

DESIGN OF BORDER SAFETY SYSTEM

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ABSTRACT:

In day-to-day life we hear about many Tamil fishermen being caught and put under Srilankan custody and even killed. The sea border between the countries is not easily identifiable, which is the main reason for this cross border cruelty. Here we have designed a system using embedded system which protects the fishermen by notifying the country border to them by using Global Positioning System (GPS) and Global system for mobile communication (GSM). We use GPS receiver to find the current location of the fishing boat or vessel. Using GPS, we can find the current latitude and longitude values and is sent to the microcontroller unit. Then the controller unit finds the current location by comparing the present latitude and longitudinal values with the predefined value. Then from the result of the comparison, this system aware the fishermen that they are about to reach the nautical border. The area is divided into four zones-normal zone, warning zone, zone near to restricted zone and finally the restricted zone. If the boat is in normal area, then the LCD displays normal zone. Thus they can make it clear that the boat is in normal area. In case it moves further and reaches the warning zone, the LCD displays warning zone. If the fisherman ignores the warning or fail to see the display and move further, and if the boat enters the zone nearer to the restricted zone the alarm will turn on and the speed of the boat engine automatically gets controlled by 50%. If the fisherman did not take any reaction about the alarm and move further, then the boat will enter into the restricted zone, the alarm continues to beep as before, and once it touches the restricted zone, the boat engine gets off by the control of fuel supply to engine.

1. INTRODUCTION

The Tamil Nadu fishermen even today invoke the historical rights and routinely stay into the International Maritime Boundary Line (IMBL) for fishing. From Tamil Nadu about 18,000 boats of different kinds conduct fishing along the India-Sri Lanka maritime border. But by accidentally crossing the border without knowledge, they get shot by the Lankan navy. This leads to loss in the both humans as well as their economic incomes. We have developed a system which eliminates such problems and saves the lives of the fishermen.

2. WORKING PRINCIPLE

The GPS Modem will continuously give the signal which determines the latitude and longitude and indicates the position of the fishermen to them. Then it gives the output which gets read and displayed in the LCD. The same data is sent to the mobile of the fisherman and simultaneously the same data is sent to the Sea border security. An EEPROM is used to store the data, received by GPS receiver. The hardware which interfaces with microcontroller are LCD display, GSM modem and GPS Receiver. GPS (Global Positioning System) is increasingly being used for a wide range of applications. It provides reliable positioning, navigation, and timing services to worldwide users on a continuous basis in all weather, day and night, anywhere on or near the Earth. 28 satellites inclined at 55° to the equator orbit the Earth every 11 hours and 58minutes at a height of 20,180 km on 6 different orbital Lanes and each one of these satellites has up to four atomic clocks on board. All we require is an accurate clock. By comparing the arrival time of the satellite signal with the onboard clock time, at which the signal was emitted, the latitude and longitudinal degree of the

boat's location is determined. The current design is an embedded application, which will continuously monitor a moving Boat and once the boat goes beyond the level of the defined layer the particular operation will be done. For doing so an Arduino (ATmega328) microcontroller is interfaced serially to a GSM MODEM AND GPS receiver.

3. BLOCK DIAGRAM

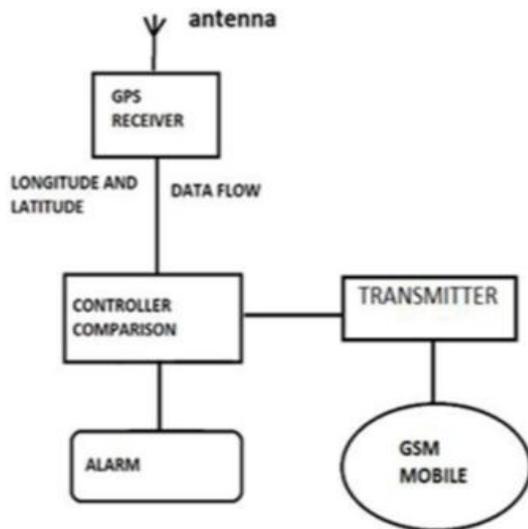


Fig. 1 Block Diagram for proposed system

3.1 GLOBAL POSITIONING DEVICE

A GPS navigation device is any device that receives Global Positioning System (GPS) signals for the purpose of determining the device's current location on Earth. GPS devices provide latitude and longitude information, and some may also calculate altitude. GPS devices are used in military, aviation, marine and consumer product applications.

3.1.1 GPS ACCURACY

The accuracy of GPS depends on the type of receiver. Most hand-held GPS units have about 10-20 meter accuracy. Other types of receivers use a method called Differential GPS (DGPS) to obtain much higher accuracy. DGPS requires an additional receiver fixed at a known location nearby. Observations made by the stationary receiver are used to correct positions recorded by the roving units, producing an accuracy greater than 1meter.

3.2. GSM MODULE

GSM module is used for transmission of message seeking assistance. GSM cannot be used in oceans as towers cannot be placed in oceans. Thus CDMA network or satellites can be used for message

transmissions .When vessel crosses border, the stored message along with current latitude and longitude positions is sent to the desired GSM module which is stored already. The prototype of the device is show in the below.

3.3 CONTROLLER

Arduino receives the data from the GPS receiver. The data received contains many details along with latitude and longitude. The latitude and Longitude of the current position is separated from the detailed data from GPS. The current positions are compared with already stored latitude and longitude of countries boundary locations. At first the latitude is compared with stored latitude which identifies if the current position is located near to the boundary. If the latitude matches then the adjacent latitudes and longitudes of the present latitude is retrieved from the controller. The current position received from GPS is stored as S1 (latitude), S2 (longitude). The latitude S1 is compared with stored latitudes.

If latitude match, then adjacent latitude and longitudes (X1, Y1 and X2, Y2) are retrieved from stored table and substituted in the equation given below:

Positions	Latitude	Longitude
Position 1	12° 05'.0 N	82° 03'.0 E
Position 2	12° 05'.8 N	82° 05'.0 E
Position 3	12° 08'.4 N	82° 09'.5 E
Position 4	12° 33'.0 N	82° 46'.0 E

$$(Y-Y1)/(Y2-Y1) = (X-X1)/(X2-X1)$$

By simplification, we get $ax + by = c$

Now, S1 and S2 are substituted in above equation of line.

Here two cases are possible:

Case 1: If LHS<RHS, then vessel is inside country border.

When vessel is inside country's border, the arduino controller gets the input from GPS receiver after a short delay loop. Latitude and longitude is extracted and manipulation with the new locations is done in the algorithm.

Case 2: If LHS>RHS, then vessel has crossed border.

When vessel crosses border, an alarm is generated immediately. Along with alarm a signal is also sent to GSM module for transmission of

message to desired sender. Alarm continues until the vessel comes back inside the country's border.

4. MARITIME BOUNDARY BETWEEN INDIA AND SRI LANKA

The boundary points are marked above. These points should be stored in microcontroller. The computation is done in arduino with these points. Thus vessel crossing the border is being calculated.



5. CONSEQUENCE

Boat Position and Navigation System contains,

- Layer1: Green LED indication
- Layer2: Red LED indication
- Layer3: Alarm indication & speed control
- Layer4: Engine off

6. CALCULATING THE POSITIONS

Because GPS receivers do not have atomic clocks, there is a great deal of uncertainty when measuring the size of the Spheres. Each radius corresponds to the distance calculated to the satellite. All possible distances to the satellite are located on the circumference of the circle. If the position above the satellites is excluded, the location of the receiver is at the exact point Where the three circles intersect beneath the satellites. Although the distance to the satellites can only be roughly estimated at first, a GPS receiver can precisely calculate these distances relative to each other. Because the relative size of the spheres is known, there is only one possible point where they can intersect.



7. BENEFITS

- The hijack of the ship by the pirates can be eradicated.
- The lost ship wrecks due to natural calamities can be identified
- By keeping the kits in the entire boats and by knowing the locations of all the boats we can use our kit to assist the traffic.

8. APPLICATION

- We can use this device also as bomb detector
- Location of any lost vehicle could be found.

9. ADVANTAGES

- Accuracy determination of location
- Maintenance cost is low
- Easily replaceable

10. CONCLUSION

Thus the fishermen can easily identify the national sea borders and therefore prevents them from entering their area. Thus saving their lives and providing good relationship with the neighboring countries. Also, the piracy of ship can be easily brought under control.

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