safe fishing in border areas thanks to this project.

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