DESIGN OF BORDER ALERT SYSTEM FOR FISHERMEN USING GPS

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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 locationby comparing the present latitude and longitudinal values with the predefined value. Then from the result of the comparison, this system aware the fishermenthat 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 LCDdisplays 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 movefurther, 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.**

I. 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.

II. 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 worldwideusers 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 AT89c51microcontroller is interfaced serially to a GSM MODEM AND GPS receiver.

Fig 1. GPS working

III. EXISTING SYSTEM

At the present time there are few existing systems whichhelp to identify the current position of the boats/ships usingGPS System and view them on an electronic map. For thepurpose of identification the fisherman are using the GPS72h, equipment used for the navigation in sea. Itprovides the fastest and most accurate method for marinersto navigate, measure speed, and determines location. Thissystem enables increased levels of safety and efficiency. Itensures whether the ship reaches its destination safely. The accurate position information becomes even more critical as the vessel departs from or arrives in port.

IV. PROPOSED SYSTEM

The proposed system uses a GPS receiver which receives signal from the satellite and gives the current position ofthe boat. The proposed system is used to detect the border ofthe country through the specified longitude and latitude ofthe position, not only between Sri Lanka and India but allover the world. The particular layer level i.e. border can bepredefined and this can be stored in microcontroller memory. The current value is compared with predefined values and if thesevalues are same, immediately the particular operation will be done i.e, the microcontroller gives instruction to the alarm to buzzer.It also uses a message transmitter to send message to thebase station which monitors the boats in the sea. Thesystem provides an indication to both fisherman and to coastal guard. Thus it saves the lives of thefisherman and alerts the base station to provide help.

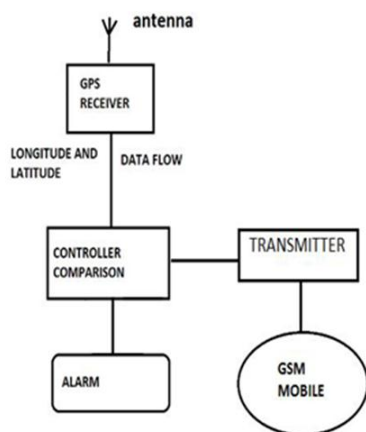### V. PROPOSED SYSTEM ARCHITECTURE

Fig. 2 Block diagram

VI. PROPOSED SYSTEM FLOW DIAGRAM

The GPS receiver receives the signal and converts it into desired data message. The data is sent to microcontroller and microcontroller extracts the latitude and longitude from the data. The positions are compared with the stored Boundary latitude and longitude positions. If the vessel is found beyond the border, then an alarm is generated along with a message transmission by a GSM.
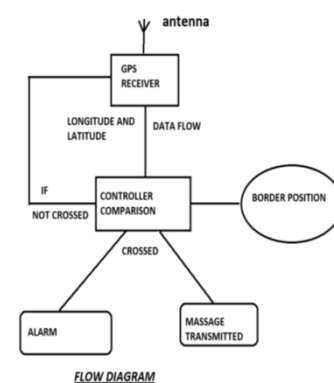

Fig. 3 System Flow Diagram

VII. 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. GPSdevices provide latitude and longitude information, andsome may also calculate altitude. GPS devices are used inmilitary, aviation, marine and consumer product applications.

VIII. GPS ACCURACY

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

IX. CONTROLLER
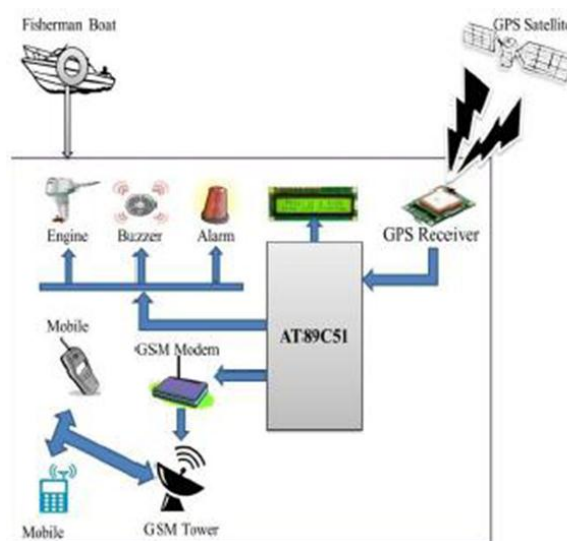
Microcontroller receives the data from the GPSreceiver through UART. The data received containsmanydetails along with latitude and longitude. The latitudeand Longitude of the current position is separated fromthe detailed data from GPS. The current positions arecompared with already stored latitude and longitude ofcountriesboundary 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 microcontroller. 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:

Postions	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 aboveequation 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 microcontrollergets the input from GPS receiver after a short delayloop.Latitude and longitude is extracted and manipulation withthe new locations is done in the algorithm.

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

When vessel crosses border, an alarm is generatedimmediately. Along with alarm a signal is also sent toGSMmodule for transmission of message to desired sender. Alarm continues until the vessel comes back insidethe country's border.
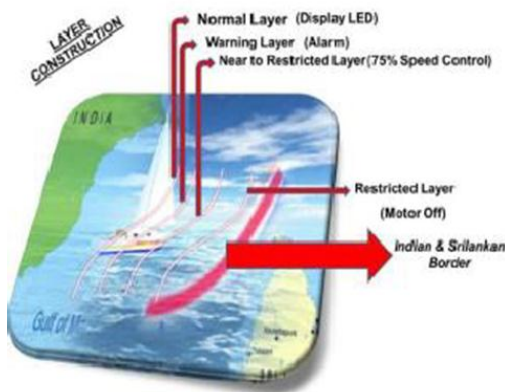
The boundary between India and Sri Lanka in the waters from Adam's Bridge to Palk Strait shall be arcs of Great Circles between the following positions, in the sequencegiven above, defined by latitude and longitude.

X. MARITIME BOUNDARY BETWEEN INDIA AND SRI LANKA

The boundary points are marked above. These points should be stored in microcontroller. The computationis done inmicrocontrollerwith these points. Thus vesselcrossing the border is being calculated.
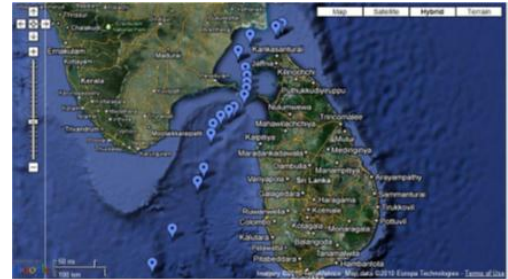

XI. CONSEQUENCE

Boat Position and Navigation System contains,

- Layer1: Green LED indication
- Layer2: Red LED indication
- Layer3:Alarm indication &speed control
- Layer 4: Engine off

XII. 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.
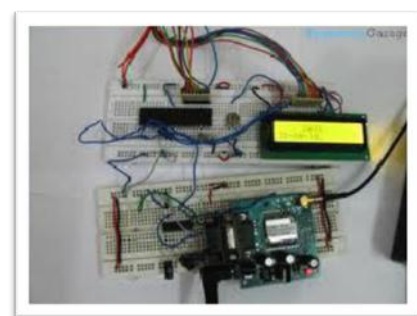
XIII. CALCULATING THE POSITIONS

Because GPS receivers do not have atomic clocks, there is agreat deal of uncertainty when measuring the size of theSpheres. Each radius corresponds to the distance calculatedto the satellite. All possible distances to the satellite arelocated on the circumference of the circle. If the

positionabove the satellites is excluded, the location of the receiveris at the exact pointWhere the three circles intersect beneaththe satellites. Although the distance to the satellites canonly be roughly estimated at first, a GPS receiver canprecisely calculate these distances relative to each other.Because the relative size of the spheres is known, there isonly one possible point where they can intersect.
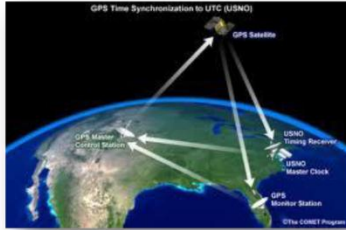
XIV.   DISPLAY UNIT

A LCD display16×2 is used for displaying the latitude andlongitude. LCD display is connected to port 1 oftheMicrocontroller. Every pin of port 1 is connected toLCD display. Message is sent through commands viaserial Communication.

XV.   FUTURE SCOPE

- We can use the EEPROM to store the previous NavigatingPositions up to 256 locations.we can navigate up toNnumber of locations by increasing the memory ofEEPROM.
- We can reduce the size of the kit by using GPS+GSMon the same module of GPS navigator.
- We can increase the accuracy up to 3m by increasingthe cost of the GPS receivers.

XVI.   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.

- Incase of any accident on the sea. it can be detected by the system and the accident location of the boat is sent to the rescue team.

XVII.   APPLICATION

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

XVIII.   ADVANTAGES

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

XIX.   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 neighbouring countries. Also, the piracy of ship can be easily brought under control.

REFERENCES

[1] GPS-based vessel position monitoring and display system. *Aerospace and Electronic Systems Magazine, IEEE*, Jul 1990.
[2] www.falcomusa.com.
[3] A. Michalski, J. Czajewski, The accuracy of the global positioning systems, *IEEE Instrumentation & Measurement Magazine*, vol. 7 (1), pp. 56–60, 2004.
[4] http://earth.google.com/.
[5] M. Diaz, 'Integrating GPS receivers into consumer mobile.