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DESIGN OF BORDER ALERT SYSTEM FOR FISHERMEN USING GPS

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Abstract - *Indian Fishermen are being jailed for inadvertently crossing the border which is not easily distinguishable by them. This irresolvable issue in the territorial waters of the state is harming the bond among the countries. The severity of the issue intensifies where the poor fishermen are being shot dead and their boats getting seized, resulting in loss of their lively hood. This tragic tale reaches its climax with the origination of a concept that uses GPS resulting in an Alert system that warns the fishermen approaching the border. This paper provides a system that will alert the fishermen and tracks the location of the boat to avoid such accidents. The location of the boat is found out using the GPS and the boat is automated and its direction is reversed when the border is crossed. The greatest advantage of the GPS system is the ability of the device to work in any weather conditions and in any means. The proposed system's architecture is reliable and robust.*

Key Words: **Maritime border, Global positioning system, Arduino Uno, LCD, Motor driver IC (L293D)**

1. INTRODUCTION

In our daily parlance, we hear about instances of Indian fishermen being restrained from fishing, intimidated and arrested by Sri Lankan navy[5]. Tamilnadu is often involved in carrying out fishing along India-SriLankan Maritime border, which is not easily locatable, thus resulting in cross border brutality. Most of the times fishermen cross the border unintentionally and fall prey for the navy. Indian navy could not aid them in the emergency due to lack of established communicational facilities at the border. Few systems are available to inform the fishermen that the borderline has been crossed. They are done so with the use of GSM[6], buzzer etc. The GSM would not be very effective as its signals are proven to be below par in the middle of the sea. This embedded system, in short safeguards the fishermen by reversing the direction of the boat and provides an indication that he has crossed using the buzzer and the red LED.

2. OBJECTIVE

The predominant purpose behind the development of this concept is to curb the acts of srilakan navy. It also ensures that precautionary measures are taken by the fishermen from entering the borders. Cross border complications will probably find a solution with this system. A system is required which protects the fishermen by notifying the country border to them by taking aid of Global Positioning System (GPS). The GPS receiver is used to find the current location of the fishing boat. As the boat starts, the subsequent location values are continuously received by the GPS receiver and are compared with the maritime border which is stored in the Arduino. Then from the result of the comparison, this system let the fishermen know that they are about to reach the nautical border or it has been crossed.

3. PROPOSED SYSTEM

This project puts forward an approach of suspecting the border and alerting the fishermen. Complete location is split up into safe zone and danger zone. This system incorporates GPS receiver, LCD display, LED and buzzer. The location of the boat is received by the GPS receiver continuously and the inputs are sent to the Arduino which compares the current location with the boundary location already stored. The Arduino then makes use of the LCD display and LED to act as an indicator for the zone in which the boat is situated. The buzzer is triggered, and the motor will be automated to alter the direction once the border is crossed. When the boat meets the border, the buzzer is activated to warn the fishermen and the boat automatically reverses its direction into the safe zone.

3.1 Advantages of GPS

1. It is very economical, can be easily handled and can be integrated with any system with ease.
2. Flexible in navigation and its wide uses for security motives[7].
3. One of the best trademark attributes of GPS is that because it functions through satellite technology, it is accessible and available across the entire globe.

4. SYSTEM ARCHITECTURE

Arduino UNO is the primary body of the project and other elements like GPS, LCD, motors , led's , buzzer are associated to it. They are the outputs of the Arduino which are configured to particular pins by the pin Mode command. The entire circuit is powered by the Arduino board, except the motor shield which is powered by the 9V battery supply. The GPS module sends the input to the Arduino for detecting the current location of the boat. As a result of the comparison of the current location value and the threshold value, the Arduino triggers the buzzer, LED and the motor accordingly.

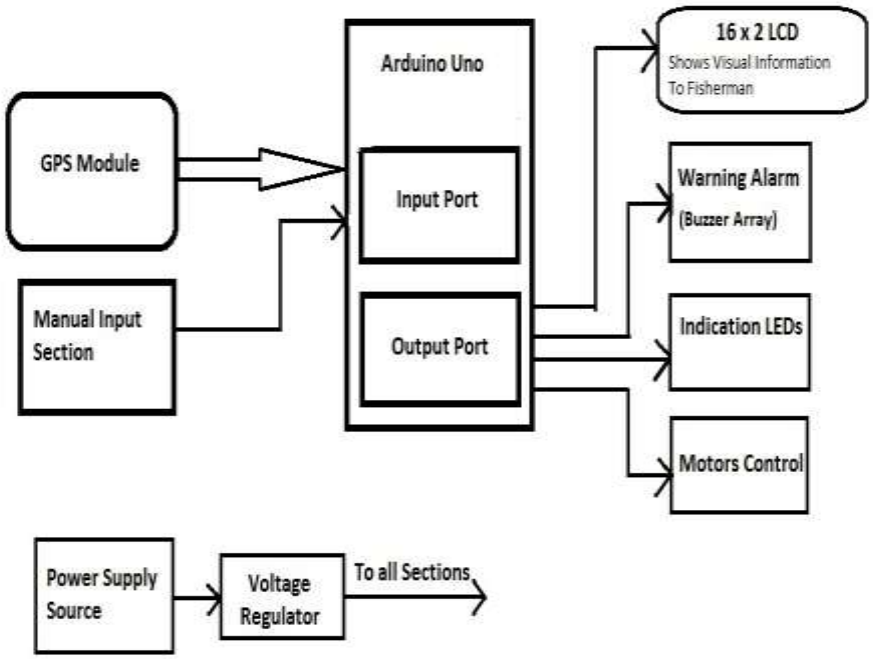

Fig -1: Architecture of the System

4.1 Arduino Uno

The Arduino Uno is an open source microcontroller board and is based on the ATmega328.It communicates using the STK500 protocol. It is easier to use and is cost effective. It can take any input like location from GPS, light on sensors and convert it into the desired output like driving a motor, announcement on a speaker. It comprises of 14 digital input/output pins, a 16MHz crystal oscillator, 6 analog inputs, a USB connection, an ICSP header, a power jack and a reset button[1].

Fig -2: Arduino Uno

4.2 GPS Module

This GPS Receiver Modem is based on SIMCOM's SIM28M GPS Module. It is a stand-alone receiver with built in LNA, which can track as low as -165 dbm signal even without network assistance[3]. SIM28M has excellent low power consumption characteristics. GPS is mainly used to enable a location processing logic to transmit the positioning data to the arduino. GPS (Global Positioning System) is a worldwide radio-navigation system formed by a constellation of 24 satellites and their ground stations[3]. With four satellites, a GPS receiver can provide very accurate clock (time, date) and position information. The Module must be used outdoors. It uses patch antenna. Provides current time, date, latitude, longitude, altitude, speed, and travel direction.

Fig -3: GPS Receiver

Fig -4: GPS Antenna

4.3 LCD

LCD stands for liquid crystal display. Since their interface serial/parallel pins are defined so it's easy to interface them with many microcontrollers[9]. Many products we see in our daily life have LCD in them. They are used to show status of the product or provide interface for inputting or selecting some process. Washing machine, microwave, air conditioners and many more are few examples of products that have character or graphical LCD installed in them.

Fig -5: LCD Display

4.4 Motor driver IC

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction[10]. It consists a Dual H-bridge Motor Driver integrated circuit (IC).The L293D can drive small and quiet big motors as well.

Fig -6: L293D IC

4.5 DC Motor

A DC motor is am electrical machine that converts one form of energy into another (i.e. electrical energy into mechanical energy). The most common types are dependent on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor[11]. The motor turns in the opposite direction when the polarity is switched.

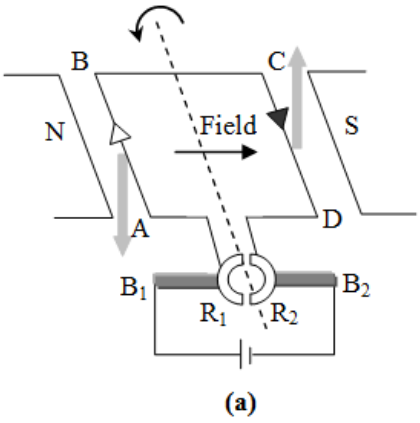

Fig -7: Working Principle

Fig -8: DC Motor

5. WORKING

- As the system is powered, locations are retrieved by the antenna of the GPS receiver. GPS transmits the data through USART and are noted down in the Arduino. The set button has to be activated to record current location of the boat.
- The Arduino reads the locations continuously from the GPS receiver, while the boat is on motion. The green led is turned "ON", and LCD exhibits "Safe Zone".

- Then Arduino repeats the task of reading the location continuously from the GPS using Serial Read Command and differentiates with the stored range of boundary values. If the outcome of the comparison i.e., the current values are within the range, it then controls the LM293D IC which drives the motors in forward direction.
- Once the locations surpass the boundary values the red LED is turned "ON" and the boat gets automated. Arduino steers the motor driver IC to alter the motor direction using the digital Write command. The buzzer is driven by the n-p-n transistor's collector voltage which beeps when the border is crossed, and automation begins.
- Under the automation phase, the boat retraces back its path away from the border. In this operation, the buzzer constantly beeps, and the Arduino displays "Danger Zone" on the LCD screen using digital Write command. *
- The boat ceases to move when it arrives sufficiently into the safe territory, and the buzzer terminates and the complete setup is brought under control of the fisherman manually.

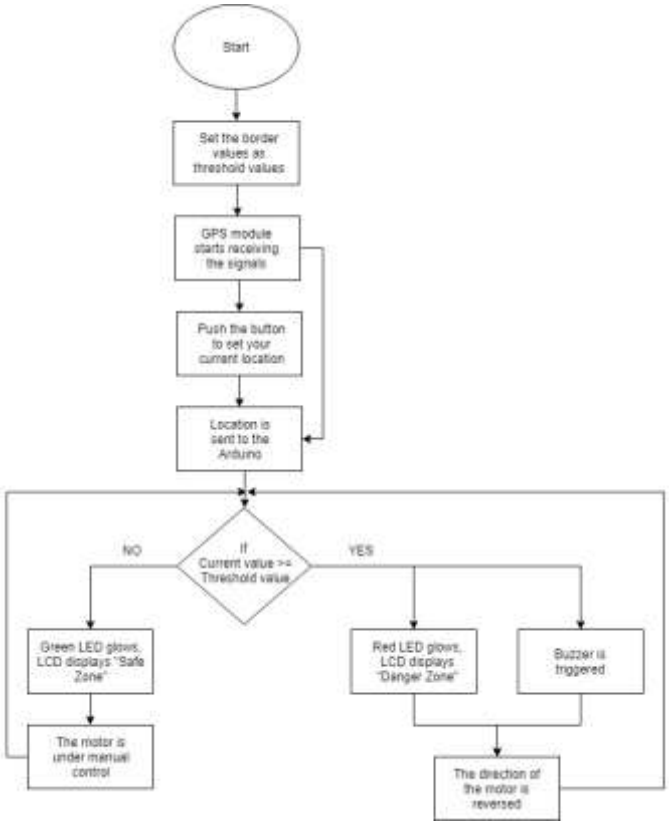

Fig -9: Flow Chart

6. TESTING AND RESULTS

- The boat is represented here by the "bot" made of 2 dc gear motors and the whole circuit is set up on the chassis.
- Some coordinates nearby the experimental location has been saved as the border location and the bot is started to move.
- The bot has successfully indicated all the signs when it is in danger zone and properly reversed its direction to reach the safe region along with the buzzer switched ON.
- Complete connections and interfacing the components with Arduino has been done on proteus. Library packages of the major components like Arduino and GPS which are not inbuilt have been added separately. Power supply, ground and basic components which are already available in this platform and have been used to complete the whole circuit configurations. This simulation has obtained desired results.

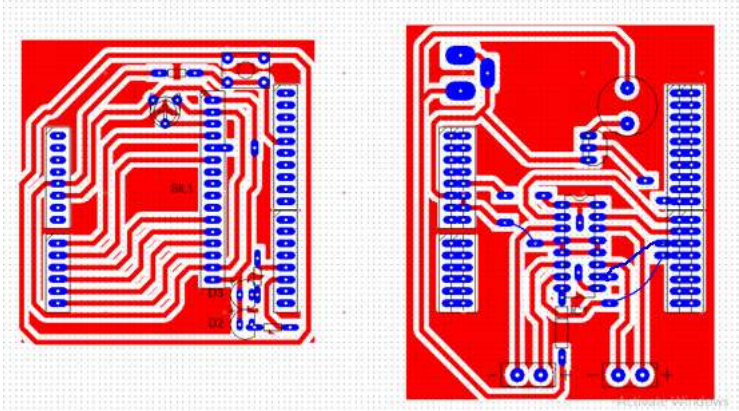

Fig -10: PCB Layout of the System

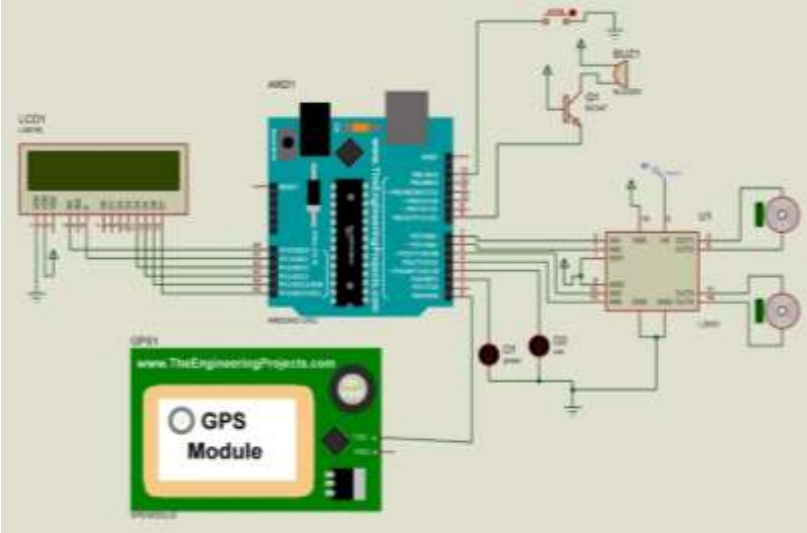

Fig -10: Simulation of the system on Proteus

7. CONCLUSION

In this paper, a POC type implementation of a portable equipment for border alert system aiding fishermen has been put forward and a working model has been set in motion and experimented. This methodology was fruitful in catching the sight of the border duly and escorting the fishermen to safety. However, the purposeful intention of this implementation is to ensure that the fishermen are traced out round the clock and are warned when the border is met across.

8. FUTURE SCOPE

- Mankind while wandering in the forests might set foot in the danger zones unknowingly which were prohibited by the forest department and fall prey for wild animals. This mechanism comes to their rescue in pointing out the danger zone.
- Marine traffic can be regulated, and the ships can be drawn away accordingly.
- The reliability of the GPS used can be revamped by incorporating advanced GPS module having very high sensitivity.

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