Simulation of Secured Maritime Border Alert System using GPRS and RFID

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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. Even though they are using GPS System, the sea border between the countries is not easily identifiable, which is the main reason for this crossborder cruelty, that is why the fishermen knowingly or unknowingly crossing the border. To overcome this, we design GPRS and RFID based Secured Coastal Border Alert System (CBAS) using Rasp-berry pi-3. Our proposed system have a two modules. One is for authentication (Guard station) using RFID and another (Boat control station) is for coastal border alert system using GPRS. In this system, the fishermen can't cross the restricted Border. We can provide life security to the fishermen and also enables the fishing community to serve as a surveillance unit.**

Key words : Boarder alert system, GPRS, GSM, RFID

I. INTODUCTION

1.1 Problem faced :

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. 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 shown in **Fig.1.**

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 : 109 Indian fishermen in Sri Lankan custody now (The Indian Express – Nov 17 , 2017)

1.2. Objective :

- To Track and authenticate the fishing boat in the sea
- To provide an Engine locking Module and Rescue Module for more secure while crossing the restricted layer.
- To provide life security to the fishermen and also enables the fishing community to serve as a surveillance unit.

1.3. Back ground study :

1.3.1 Indian Srilankan Coastal border:

The Indian Srilankan Coastal border is shown in Fig.2 and the layers longitude and latitudes are Table 1

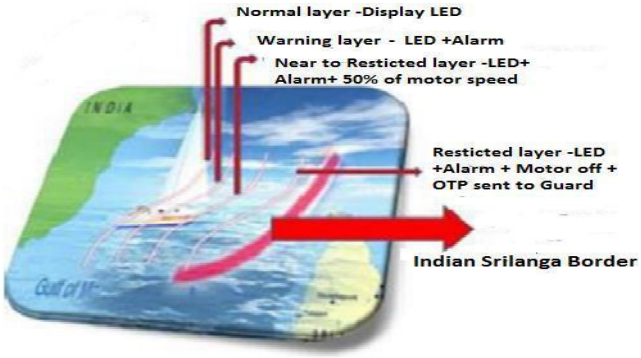

Fig.2 Indian SrilanganCoastal border

Table 1 : longitude and latitudes of the CB

Position	Layer	Latitude	Longitude
1	Normal	12° 05'.0 N	82° 03'.0 E
2	Warning	12° 05'.8 N	82° 05'.0 E
3	Near Restricted	12° 08'.4 N	82° 09'.5 E
4	Restricted	12° 33' 0 N	82° 46'.0 E

1.3.2 RFID (Radio Frequency IDentification)

RFID methods utilize radio waves to accomplish this. At a simple level, RFID systems consist of three components: an RFID tag or smart label, an RFID reader, and an antenna. RFID tags contain an integrated circuit and an antenna, which are used to transmit data to the RFID reader

1.3.3 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 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.

1.3.4 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.

1.4 Solution identified

To overcome this, we design RFID based Secured Coastal Border alert System using Raspberry pi-3.

I.5 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. MANETS can used for address - ing these issues by algorithms called cooperative localization. Presently there are few existing systems using GPRS 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. The accurate position information becomes even more critical in GPS based monitoring system. This also acquires increased levels of safety and security for mariners. For that ,in our proposed system we are using RFID for authentication

1.6 Organization of the paper

In this paper, chapter I discussed about the Introduction**,** in chapter II, we have to discuss about the Proposed work & Design flow**,** in chapter III is for Implementation and in chapter IV is for Result and discussion.

II. PROPOSED WORK & DESIGN FLOW

The proposed design shown in **Fig 3** consists of two sections :

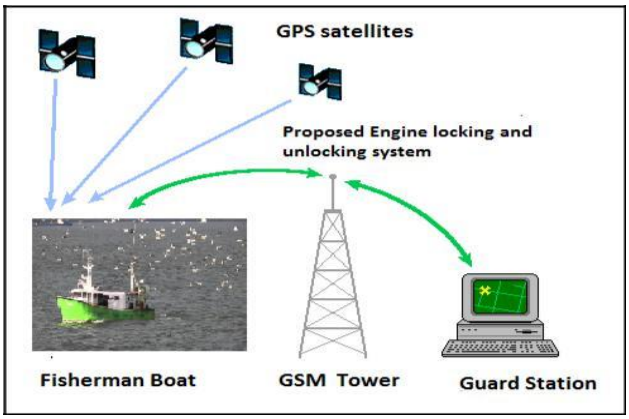

Fig 3 : GPS and GSM based CBAS

Module:1 Raspberry pi & RFID based Guard Controlled Section (GCS) located in sea shore **Module:2** Micro controller & RFID based Coastal Border Alert Section (CBAS) located in the boat for authenticated Indian fisherman

2.1 Process flow :

The CBAS has three process. It is shown in **Fig.4**

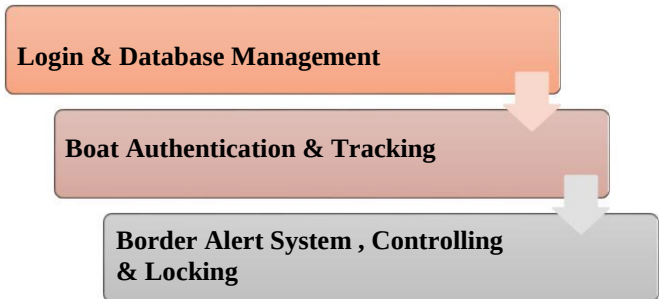

Fig.4 Process flow of CBAS

2.2 Flow Diagram

2.2.1 *Enrol & Login of Fishing boat ID in Guard Section:*

Registration : **Step**:1 Each RFID Tag contain unique ID and each boat having different tag.

Each authenticated Indian fisherman have separate tag and their information along with their mobile number are stored in the database via USB port of raspberry and it can be visualized in the Monitor. The flow diagram is shown in **Fig.5**

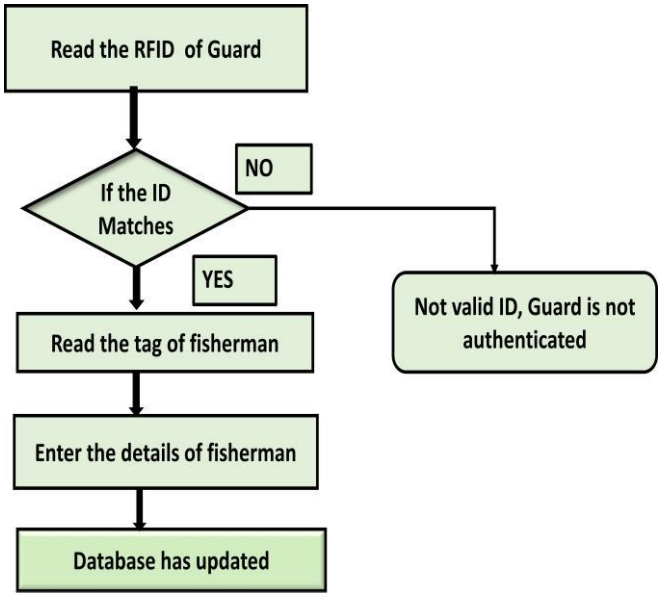

Fig.5 Registration & Login of Fishing boat ID in Guard Section

2.2.2 Enrol and login : **Step:2** RFID reader allows only the authorize Indian fisherman tag and allow them to enter in to the sea. It is shown in **Fig.6**

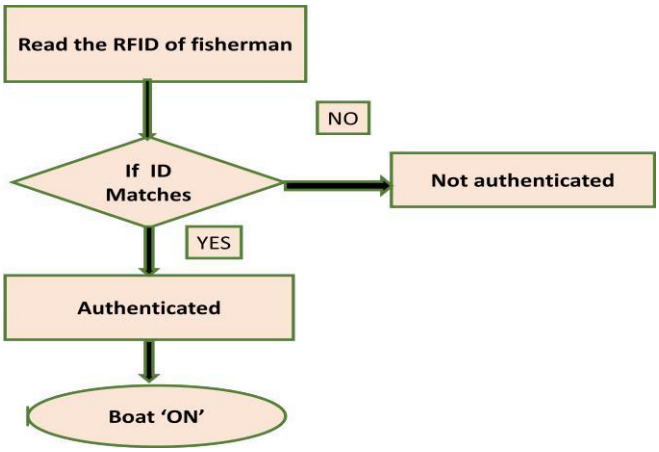

Fig.6 Enrol and login

2.2.3 Boat engine controlling system: The flow Diagram is shown in **Fig 7.**

Step 3: Unique RFID of the fisherman read by the RFID reader. After verifying the stored fisherman ID in the Microcontroller, the boat engine is ON and the boat move.

Step 4: We use GPS to find real time latitude & longitude (**R11 & R12)** and it is compared with the predefined stored layer specification **(S11 & S12)** in the Micro controller.

Border calculation:

Let **R11 & R12** be first point**(x1,y1)** and **S11 & S12** be the second point **(x2, y2)** We know the equation of the straight line with two points be

$$\frac{\quad}{\quad} = \frac{\quad}{\quad} \qquad \text{--- (1)}$$

From that we can have

$$ax + by = C \qquad \text{--- (2)}$$

Using Eq (2) the boundary points are calculated.

Let LHS = Stored Latitude and Longitude data,

RHS = Received Latitude and Longitude data.

Here There are two cases are possible:

- Case 1: If **LHS ≤ RHS,** then **Boat is inside country border.** (no changes)
- Case 2**:** If **LHS>RHS**, then **Boat has crossed border.** (indicate according to layers specified)

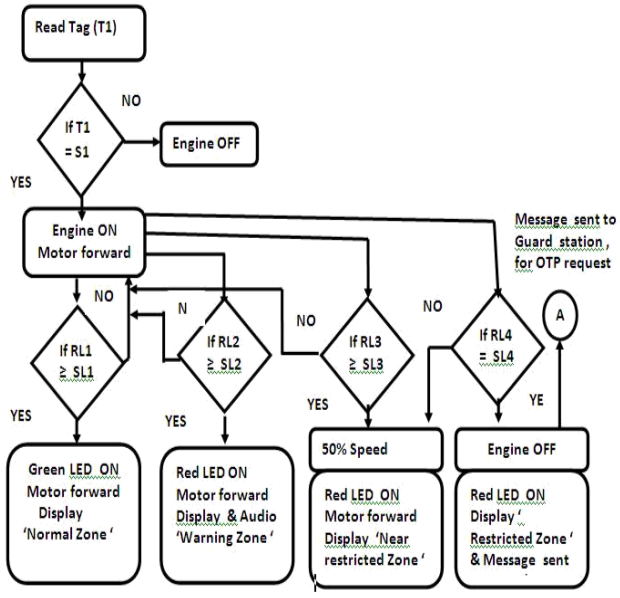

Fig. 7: Boat engine controlling system

Step 5: When it cross the Normal layer **(C1),** the message **" Boat is in Normal layer"** is displayed in the LCD display " and **Green LED is ON,** that indicate as the boat is in safe Zone.

Step 6: When it cross the Warning layer **(C2),** the message " **Boat is in Warning layer**" is displayed

" **Red LED is ON,** and **alarm is also ON**, that indicate as warning Zone.

Step 7: When it cross the Near restricted layer **(C3),** the message " **Boat is in Near restricted layer**" is displayed " Red LED is ON, alarm is ON and **engine speed is reduced to 50%**

Step 8 : When it cross the restricted layer**(C4),** the message " **Boat is in restricted layer**" is displayed, " Red LED is ON, alarm is ON, **engine**

is locked, immediately the boat ID from microcontroller is **sent** to the **Guard section** module along with **via GSM** the message that **Boat is locked.**

III. IMPLEMENTATION

3.1 In our design we proposed 2 boats with 2 RFID tag & two RFID reader in different location and they can be connected to raspberry pi via USB port shown in **Fig 8.** The Circuit diagram of Boat Engine controlling system along with RFID, GPRS and GSM using 8051 is shown in **Fig 9.**

Fig 8. RFID & LCD - Raspberry pi via USB port

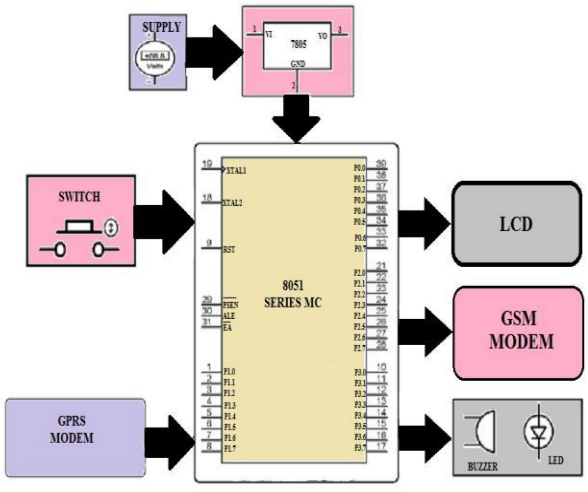

Fig. 9: Circuit diagram of Boat Engine controlling system

IV. RESULTS AND DISCUSSION

4.1 Module:1 Raspberry pi with RFID – Guard Control Section

Using **phython language, we can read the RFID** Tag data from the RFID reader are accessed by the Rasperry Pi The program is shown below and the simulated output is shown in **Fig.10**

RFID python program

```
import serial                    #import serial module
def read_rfid      ():
  ser = serial.Serial ("/dev/ttyAMA0")       #Open named
  port

     ser.baudrate = 9600                     #Set baud rate to 9600
     data = ser.read(12)
     ser.close ()                            #Close port
     return data                             #Return data
id = read_rfid ()                            #Function call
print id                                     #Print RFID
```

Fig. 10 Raspberry pi with RFID – Guard Control Section

4.2 Module:2 8051 with RFID – Coastal border Alert Section

Similarly, The latitude and longitude values of different layers of border is stored in 8051 using **keil** software. When the GPRS data is less than the stored data the boat is with in the layer and the Engine is ON shown in **Fig.11**. The corresponding result is shown in **Fig.12.** Otherwise if the GPRS data is greater than the stored data the boat crossed the border layer and the Engine is OFF. The corresponding result is shown in **Fig.13**

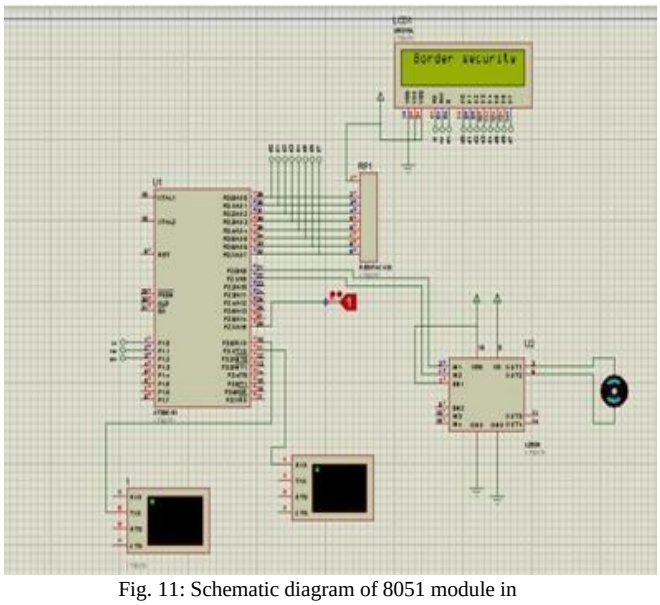

Fig. 11: Schematic diagram of 8051 module in PROTEUS

V. CONCLUSION

5.1 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

5.2 Future scope

- For immediate access , use **Paytm** for penalty fees.
- We can Connect the Guard section (Raspberry pi) to cloud via cloud server and store more data . We can also send the E-mail to nearer Recue stations

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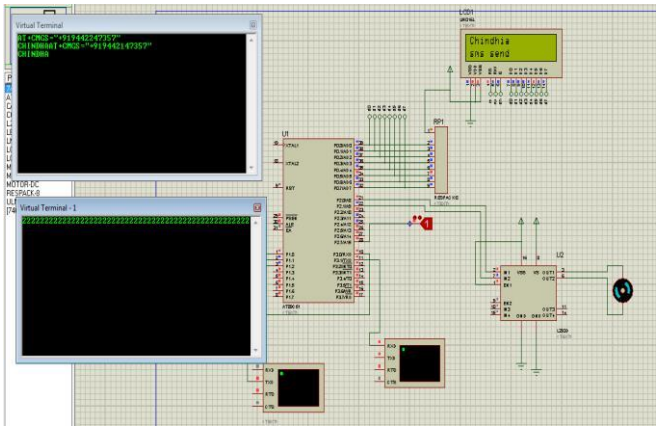

Fig. 12: 8051 with RFID – Boat is with in the Layer (Engine ON)

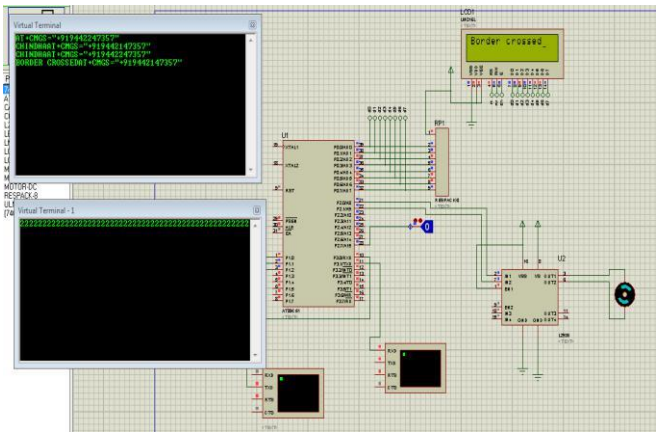

Fig. 13: 8051 with RFID – Crossed the border (Engine OFF)

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