IOSR Journal of Computer Engineering (IOSR-JCE)
e-ISSN: 2278-0661, p-ISSN: 2278-8727
PP 19-23
www.iosrjournals.org

Intelligent boundary alert system using GPS

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ABSTRACT: *The Tamil Nadu factor in India-Sri Lanka relations that had been quiet for long has come to the fore in the form of the fishermen issue. Frequent incidents of fishermen from Tamil Nadu getting shot in the Sri Lankan's maritime boundary have enraged all citizen of the state. From Tamil Nadu about 18,000 boats of different kinds conduct fishing along the India - Sri Lanka maritime border. Ever since violence broke out in Sri Lanka two decades ago, fishing activity has not been peaceful. Tamil Nadu fishermen are arrested, or shot, by the Sri Lankan Navy. In this problem will be solved by using An Intelligent Boundary Alert System (IBAS).An IBAS system induces the new methodology for saving the fishermen valuable life and their properties from the Sri Lankan's navy. The main objective of this system is used to help the fishermen to navigate inside our maritime country border.*

Keywords - *GPS, ARM7, WSN*

I. INTRODUCTION

The Tamil Nadu factor in India-Sri Lanka relations that had been quiet for long has come to the fore in the form of the fishermen issue. Frequent incidents of fishermen from Tamil Nadu getting shot in the Sri Lankan's maritime boundary have enraged all citizen of the state. From Tamil Nadu about 18,000 boats of different kinds conduct fishing along the India-Sri Lanka maritime border. Ever since violence broke out in Sri Lanka two decades ago, fishing activity has not been peaceful. Tamil Nadu fishermen are arrested, or shot, by the Sri Lankan Navy. From the fishermen's point of view, straying takes place inadvertently, due to sheer ignorance about maritime boundaries. At times, the drift is because of engine failure or strong currents. At the same time however, quite a few Indian fishermen engage in free floating to exploit marine resources in Sri Lankan waters, knowing full well, the risks involved in crossing the International Maritime Boundary Line (IMBL). Growing markets for marine resources has forced Tamil Nadu fishermen to take risks. 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. GPS is made up of three segments: Space, Control and User. GPS has become a widely used aid to navigation worldwide, and a useful tool for map-making, land surveying, commerce, scientific uses, tracking and reliance, and hobbies such as geo caching and way marking. None of the present GPS systems satisfy the requirements for the safety of civilian navigation in the sea as the maritime boundary of a country cannot be marked. It adds on the versatility and the usefulness of a GPS device in the sea. The main objective of the paper is to help the fishermen not to navigate beyond other country's border. If a fisherman navigates beyond the country's border, an alarm is generated indicating that the fisherman has nearing the border. With this alarm, the fisherman can be caution and come back inside the country's border. Additionally, a message transmitter is interfaced with the device to send a message to base station located on the shore indicating that a vessel has crossed the border. Thus guards in the shore can assist and provide additional help to those fishermen if needed.

II. EXISTING SYSTEM

At present, there are few existing systems which help to identify the current position of the boats/ships using GPS system and view them in an electronic map. GPS provides the fastest and most accurate method for mariners to navigate, measure speed, and determine location. This enables increased levels of safety and efficiency for mariners worldwide and accurate position, speed and heading are needed to ensure the vessel reach its destination safely. The accurate position information becomes even more critical as the vessel departs from or arrives in port.

III. PROPOSED SYSTEM

The proposed system is used to detect the maritime boundary of the country where the long time dispute between Sri Lanka and India still exists. This mainly happens when fisherman crosses maritime

border of neighboring country as he is not aware of the limits in sea. The proposed system uses a GPS which receives signals from the satellite and gives the current position of the boat. With already known details of the latitude and longitude of the maritime boundary stored in the ARM processor .It compares the current position and stored boundary position if the vessel near to the boundary means it generate an alarm. It also uses a WSN to send message to the base station which monitors the boats in the sea. Our system provides an indication to both fisherman and to coastal guard. Thus the system saves the lives of the fisherman or reduces the damages caused to them by Lankan coast guard.

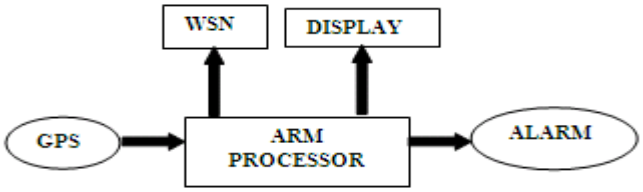

Figure 1: block diagram

GPS send the current position to the ARM processor.arm processor already known details of the maritime country border. It compares the current position to the maritime border. If the vessel is near to the border then it give alarm and it again compare to the border if the vessel position again near to the border means it stop the motor. And the information sends to the coast guard. The coast guard helps the fishermen to reach the safe position.

IV. RESULT AND ANALYSIS

The power supply connects with the GPS to initialize the GPS module. And the GPS interface to the laptop by using UART. GPS produce the NMEA output. So the given output is separated by using the Visual Basics. The resultant output given to the ARM processor. ARM processor compares the current position to stored value. If the resultant value is greater than the stored value then the alarm is generated. And the information sends to the coast guard.

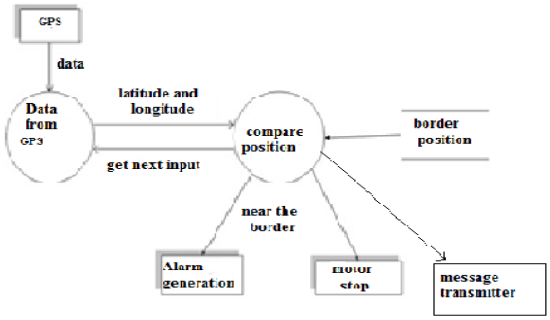

Figure 2: GPS working flow diagram

The maritime boundary between Sri Lanka and India in the Bay of Bengal shall be arcs of great circles between the following positions, in the sequence given below, defined by latitude and longitude:

Table 1: Maritime boundary in Bay of Bengal

POSITIONS	LATITUDE	LONGITUDE
Position 1	**10° 05'.0 N**	**80° 03'.0 E**
Position 2	**10° 05'.8 N**	**80° 05'.0 E**
Position 3	**10° 08'.4 N**	**80° 09'.5 E**
Position 4	**10° 33' 0 N**	**80° 46'.0 E**
Position 5	**10° 41'.7 N**	**81° 02'.5 E**
Position 6	**11° 02'.7 N**	**81° 56'.0 E**
Position 7	**11° 16'.0 N**	**82° 24'.4 E**

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 sequence given below, defined by latitude and longitude

Table 2: Maritime boundary in Palk Strait

POINT	LATITUDENORTH	LONGITUDEEAST
1	10° 05'	80° 03'
2	09° 57'	79° 35'
3	09° 40'.15	79° 22'.60
4	09° 21'.80	79° 30'.70
5	09° 13'	79° 32'
6	09° 06'	79° 32'

a. 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 microcontroller with these points. Thus vessel crossing the border is being calculated.

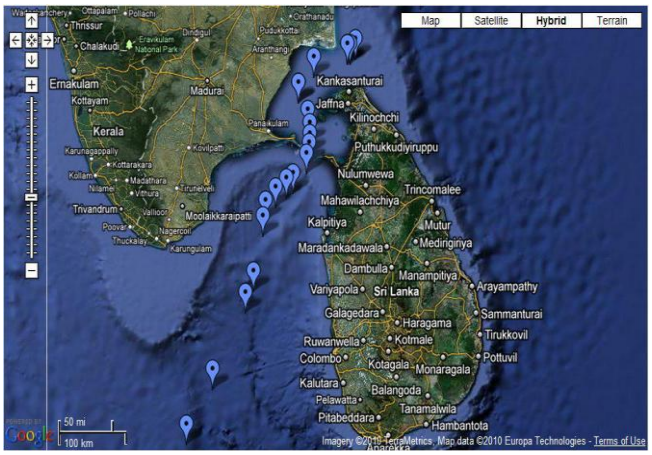

Figure 3: Graphical representation of border

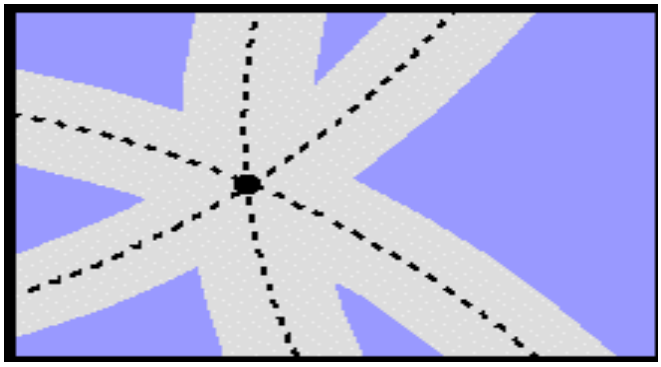

Figure 4: Calculating the position

Because GPS receivers do not have atomic clocks, there is a great deal of uncertainty when measuring the size of the spheres. In the figure at left, the dashed lines show the actual intersection point, and the gray bands indicate the area of uncertainty. 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.

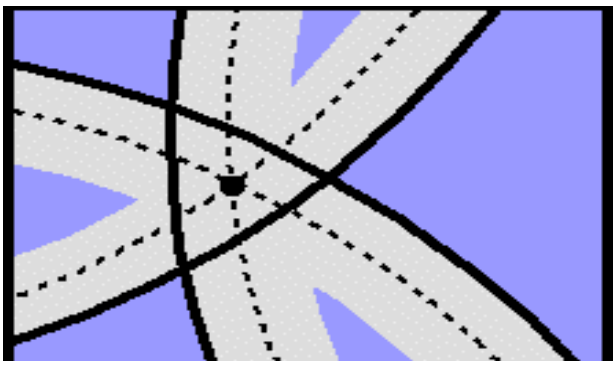

Figure 5: sphere location

In fig 5, the solid lines indicate where the GPS receiver "thinks" the spheres are located. Because of errors in the receiver's internal clock, these spheres do not intersect at one point.

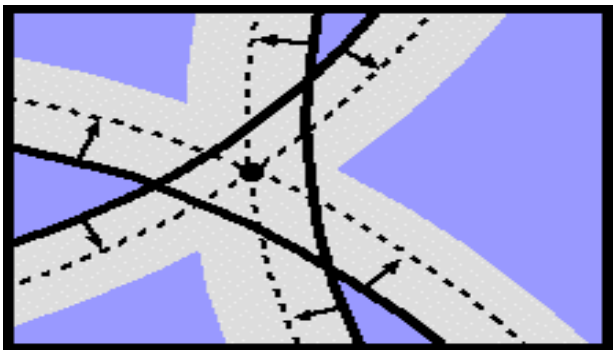

Figure 6: intersection point determination

The GPS must change the size of the spheres until the intersection point is determined. The relative size of each sphere has already been calculated, so if the size of one sphere is changed, the other spheres must be adjusted by exactly the same amount. Three spheres are necessary to find position in two dimensions four are needed in three dimensions.

b. Distance Calculation

The distance the vessel has travelled can be calculated from the starting point of the vessel. This allows the fisherman to know how much distance he has travelled from the shore. This calculation can be done on basis of the Harversine formula.

R=earth's radius(mean radius=6,371km)
diff_lat=lat2−lat1
diff_long=long2−long1
a=sin²(diff_lat/2)+cos(lat1).cos(lat2).sin²(diff_long/2)
c=2.atan2((a)^(½),(1-a)^(½))
distance = R*c

c. GPS Output

By using VB, the GPS NMEA output is separated into latitude and longitude value.

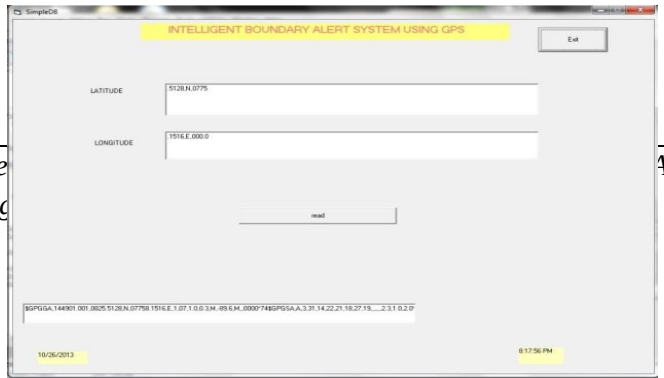

Figure 7: GPS output

V. CONCLUSION

NMEA values are obtained from GPS. By using visual basics the latitude and longitude values are separated from NMEA values. In future these values are given to the ARM processor.ARM processor have been already known details of the maritime country border. It is used to compare the current position with stored value. The resultant value is near to the stored value then it gives alert to the fishermen to save the fishermen valuable life. And it gives the information to the coast guard in the shore.

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