GPS System Based Low Cost Maritime Boundary Identification Device

N.Divya, R.R.Rubia Gandhi, I.Abinaya, M.Karthik, R.Mohan Kumar

Abstract — *The aim is to build a friendly environment for the Indian fishermen preventing them from facing many hardships. This can be done using GPS(Global Positioning System) that provides navigation, positioning and other time details in all the weather conditions for everyone and everywhere.GPS system being used for map-making, commerce, surveillance. But this paper helps in preventing the violence created between India-Sri Lanka caused for crossing the border IMBL(Indian Maritime Boundary Line) which is unintentional. The important purpose of this paper is to alert the fishermen before crossing the country's border. If they travelled beyond the border an alert message will be transmitted or sent to the base station by using an X-bee transmitter. This system is developed to help the lives of the fishermen and not to move beyond Indian Boundaries. On the whole it is a plan of creating a suitable device for civilian navigation at low cost.*

Keywords— *GPS, X-bee module, AT89S52, IMBL*

I. INTRODUCTION

The relation between India-Sri Lanka became unhealthy due to the fishermen issue. This issue affected the culture and heritage of both India and northeast .Since fishermen of both countries were living below the poverty line, so they were fond of fishing in the areas where they get a greater profit despite all the conditions beyond that, Sri Lanka about 20000 boats involved in shipping along India- Sri Lanka border. Shipping activities is not peaceful in Sri Lanka for the past two decades. As the result, many Most of the Tamilnadu fisherman was shot by the Sri Lankan navy. This is mainly due to the unaware of the border crossing area.

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Also many Indian fishermen likely depend on fishing in Sri Lankan area which is banned in 1976 by maritime boundary agreement another factor that urges Indian fishermen to cross the boundary is the quantity of the fish available there and the brown prawns beyond IMBL (Indian Maritime Boundary Level).

II. EXISTING SYSTEM

Initially the wireless networks were used by various applications like when the location of the nodes are to tracked by the calculation of the communication factors various secure and sensitive applications requires the deployment of mobile ad- hoc networks. These networks (MANETS) can be used for addressing the location issues by algorithms called as cooperative localization. Here the main issue is that multiple hop nodes can't be localized using single hop localization algorithms. Cost and energy depletions were the main drawbacks of the sensor networks. At present there were few existing systems using GPS technology to identify and to track the present position of the boats/ships. This system uses electronic map that provides an effective method for navigation and locality detection by the worldwide users. It provides greater security for mariners. The precise position based information becomes more critical in GPS based monitoring system.

III. PROPOSED SYSTEM

This system is to safeguard the poor mariners before crossing the border and helps them to go in a right path to save their lives. Our proposed system helps detecting the location of the Fishing boat using GPS system. GPS system helps in detecting the latitude and longitudinal positions of the Fishing boat and send signals to the boat using wireless mode to guide the boat , if travels beyond the border. It is the latest technology which helps us in identifying the vessel either inside or outside the border. The XBEE technology helps in communicating from both the ends , the control system and Fishing boat. With the help of trending technologies we can able to save the human life from danger. GPS is used here to monitor the boat position anywhere in the sea. The GPS receiver receives the boat position in the form of latitude and longitude from satellite through GPS antenna and sends the information to the 8051 microcontroller. The Microcontroller displays the latitude and longitude on the LCD display which is interfaced to it.

Then information signal is transmitted to the base stations and the coastal guards through ZIGBEE module. Microcontroller is pre-programmed in such a way to undergo the process. All the information related to the process is sent to the Microcontroller and the operations takes place instantly.
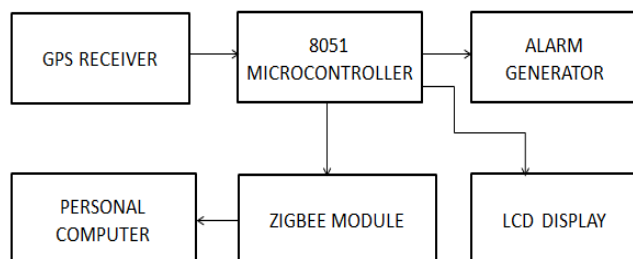
IV. PROPOSED SYSTEM ARCHITECTURE

Figure1: Proposed System Architecture

The signal is received by the GPS receiver and converted into desired data that can be read by the microcontroller. The microcontroller is pre-programmed to extract the latitude and longitude from the data received as of the GPS receiver. The received positions are verified with the default values of boundary. If any object crossed beyond the predefined border values, an alert is given to the fisherman in LCD and also to the base stations through X-bee module

V. BOUNDARY POSITION

The maritime margin between India- Sri Lanka and India in the Gulf of Mannar will be like arcs of great circles between the two countries. The values in latitude and longitude of the maritime border between the two countries in the Gulf of Mannar region are shown in Table 1.

Positions	Latitude	Longitud
1	09° 06'.0 N	79° 32'.0 E
2	09° 00'.0 N	79° 31'.3 E
3	08° 53'.8 N	79° 29'.3 E
4	08° 40'.0 N	79° 18'.2 N
5	08° 37'.2 N	79° 13'.0 E
6	08° 31'.2 N	79° 04'.7 E
7	08° 22'.2 N	78° 55'.4 E
8	08° 12'.2 N	78° 53'.7 E
9	07° 35'.3 N	78° 45'.7 E
10	07° 21'.0 N	78° 38'.8 E
11	06° 30'.8 N	78° 12'.2 E
12	05° 53'.9 N	77° 50'.7 E
13	05° 00'.0 N	77° 10'.6 E

Table 1: Maritime Boundary in the Gulf of Mannar

Table 2 shows the values in latitude and longitude of the International maritime border between the two countries in the Bay of Bengal region. Table 3 shows the values in latitude and longitude of the maritime border between the two countries in the Palk Strait region. The border points will be stored in microcontroller (AT89S52).

Microcontroller is used to compare the points with the boat's present location with the predefined boundary values. When the boat crosses the maritime limit values, an alert signal is indicated to save mariners lives.

Positions	Latitude	Longitude
1	10° 05'.0 N	80° 03'.0 E
2	10° 05'.8 N	80° 05'.0 E
3	10° 08'.4 N	80° 09'.5 E
4	10° 33' 0 N	80° 46'.0 E
5	10° 41'.7 N	81° 02'.5 E
6	11° 02'.7 N	81° 56'.0 E
7	11° 16'.0 N	82° 24'.4 E

Table 2: Maritime boundary in the Bay of Bengal

Positions	Latitude	Longitude
1	10° 05' N	80° 03' E
2	09° 57' N	79° 35' E
3	09° 40'.15 N	79° 22'.60 E
4	09° 21'.80 N	79° 30'.70 E
5	09° 13' N	79° 32' E
6	09° 06' N	79° 32' E

Table 3: Maritime boundary in Palk Strait

VI. ZIGBEE SYSTEM

Zig-Bee is used for communication and to form personal area networks build from low power, small digital radios. It follows IEEE 802.15 standard. However it operates on low- power, Zig-Bee modules can transfer data to long distances by transient data with various intermittent objects to reach modules at high distant, by creating a lattice network. Zig-Bee modules are applied to secure net working areas, sustained battery life and decreased data rate. Zig-Bee has a proposed data transfer rate of 250 Kbit/s, and it is suitable for timely or alternating data or a single data transmission from sensors or any other devices. Its wide usage includes wireless switch using light, display in electrical meters, system application for management of traffic and other relevant industrial equipments that requires small distance low cost data transfer. Zig-bee modules are less expensive and less expensive than other WPANs, like Bluetooth or Wi-Fi.

Applications of Zig-bee:

1. Home Automation
2. Sensory Wireless networks
3. Industrial Automation and control purposes
4. Embedded framework
5. Medical records collections
6. Smoke warning
7. Intruder recognition
8. Automation in Building

VII. GLOBAL POSITIONING SYSTEM [GPS]

The Global Positioning System is a satellite based navigation system that provides location and time data in all weather conditions, anywhere on the Earth where there is an unobstructed line of sight to four or more GPS satellites which are orbiting around the earth. This system provides significant capabilities to military, civil and commercial users around the world. It is maintained by the United States of America and is freely accessible to anyone with a GPS receiver.

VIII. RESULTS AND DISCUSSION

This paper is proposed using 8051 microcontroller. It is designed using an embedded system applicable for protection of fishermen. In this work, for hardware interfacing and GPS Receiver serial interface AT89S52 microcontroller device is used. The serial communication between the GPS receiver and the microcontroller is done by MAX-232 protocol.

The PROTEUS design tool is used for simulation process. Proteus software is used for microprocessor simulation, and design in printed circuit board (PCB). Proteus Professional is used for computer-aided design of electronic circuits. An important use of the Proteus Professional package is the prospect of simulating the programmable devices: microcontroller, microprocessor and others.
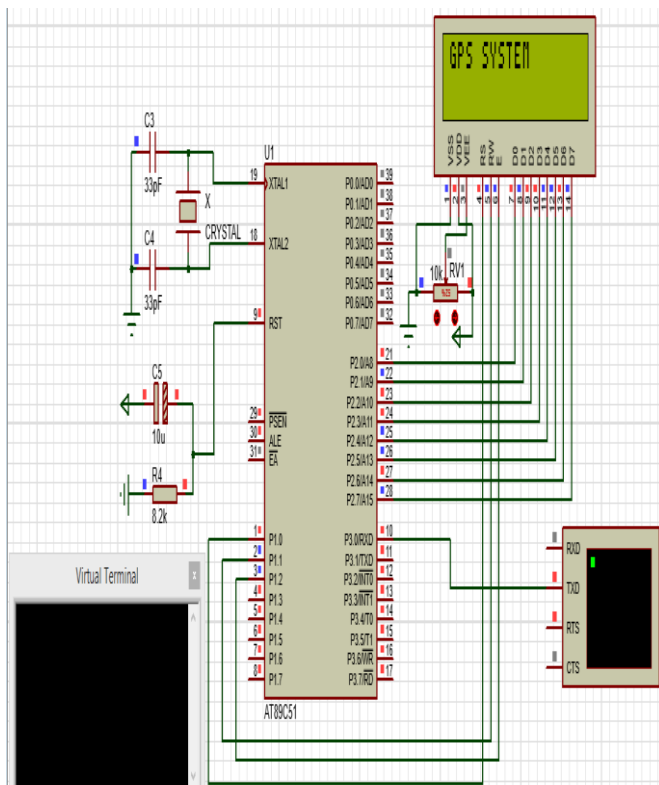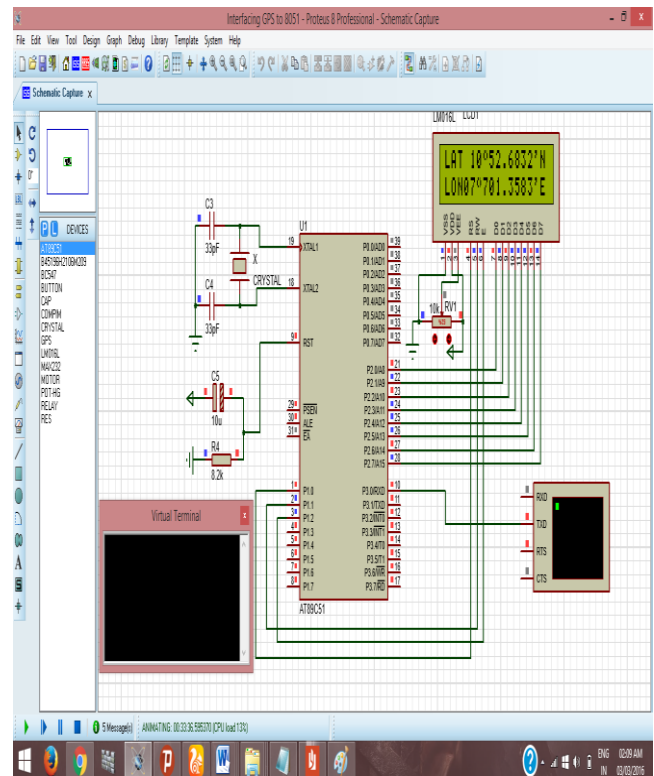

Figure 3: Simulation diagram of LCD showing Latitude and Longitude values
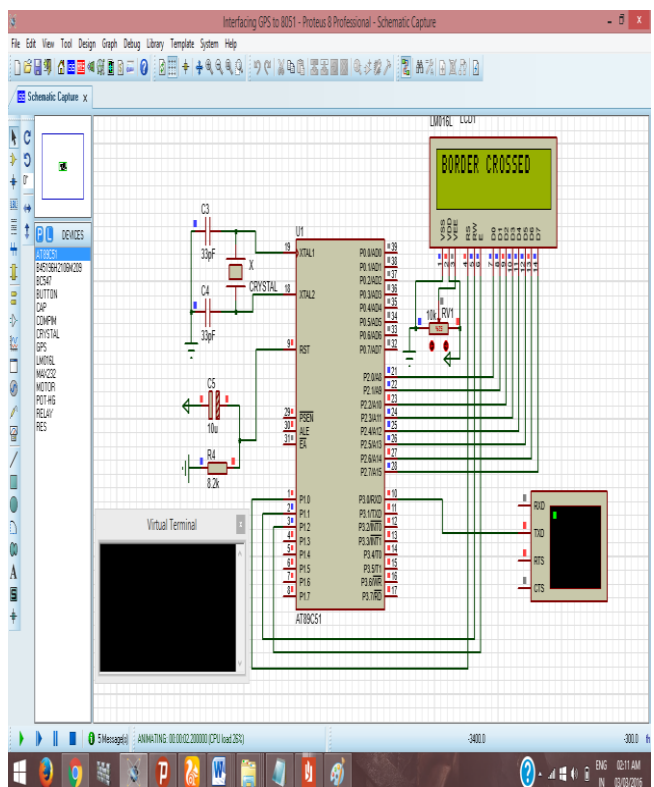

Figure 4: Simulation diagram of LCD showing the alert message

The figure 1 shows, how the 8051 microcontroller is interfaced with GPS receiver and LCD display. Initially the LCD displays GPS SYSTEM.

Figure 2: Simulation diagram of GPS receiver interfaced with microcontroller and LCD

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The figure 2 indicates the LCD display showing the latitude and longitude values which are obtained from the GPS receiver interfaced with 8051 microcontroller, as the microcontroller is programmed to do so. The figure 3 shows LCD displaying the Alert message when the device crosses the border.
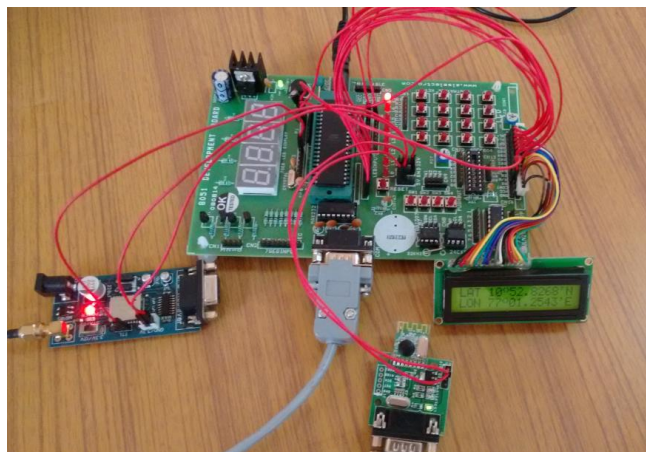

Figure 5: Hardware setup of GPS system

IX. CONCLUSION

From the proposed system, Border Alert System for Boats using GPS and Zig-bee, its results and discussions proves that this system works well, and can be put forward to practical applications. The main feature of this paper is when someone crosses the border line; the module shows indication of warning message in the LCD display and alerts the fishermen, so that the life of innocent fishermen can be saved.

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