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IMPLEMENTATION OF MARITIME BORDER ALERT SYSTEM

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Abstract: The technology proliferation of Global Positioning System (GPS) is used to provide location based positioning, Navigation and time details in all climatic conditions and even anywhere any time. Though it comprises three units namely control unit, space and user unit and has become popularly used technology for time and location sensitive navigation, tracking and surveillance applications. The requirements of safety civilian in the sea as the maritime boundary (navigation) of a country cannot be achieved. The marine GPS navigation device and packages became a revolutionizing tool for fisherman boat's maritime border crossing issues. The proposed system coins a low cost maritime border crossing alert system that amalgamating the potency of marine GPS device. It continuously monitoring, tracking, alerting and controlling the fisherman's activity from the remote station located on the shore.

Keywords: Maritime border crossing; Low cost maritime border crossing alert system; Marine Global Positioning System

I. INTRODUCTION

The island like Sri Lanka, peninsula like India and the coastal countries are separated by their maritime borders. The people livelihood in coastal area of those countries purely depends on fishing occupation in the sea. Crossing the border is being a serious offence. Especially, In Tamilnadu nearly 20,000 boats perform fishing in the Bay of Bengal [10]. Due to carelessness or unknowing the boundary limit, the fisherman used to rude the maritime borders. Once they rude the border, they arrested or killed by the relevant navy and they are being abducted and their boats are being captured by the neighbourhood countries coastal guards. In such situation the lives of fishermen continue to be difficult. It is a major threatening issue and leads to loss in the both humans as well as their economic incomes.

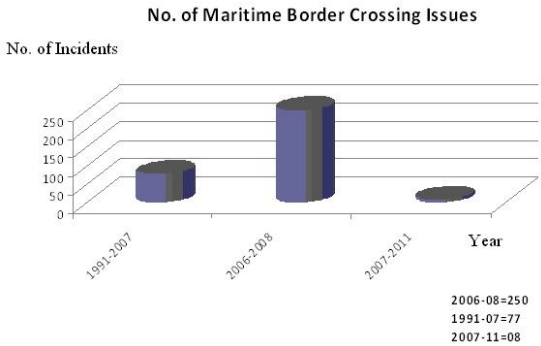

Fig. 1 No. of Maritime Border Crossing Issue

As far as the fishing activity has not been peaceful since the issue of maritime border crossing. Coastal route is always a choice of intruders. Fig 1 shows between the years of 1991-2011, 86 Indian fishermen are killed in 167 incidents by Sri Lanka navy [11]. In 2013 Madurai bench of madras high court will quoted. In order to avoid this issue, there is a need for producing significant realization among our fishermen to avoid crossing over into Sri Lanka water boundary. The technology proliferation will be an apt choice for resolving the nautical boundary crossing issue. Global Positioning System (GPS), Global System for Mobile communication (GSM) and Wireless Networks can be the best choice for addressing the maritime border crossing issue. The proposed system is used to devise a low cost alert system for fisherman that gives an alert when the boat/ship crossed beyond other country's border. It helps the fishermen not to go afar of border. If the fishermen violate the border agreement, an alarm (danger signal) is generated indicating that the fisherman has violated the rule. In addition, a Global System for Mobile communication supported TX interface will send (forward) 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. Keeping in mind about lives of Indian fishermen, this device has been created to help them not to move beyond Indian border.

II. EXISTING SYSTEMS

At first the wireless networks are utilized by many applications where the locations of the nodes in the networks need to be tracked based on the calculation of communication factors among nodes. Hence many time and secure sensitive applications require the deployment of mobile ad-hoc networks. Mobile Ad-hoc Networks (MANETS) can also used for addressing these issues by algorithms called cooperative localization. The challenges are extended to cooperative localization is that multiple hops nodes cannot be localized using single hop localization algorithms. In sensor network technology, the localization of sensor needs to be tagged with sensor data. Cost and energy depletions are the notable drawbacks of the sensor networks. Presently there are few existing systems using GPS technology to track and identify the current position of the boats/ships. These systems used electronic map that provides an effective method for navigation and localization detection by the naïve users. This also acquires increased levels of safety and efficiency

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for mariners. The accurate position information becomes even more critical in GPS based monitoring system.

III. PROPOSED WORK

The proposed system is a low cost maritime border crossing alert system mainly focused the small scale fisherman who lives just near to the poverty line. This system includes data collection unit, Processing unit, Controlling unit and Transmission unit as shown in fig 2. The data collection unit consists of location detection components like GPS, transmitter and other components attached in the boat that accomplish the vessel localization by collecting the geographical positions. The processing unit holds the set of latitude and longitude values of the sea in the form of databases that can be used for comparing the present boat position with legal border limits. The controlling unit resides in the sea shore (remote station) from where the decision has been made if the vessel crossed the maritime border. All the communication among these three units is handled by transmission unit. The proposed system's detailed work flow is discussed in the following sections.

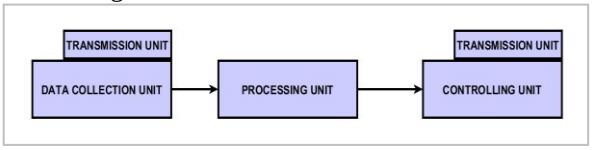

Fig. 2 Block diagram of the proposed system

A. Work flow of the proposed system

Fig 3 shows that the Marine GPS receives the longitude and latitude values of geographical location and converts it into desired data message. The data is transmitted to the MC (PIC 16F877A microcontroller) and it extracts the latitude and longitude values from the data. The positions are compared with the latitude(N) and longitude(E) positional database values. If the vessel is found beyond the border, then an alert is generated along with a message transmission by a RX.

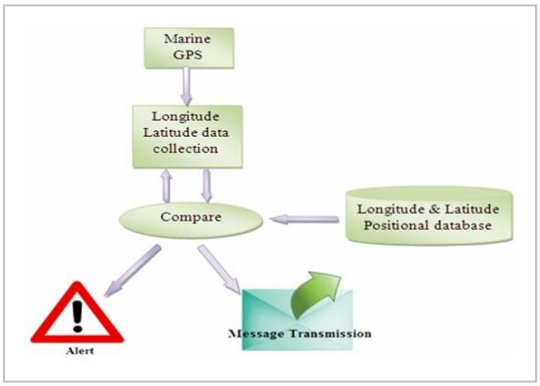

Fig. 3 Workflow diagram of the proposed system

ACKNOWLEDGMENT

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B. Data Collection Unit and Controlling Unit

The data collection unit amalgamates the components GPS module, display unit, transmission unit, micro controller and buzzer for indication. Fig 4,5,6 shows the organization diagram of this unit. Through the GPS calculation, location of the boat is monitoring continuously and transferred to the remote station after minimal processing steps.

The 3 level border (B1, B2, and B3) areas details are stored in the controlling unit. If a vessel crossed B1, the controlling unit will provide an alert through buzzer through the radio frequency transmitter. If a vessel crossed B2, the control room will send an alert message to the ship and coastal guards. If a vessel crossed B3, motor of the boat will be stop using motor drive from the control unit itself. Fig 4 shows the block diagram of the controlling unit.

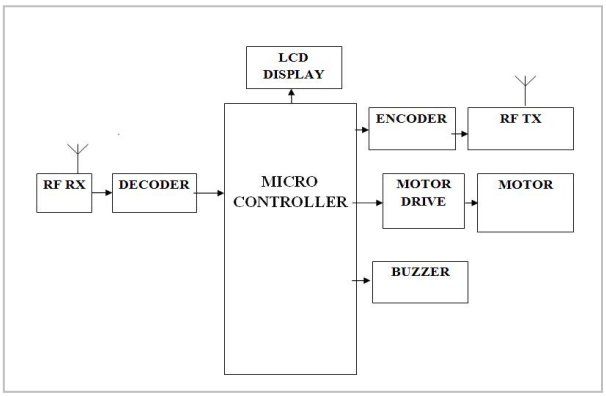

Fig. 4 Component organization of data collection unit

All three longitude and latitude values of three level border is stored in the database which located in the remote station. Sample maritime boundary's longitude and latitude values of three borders are tabulated in table 1. The surveillance boats included a RFID tags for find out exact vessel in the sea and also control the movement of the boat further.

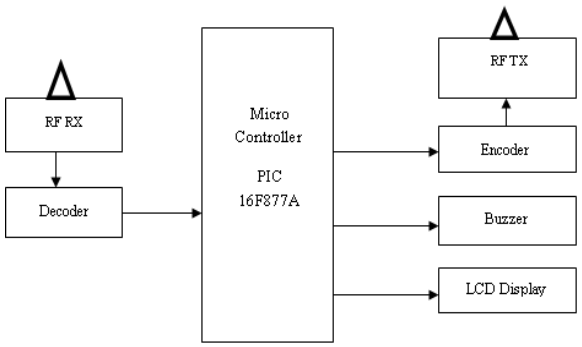

Fig. 5 Organization of controlling unit

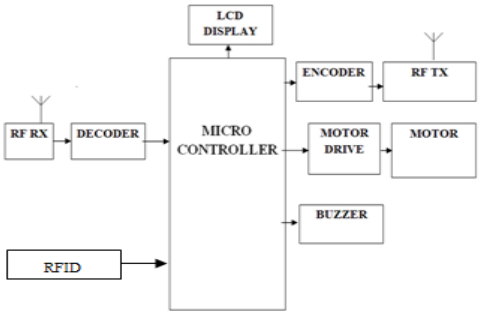

Fig. 6 Survillence boat

TABLE I

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SAMPLE MARITIME BOUNDARY IN BAY OF BENGAL

Borders	Boundary Values	
	Latitude	*Longitude*
B1	10° 05'.0 N	80° 03'.0 E
B2	10° 08'.4 N	80° 09'.5 E
B3	10° 33'.0 N	80° 46'.0 E

Though the latitude and longitude value is retrieved through satellite, GPS device has the internal component for calculating exact location value based on the retrieved information from satellite.

IV. TECHNOLOGIES USED

A. Global Positioning System(GPS)

It is a space based satellite navigation system and radio navigation system that produces timing and location information in all climate conditions, nearby the Earth where there is an unobstructed line of sight to 4 or more Global positioning system satellites. The system produces critical capabilities to army, civil users and commercial users everywhere the world. The GPS RX receives the signals from GPS satellites that can only be used suitably in outdoors. Conventional receivers did not suitable for forest regions or metropolitan cities due to the buildings obstruction but the latest receiver designs have high performance.

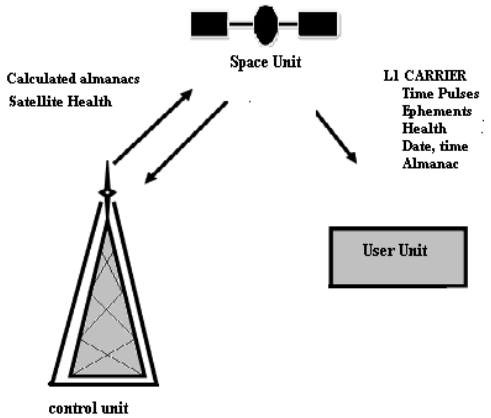

Fig. 7 GPS Segments

GPS processes mainly depend on time reference. The GPS receiver perceives the location of the satellites. The latitude and longitude values are calculated by estimating how far away a satellite imaginary sphere. The GPS signal made of a pseudo random code, almanac data and ephemeris data in its signal. The GPS architecture is shown in fig 7.

B. GPS Satellites

A satellite [8] is manned or unmanned vehicles that move around the earth or other planet in defined path. Many number of artificial, or man-made, satellites orbit Earth. Some of them capture pictures of the planet which facilitate the better research on weather prediction and track hurricanes. Few of them track and monitor other planets for preceding the space based research. Fig 8 shows that India has launched 72 satellites (seventy two Indian satellites) (as of 5 November 2013) of many types since its first attempt in 1975 [11]. The Indian Space Research Organization (ISRO) is the responsible organization for Indian satellites. Localization is one of the applications of some satellites which send the coordinate value of the earth. By using the GPS technology based device the location can be easily find out.

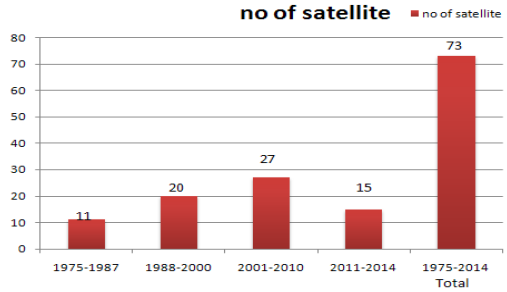

Fig. 8 Number of Indian satellites

C. GSM Module

GSM cannot be placed in oceans so that satellite communication is used for message transmission. When the vessel crosses the border, GSM module is used to receive the latitude and longitude positions which are already stored in the database. The data transmission enhanced once the vessel crossed the border with an alert to the GSM module for transmission of message to desired sender. Alert continues until the vessel comes back inside the country's border.

D. Other Components

Mechanical energy converted into electrical energy by DC motor. Principle of Lorenz force which states that when a wire carrying a current this will produce some magnetic field in a region the wire experience the force based on this DC motor will works & it give torque to coil to relate. Radio frequency identifier (RFID) [3] is a tracking technology used to recognize and validate tags that are applied to any product, individual or animal. Radio frequency observation and recognition is general term used by produce use of radio waves in order to identify objects and people

V. SIMULATION ENVIRONMENT

The simulation of this project has done with the help of PROTEUS simulation tool. Printed circuit board layout now offering automation of both component track routing and, placement getting the design into the computer can often be the most time consuming element of the exercise. The simulation result of the proposed work using PROTEUS is given below.

References section must not be numbered.

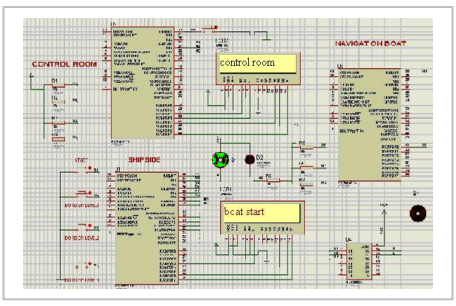

Fig. 9 PROTEUS simulation tool

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Here all the components are configured as per the system design using PROTEUS tool. The fig 9 shows that pin level connection and configuration of all components of three units like control room, boat section and navigation boat. Three level border crossing scenarios are simulated &shown in fig 10, 11, 12. Fig 13 and 14 displays the boat starting and Navigation boat starting simulation setup.

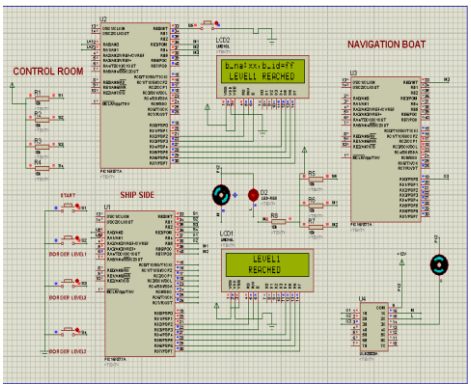

Fig. 10. Border1 crossing simulation setup

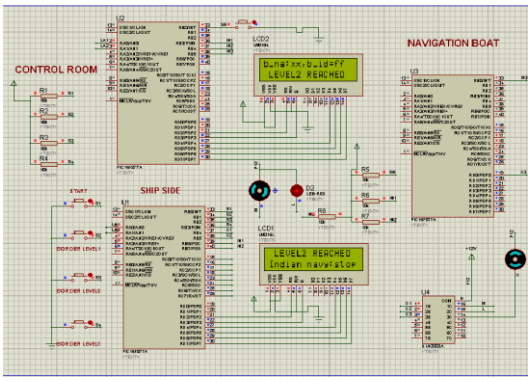

Fig. 11. Border2 crossing simulation setup

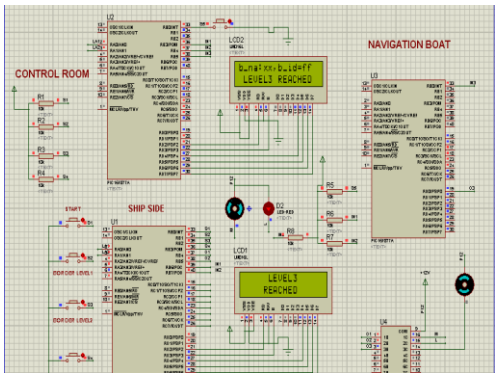

Fig. 12.Border3 crossing simulation setup

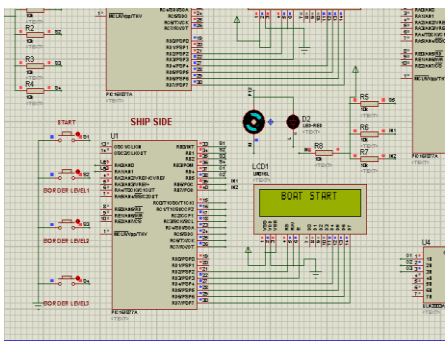

Fig. 13. Boat starting

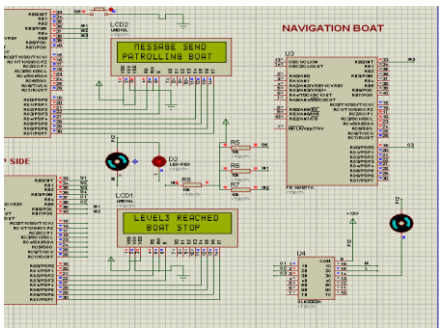

Fig. 14. Navigation boat starting simulation setup

VI. CONCLUSION

In the conventional, the fishermen have to keep watch the maritime border, which cannot be easily separated as land region. If they crossed certain limit on the sea. They have to pay the penalty or got arrested by the naval guards of the neighbor country. The project generates alarm if they cross the border by mistake. With the simple circuitry and the use of sensors (low cost sensors) makes the project a low cost product, which can be purchased even by a poor fisherman. This project is best suited for places where the fishermen continuously monitor the boundary limit. This project also aims at solving relevant social problems with the appropriate use of satellite geographical location data for through wireless networking. Our goal is to confront wireless networking with a concrete problem of world-wide dimensions, the sustainability of fishermen community are taken care by the simulation experiments. The simulation result shows the circuit level work is outperformed well that can be extended to circuit fabrication in future. This paper will be used for advancement of coastal border averment. This also will give sufficient process to both ship and coastal guardians, if anyone crossing the border. The process of routing the fishermen will make more efficient. The process of increasing the accuracy will be achieved greater in future.

REFERENCES

[1] Arora.A , Kumar.S, and Lai. T, "Barrier Coverage with Wireless Sensors," Proc. MobiCom, pp. 284-298, 2005.

[2] Akan,OB, and Arik, M "Collaborative Mobile Target Imaging in UWB Wireless Radar Sensor Networks," IEEE J. Selected Areas in Comm., vol. 28, no. 6, pp. 950-961, Aug. 2010.

[3] Bulut, E, and Szymanski,B,A , Wang,Z "Distributed Energy-Efficient Target Tracking with Binary Sensor Networks," ACM Trans. Sensor Networks (TOSN), vol. 6, no. 4, pp. 1-32, 2010.

[4] Chand,N, Katiyar, V, Kumar,P, "An Intelligent TransportationSystems Architecture Using Wireless Sensor Networks," Int'lJ. Computer Applications(CA), vol. 14, no. 2, pp. 22-26, 2011.

[5] Challen, G.W, Waterman, J., and Welsh, M., "IDEA: Integrated Distributed Energy Awareness for Wireless Sensor Networks," Proc. Eighth Int'l Conf. Mobile Systems, Applications, and Services (MobiSys '10), 2010.

[6] http://timesofindia.indiatimes.com/city/madurai/85-fishermen-killed-by-Sri-Lanka-in-10-years-Govt/articleshow/15540452.cms

[7] K. Suresh Kumar et al., "Design of low cost maritime boundary identification device using GPS system", International Journal of Engineering Science and Technology, Vol. 2(9), PP. 4665-4672, 2010

[8] http://softwarecrackandhack.blogspot.in/2013/06/proteus-pro-74 p3.html

[9] http://my.opera.com/kelompok9/blog/proteus-7-4

[10] http://www.isro.org/satellites/satelliteshome.aspx