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STUDY OF MARITIME BOUNDARY IDENTIFICATION AND FISHERMAN PATROL SYSTEM

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ABSTRACT

Today's life we hear about many Tamil fishermen being caught and put under Shri-Lankan 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 usingPIC microcontroller which protects the fishermen by notifying the country border to them byusing 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, wecan find the current latitude and longitude values and is sent to the micro controller unit. Thenthe controller unit finds the current location by comparing the present latitude and longitudinalvalues with the predefined value. Then from the result of the comparison, this system awarethe fishermen that they are about to reach the nautical border. The area is divided into threezones- normal zone, warning zone, restricted zone.If the boat is in normal area, then the LCD displays normal zone. Thus they can make it clearthat the boat is in normal area. In case it moves further and reaches the warning zone,the LCDdisplays warning zone and alarm is triggered in boat .The Boat Unit installed in each boat continuously retrievesits GPS coordinates and calculates the distance between the boat and the stored values of themaritime border.When the distance between boat and border furtherdecreases to a minimum value the coordinates of the boat is sent to the Coast Guard patrol boatserver by the GSM module.

Keywords: GPS Module, GSM Module, LCD, PIC Micro controller, CCS C compiler,PICkit 2 v2.61., Protel Client 98, Proteus.

I. INTRODUCTION

The Tamil Nadu fishermen even today invoke the historical rights and routinely stay intothe International Maritime Boundary Line (IMBL) for fishing. From Tamil Nadu about 18,000boats of different kinds conduct fishing along the India-Sri Lanka maritime border. But byaccidentally crossing the border without knowledge, they get shot by the Lankan navy. Thisleads to loss in the both humans as well as their economic incomes. We have developed a systemwhich eliminates such problems and saves the lives of the fishermen.The system is used to detect the maritime boundary of the country where the long timedispute between Sri Lanka and India still exists. This mainly happens when fisherman crossesmaritime border of neighboring country as he is not aware of the limits in sea. The proposedsystem uses a GPS receiver which receives signals from the satellite and gives the

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current position of the boat. With already known details of the latitude and longitude of the maritimeboundary, the PIC microcontroller calculates the current position and stored boundary positionsand indicates the fisherman that he has crossed the boundary by an alarm system. It also usesa message transmitter to send message to the base station which monitors the boats in the sea.This system provides an indication to both fisherman and to coastal guard. Thus the systemsaves the lives of the fisherman or reduces the damages caused to them by Sri Lankan coastguards.

II. LITERATURE SURVEY

In this system we have to implement the embedded system for protecting the life of fisherman who fishing in deep sea. Can detect the boundary condition of our country for thefishing for safety side. As well as this leads to humans and economical income. Using this systemwe can reduce the human interface and communication will be much better.

2.1 Location Based System Using GPS-Fishermen SMSAlert System

A GPS-based wireless ad hoc network is proposed for marine Monitoring, search, and rescueapplications in Vietnam. The network routing protocol and algorithm are evaluated using Net-work Simulator 2 software. The results indicate a success rate of packages transmission higherthan 85 % and show the great potential of the proposed concept.Keywords-Ad hoc network,marine monitoring and searching, Global Positioning System (GPS).A GPS receiver which receives signal from the satellite and gives the current position of the boat. The proposed systemis used to detect the border of the country through the specified longitude and latitude of theposition, not only between Sri Lanka and India but allover the world. The particular layer leveli.e. border can be predefined and this can be stored in PIC microcontroller memory. The currentvalue is compared with predefined values and if the values are same, immediately the particularoperation will be done i.e. the PIC microcontroller gives instruction to the alarm to buzzer.Italso uses a message transmitter to send message to the base station which monitors the boatsin the sea. The system provides an indication to both fisherman and to coastal guard. Thus itsaves the lives of the fisherman and alerts the base station to provide help.[1].

2.2 Design of Maritime Boundary Identification System And Fishermen Patrol System

The system is used to detect the maritime boundary of the country where the long time disputebetween Sri Lanka and India still exists. This mainly happens when fisherman crosses maritimeborder of neighboring country as he is not aware of the limits in sea. The proposed systemuses a GPS receiver which receives signals from the satellite and gives the current position of theboat. With already known details of the latitude and longitude of the maritime boundary, thePIC microcontroller calculates the current position and stored boundary positions and indicatesthe fisherman that he has crossed the boundary by an alarm system. It also uses a messagetransmitter to send message to the base station which monitors the boats in the sea. Thissystem provides an indication to both fisherman and to coastal guard. Thus the system savesthe lives of the fisherman or reduces the damages caused to them by Sri Lankan coast guards [2].

2.3 Design of Border Alert System for Fishermen Using GPS

The system is mainly for fishermen are used to detect the maritime boundary between thetwo countries. This

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mainly happens when fisherman crosses maritime border of neighboringcountry as he is not aware of the limits in sea. The proposed system uses a GPS conceptto receive signals from the satellite and gives the current position of the boat. The latitudeand longitude of the maritime boundary. To calculates the current position, stored boundary positions and indicates the fisherman that he has crossed the boundary by an alarm, vibrateand notification. The alert will be send to the server section and the fisherman will get the alertvisually. This will be more user friendly for the fisherman near the border area.[3].

2.4Indias Maritime Neighborhood: Issues and Option- Sri Lankan Case

The speaker began with the observation that India shares maritime boundaries with as manycountries as it shares land borders. Officially, there is no maritime boundary issue between Indiaand Sri Lanka. The relationship between both the countries had been traditionally cordial. Thetwo countries are engaged in wide ranging areas. The relationship between the two serves as amodel of good neighborly interactions [4].

2.5 International Fisheries Enforcement Management Using Wide Swath SAR

The proposed system uses a GPS receiver which receives signal from the satellite and givesthe current position of the boat. The proposed system is used to detect the border of thecountry through the specified longitude and latitude of the position, not only between Sri Lankaand India but all over the world. The particular layer level i.e. border can be predefined andthis can be stored in microcontroller memory. The current value is compared with predefinedvalues and if these values are same, immediately the particular operation will be done i.e, themicrocontroller gives instruction to the alarm to buzzer.It also uses a message transmitter tosend message to the base station which monitors the boats in the sea.

2.6 Deep Sea Fishermen Patrol System for Coastal Intruder Positioning

The Indian Coastguard was formally inaugurated on 18 august 1978. It is set as an independent armed force of the Indian Union, through an act of parliament. It is the fourth armed forceunder the Ministry of Defense- the first three being the Army, the Navy and the Air Force. Ithas a specific character for nonmilitary security but addresses to National Defense. It normallydeal with marine safety, maritime security, lifesaving, law enforcement, maritime environmentalsecurity and fisheries. These call for monitoring, control, surveillance and response.The Coastguard has multiple responsibilities and strengthening the safety of fishers. Fishersare vulnerable to disasters of several kind-accidents, casualties, abduction, and alien interventions. The Indian coastguard cannot assist fishers exclusively but concern for fishers is centralto its aims. The strategic role of the Coastguard is to protect the maritime zones from illegalactivities including infiltration through maritime routes and environmental damage and providehumanitarian and scientific assistance within the maritime domain. The Indian Coastguard toohas its exclusive duties and functions as spelled out in the Coastguard Act 1978, include

1. Safety and protection of islands and o shore structure
2. Protection and preservation of maritime environment and endangered species
3. Prevention and control of pollution in maritime zone
4. Assistance to the customs in anti-smuggling operations
5. Assistance to fisherman in distress at sea
6. Safeguarding life and property at sea

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7. Preventing poaching in Indian water
8. Assisting in ocean research
9. Enforcing maritime law

III. MODELING/DEVELOPMENT OFSYSTEM

1. Block Diagram
2. Working
3. Algorithm

3.1 Block Diagram

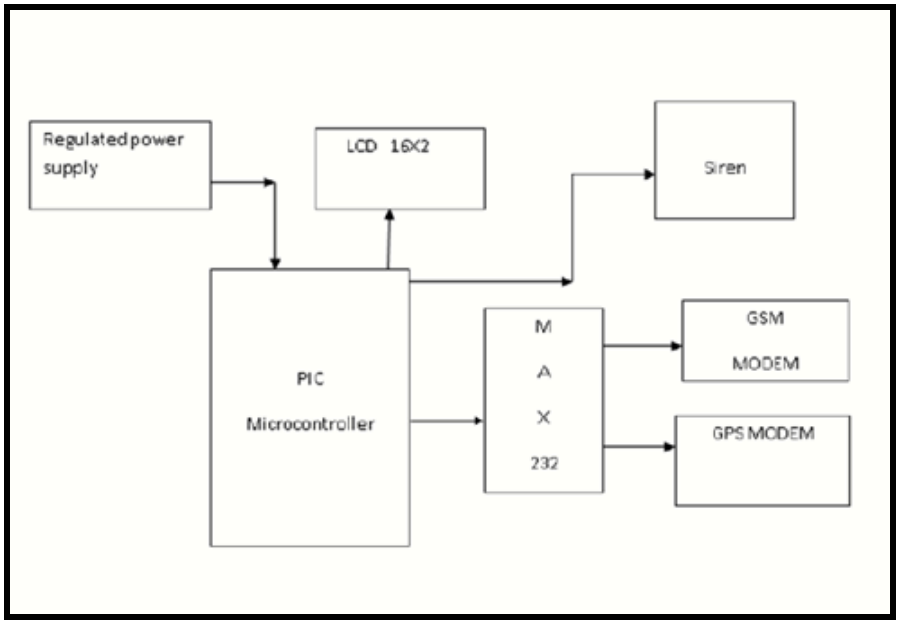

Figure 3.1: Block Diagram

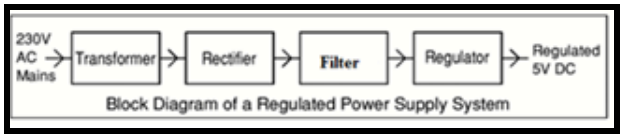

Figure 3.2: Block Diagram of Power Supply

The basic block diagram of the Maritime boundary identification and fisherman patrolsystem is shown in above figure. Mainly this block diagram consists of the following essentialblocks:

1. Power Supply
2. GPS and GSM module
3. PIC16F877A microcontroller
4. LCD Display

3.1.1 Power Supply Unit

Linear regulated power supply, all the electronic circuit needs a dc voltage is derived fromthe single ac phase main supply. For this purpose we have to use a regulated dc power supply.The block diagram of regulated dc power supply is shown in figure 3.2

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The basic building blocks of regulated dc power supply are

• Step down transformer

• Rectifier

• Filter

• Voltage regulator IC's

• Load

And Components used in power supply design shown above image 3.2.

• Transformer

A step down transformer is used to reduce the ac main voltage to an adequate smallvalue. The turn ratio of transformer is adjusted to obtain a stepped down AC voltage. Ituses ac mains and gives another ac circuit with decrease in voltage/current level withoutany change in frequency both the input and output of transformer is AC quantities. Theelectrical energy is generated and transmitted at an extremely high voltage. The voltageis to be reduced to a lower value for its domestic & industrial use. This is done by usingtransformer by reducing voltage level using a transformer then the transformer is calledas step down transformer. It totally depends on turn ratio. The basics of transformerdepends on alternating ux mechanism; here, in this project, we use transformer having input 230V and gives output 9-0-9 V approximately Vrms voltage. The transformer havingk < 1 or V1 > V2 is called step down transformer. In transformer copper, iron loss takeplace; but the advantage of using center tapped transformer for getting output for twodifferent connection and but efficiency of giving output is poor.

• Rectifier

The voltage is converted by transformer is given to rectifier which rectifies the output oftransformer and gives pulsative DC voltage by using bridge rectifier. The main advantageof using bridge rectifier is better rectification efficiency, low ripple factor and also PIVrating of diode Vm bridge rectifier circuit consist a four diode connected in the form ofbridge.The center tapped input transformer is not require but if we use then no matter takeplace. It offers full wave rectification. The diode conduct in pairs at any given instant oftime, for positive half cycle diode pair like D1 & D3 conducting & D2 & D4 remains asit is and vice versa. The process going on we get approx. 82% - 90% rectification andalso transformer utility factor is also goes to 81.2% and so on. But disadvantage of bridgerectifier is four diodes are required and voltage drop increases & output voltage reduce dueto voltage drop conduction of two diode take place simultaneously.

• Filter

Filter is electronic circuit used along with rectifier in order to get pure ripple free DCvoltage. Till now we have seen that from all the rectifiers we get a pulsating dc voltage.In order to obtain dc waveform we connect to the rectifier. Filter circuit uses passivecomponent like capacitor. The capacitors store the energy during discharging period. Theprinciple is used in designing the capacitor filter. The capacitor input filter is used toreduce the ripple contents in output of rectifier obtain a pure DC voltage. Capacitor isfilter capacitor which is connected across the load electrolytic capacitor are normally usedas filter capacitor.

• Voltage Regulator

The filter output voltage is very close to pure to DC voltage .The ripple or DC part in thevoltage is minimized by the filter. The filtered output voltage is then applied to a voltageregulator which tries to keep the DC output voltage constant even if the supply voltageor load unregulated power supply output is not useful, for that weuse

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regulated power signal. For reducing fluctuation causes poor regulation. There aretwo types voltage regulator & in switching regulator same type occurs IC based regulatorconsist fixed.

• Voltage and Variable Regulator IC

IC regulators are widely used as having inbuilt protection circuit such as thermal shut-down. The two capacitors used before & end of input; output channel of regulator IC isfor removing noise interference &transient in input respectively.

3.1.2 GSM Module

GSM MODEM is a class of wireless MODEM devices that are designed for communication ofa computer with the GSM and GPRS network. It requires a SIM (Subscriber Identity Module)card just like mobile phones to activate communication with the network. Also they haveIMEI (International Mobile Equipment Identity) number similar to mobile phones for theiridentification. A GSM MODEM can perform the following operations:1. Receive, send or delete SMS messages in a SIM. 2. Read, add, search phone book entriesof the SIM. 3. Make, Receive, or reject a voice call. The MODEM needs AT commands, forinteracting with processor or controller, which are communicated through serial communication.These commands are sent by the controller/processor. The MODEM sends back a result afterit receives a command. Different AT commands supported by the MODEM can be sent by

the processor/controller/computer to interact with the GSM cellular network. A GSM moduleassembles a GSM modem with standard communication interfaces like RS-232 (Serial Port), USBetc., so that it can be easily interfaced with a computer or a microprocessor / microcontrollerbased system. The power supply circuit is also built in the module that can be activated byusing a suitable adaptor.

3.1.3. PIC 16F877A Microcontroller

PIC (Peripheral Interface Controller) is an 8 bit PIC Microcontroller used in this systemand it is the heart of the overall system. PIC16F877A series controller used here seems to beefficient and cost effective for this parking management system. The proposed design uses PICmicrocontroller. It is a low power controller that provides support for high speed communications, with the ability to be programmed using different commands. When the boat will crossthe restricted zone,critical zone then it will send the SMS to the fisherman through GSM. Itis 40 pin controller.

3.1.4. LCD Display

Interfacing between PIC micro controller and the LCD is required for displaying the statusof parking status. TheLCD is set to 16x2 display. Depending on the status of parking slots,the LCD displays the number of vacant marking slot in the parking area which is placed on theentry gate. The data from the micro controller is communicated using upper 4 bits of one-of theports and the data pins of the LCD is connected to data pins D4, D5, D6, D7 of the LCD. TheLCD is enabled using Enable (E) pin. Reading and writing of data to the LCD is handledusingR/W pin.

3.1.5 GPS Module

Global Positioning System is based on satellitenavigation technology. A GPS Receiver provides the accurate location of an object in terms of latitude and longitude. Accurate time calculation with respect toGMT can also be done by using GPS. GPS provides a lot of geographical information for a particular object like its latitude,

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longitude, direction of travel, GMT etc. This information are assembled in a particular string format which are to be decoded by GPS modems.

3.1.6 Serial interface

- The RS232 standard describes a communication method capable of communicating in different environments.
- This has had its impact on the maximum allowable voltages etc. on the pins.
- In the original definition, the technical possibilities of that time were taken into account.
- The maximum baud rate defined for example is 20 kbps.With current devices like the 16550A UART, maximum speeds of 1.5 Mbps are allowed.

3.1.7 Buzzer

- Rated Voltage 3.6 V
- Operating Voltage 2.5-4.5 V
- Rated Current 110 MA
- Frequency 2730 Hz
- Operating Temperature 30 drgC to 70 degC
- Weight 0.5g

3.2. Working

The Boat Unit installed in each boat continuously retrieves its GPS coordinates and calculates the distance between the boat and the stored values of the maritime border. When thedistance between the boat and the border is below the reference value, an alarm is triggered inthe boat. When the distance between boat and border further decreases to a minimum value the coordinates of the boat is sent to the Coast Guard patrol boat server by the GSM module. Our system consists of three major units which coordinate among each other efficiently. Thesystem is thus divided into the following units,

A. Boat Unit

B. Main Server

C. Coast Guard Unit.

The Boat Unit installed in every boat continuously scans the GPS location of the boat. The location of the boat is sent at regular intervals to the main server through a GSM modem. The Boat Unit calculates the distance between the boat and border and if the distance is below the reference value, the PIC micro controller triggers the siren. The siren rings until the distance becomes greater than the reference value. If the distance keeps decreasing, then upon reaching a minimum value the PIC micro controller sends the GPS location of the boat to the main server through a GSM module. The main server alerts the Coast Guard station and sends the GPS location of the boat to the nearest available Coast Guard Patrol Boat Unit. The Coast Guard Unit installed on the patrol boat receives the GPS location of the boat from the main server through a GSM modem. The electronic display on the Coast Guard Unit plots the shortest path to the fishing boat on its display. Thus the boat can be secured from attack from the rival camp. Under certain cases the fishermen sight poachers or intruders from other side poaching into our

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seas. Under such conditions the fishermen can alert the Coast Guard by pressing the intrusion button on the Boat Unit. The Main server sends the coordinates of the boat to the nearest available Coast Guard patrol Boat. Thus intrusion into our lands can be effectively dealt with.

The GPS receiver receives the signal from the satellite and converts it into desired data message. The data is retrieved by the microcontroller. The microcontroller calculates the distance between Boat Unit and the Border from the stored values of the latitude and longitude. COAST GUARD UNIT The Coast Guard unit has a GPS SYSTEM and a GSM MODEM for transmitting GPS data to the Main Server. The server receives the GPS data sent by the Coast Guard Unit at regular intervals of time. The server sends the coordinates of boat to the Coast Guard Unit. The Coast Guard unit on receiving the co-ordinates plots them on to a map.

3.3. Algorithm

i. Start
ii. Initializing controller.
iii. Initializing LCD.. Display name of project on LCD.
iv. Initializing GPS.
v. Initializing GSM.
vi. GPS always in received mode.
vii. Co-ordinate longitude and latitude send to controller.
viii. Pre-define boundary consider in controller.
ix. Compare existing position with pre-defined.
x. Pre-define coordinate different from present coordinate.
xi. Alert message on LCD.
xii. Microcontroller generating PWM pulse.
xiii. Comparing PWM pulse with exiting value.
xiv. If in warning zone decrease speed by 50 %.
xv. If restricted zone stop the motor.
xvi. Otherwise continue in actual speed.
xvii. STOP.

IV. ADVANTAGES

• This system thus provides life security to the fisherman
• Enables the fishing community to serve as a surveillance unit
• Accuracy determination of location
• Maintenance cost is low
• Easily replaceable

V. DISADVANTAGES

Disadvantage in this system is that it uses GSM technique which is a queue based techniquethus delay in

communication might occur. It can be overcome by prioritizing the signalssent by these modules.

VI. APPLICATIONS

• Applicable in fishing boats
• 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 wecan use our kit to assist the track.

VII. RESULT

We have developed a systemwhich eliminates such problems and saves the lives of the fishermen.The system is used to detect the maritime boundary of the country.

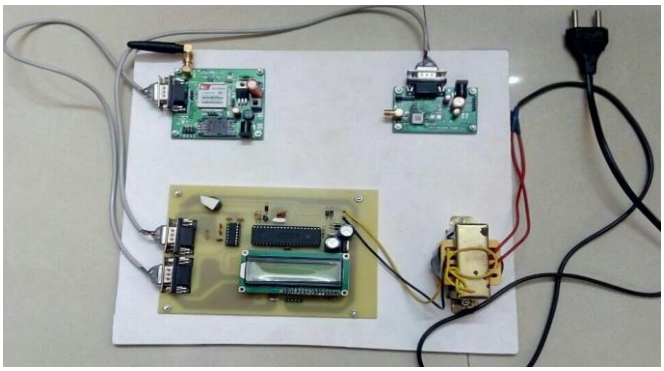

Fig. Maritime boundary identification and fisherman patrol system

VIII. CONCLUSIONS

In this way we conclude that this project displays the maritime boundary identificationand fisherman patrol system using PIC micro controller, GPS and GSM.This system implements GPS is to create a security system. The fisherman, while navigating crosses the maritime boundary, unknowingly as they are unable to visualize it in the oceanwhich causes loss to its life. Through this project a GPS based security system is provided tothe fisherman so that they can find out when they are in danger.Thus the fishermen can easily identify the national sea borders and therefore preventsthem from entering their area. Thus saving their lives and providing good relationship with the
neighboringcountries.

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