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FISHERMEN NAUTICAL BORDER ALERT SYSTEM

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Abstract — **In day-to- day life we hear about many Tamil fishermen being caught and put under Sri 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 using embedded system which protects the fishermen by notifying the country border to them by using 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, we can find the current latitude and longitude values and is sent to the microcontroller unit. Then the controller unit finds the current location by comparing the present latitude and longitudinal values with the predefined value. Then from the result of the comparison, this system aware the fishermen that they are about to reach the nautical border. The area is divided into four zones- normal zone, warning zone, zone near to restricted zone and finally the restricted zone. If the boat is in normal area, then the LCD displays normal zone. Thus they can make it clear that the boat is in normal area. In case it moves further and reaches the warning zone, the LCD displays warning zone. If the fisherman ignores the warning or fail to see the display and move further, and if the boat enters the zone nearer to the restricted zone the alarm will turn on and the speed of the boat engine automatically gets controlled by 50%. If the fisherman did not take any reaction about the alarm and move further, then the boat will enter into the restricted zone, the alarm continues to beep as before, and once it touches the restricted zone, the boat engine gets off by the control of fuel supply to engine.**

Keywords — GPS, GSM, hazardous, interfaced, microcontroller, resonating, sustainable.

I. INTRODUCTION

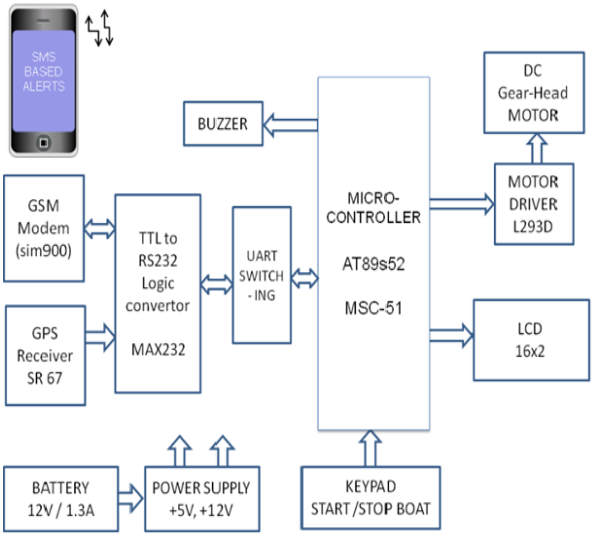
Global Positioning System (GPS) provides a wide range of navigation and timing services. With the combined interlocked usage of the GSM technology, it can be used for border security, tracking of boats and ships in the oceans and in the seas. The current issue of Indian fishermen being abducted by the Sri Lankan navy is of serious concern. This paper serves as a benefit for these people where a DGPS system is attached to the boat which in turn is connected to an alarm device. The DGPS receives the topographic location of the boat in the sea and then triggers an alarm if the border of the country is crossed by the boat. Topographic location of a country's border can be obtained with the information of the latitude and longitude of the place and position of the boat. The borders of each country are defined in two levels. The first level extends till a certain distance in the sea and it is called as the National order of the country. Succeeding the national borders and just a few kilometers towards is the International borders. The additional advantage from the existing border alert systems that are already imparted is that, the interlock of the GSM where minute by minute position of the boat can be received through an SMS to the family members from the control room through the use of DGPS.

II. WORKING PRINCIPLE

THE GPS MODEM WILL CONTINUOUSLY GIVE THE SIGNAL WHICH DETERMINES THE LATITUDE AND LONGITUDE AND INDICATES THE POSITION OF THE FISHERMEN TO THEM. THEN IT GIVES THE OUTPUT

WHICH GETS READ AND DISPLAYED IN THE LCD. THE SAME DATA IS SENT TO THE MOBILE OF THE FISHERMAN AND SIMULTANEOUSLY THE SAME DATA IS SENT TO THE SEA BORDER SECURITY. AN EEPROM IS USED TO STORE THE DATA, RECEIVED BY GPS RECEIVER. THE HARDWARE WHICH INTERFACES WITH MICROCONTROLLER ARE LCD DISPLAY, GSM MODEM AND GPS RECEIVER.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. 28 SATELLITES INCLINED AT 55° TO THE EQUATOR ORBIT THE EARTH EVERY 11 HOURS AND 58MINUTES AT A HEIGHT OF 20,180 KM ON 6 DIFFERENT ORBITAL LANES AND EACH ONE OF THESE SATELLITES HAS UP TO FOUR ATOMIC CLOCKS ON BOARD. ALL WE REQUIRE IS AN ACCURATE CLOCK. BY COMPARING THE ARRIVAL TIME OF THE SATELLITE SIGNAL WITH THE ONBOARD CLOCK TIME, AT WHICH THE SIGNAL WAS EMITTED, THE LATITUDE AND LONGITUDINAL DEGREE OF THE BOAT'S LOCATION IS DETERMINED. THE CURRENT DESIGN IS AN EMBEDDED APPLICATION, WHICH WILL CONTINUOUSLY MONITOR A MOVING BOAT AND ONCE THE BOAT GOES BEYOND THE LEVEL OF THE DEFINED LAYER THE PARTICULAR OPERATION WILL BE DONE. FOR DOING SO AN AT89C51MICROCONTROLLER IS INTERFACED SERIALLY TO A GSM MODEM AND GPS RECEIVER.

III. BLOCK DIAGRAM



IV. BLOCK DIAGRAM DESCRIPTION

1. As the name suggests, main aim of the system is to prevent fishermen's from crossing boundaries. Microcontroller 89s52 acts as a main control block of the proposed system. GPS modem SR 67 is interfaced to the system using UART protocol. Modem continuously transmits the data containing location and other information.

2. This data is read by the microcontroller which fetches the location information. This information is in the standard NMEA protocol data format. GPS modem transmits the data in RS232 protocol, whereas microcontroller supports TTL, hence MAX 232 acts as a protocol convertor.

3. GSM SIM900 modem is used to add SMS alert facility to the system. Microcontroller is preprogrammed with boundary location for that particular geographical area. It continuously reads data from the GPS and compares with the

boundary location, if the current location to be found is near the boundary the microcontroller alerts the user using a buzzer.

4. If system tends to get more and more closer to the border, an SMS is sent to the control room for alert, simultaneously ringing the alarm. In case boat reaches the border and the location matches the pre-stored boundary the engine is made automatically off by the system.

5. LCD acts as a user interface which continuously displays Latitude and Longitude co-ordinates. 12V 1.3 AH Battery is used to power up the system.

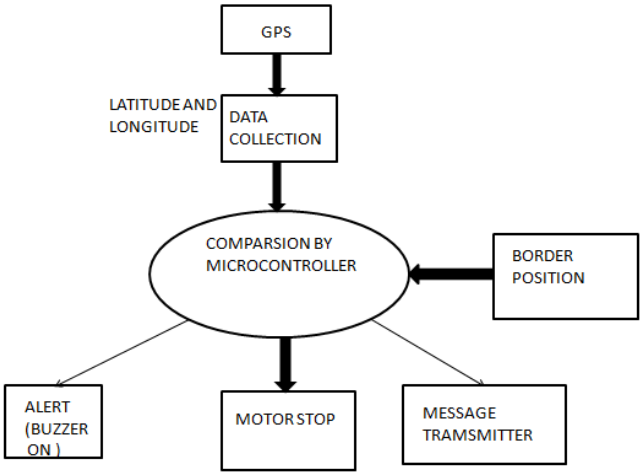
6. LM 7805 used as a voltage regulator IC which provides +5V constant DC supply. Relays used to control the engine operation. ULN 2803 acts

V. EXISTING SYSTEM

At the present time there are few existing systems which help to identify the current position of the boats/ships using GPS System and view them on an electronic map. For the purpose of identification the fisherman are using the GPS72h, equipment used for the navigation in sea. It provides the fastest and most accurate method for mariners to navigate, measure speed, and determines location. This system enables increased levels of safety and efficiency. It ensures whether the ship reaches its destination safely. The accurate position information becomes even more critical as the vessel departs from or arrives in port

VI. PROPOSED SYSTEM

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

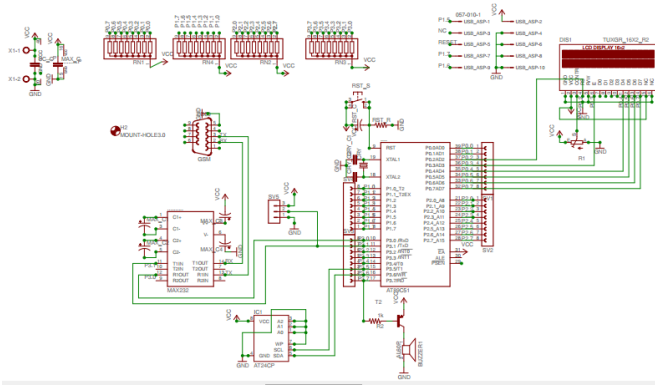


PROPOSED SYSYTEM ARCHITECTURE

VII. PROPOSED SYSTEM FLOW DIAGRAM

The GPS receiver receives the signal and converts it into desired data message. The data is sent to microcontroller and microcontroller extracts the latitude and longitude from the data. The positions are compared with the stored Boundary latitude and longitude positions. If the vessel is found beyond the border, then an alarm is generated along with a message transmission by a GSM.

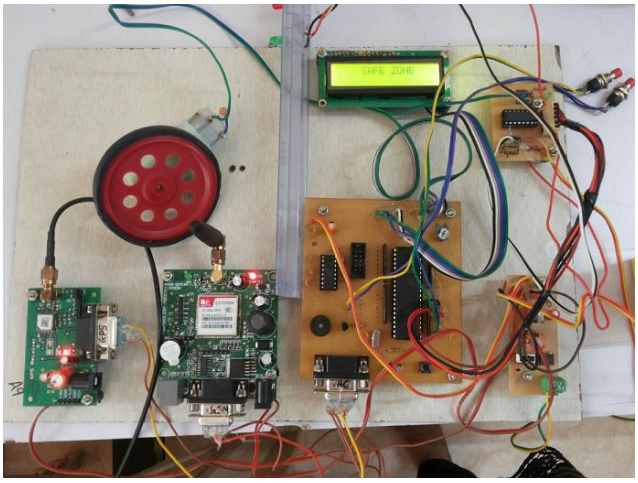
CIRCUIT DIAGRAM:



VIII. GLOBAL POSITIONING DEVICE

This GSM Modem can accept any GSM network operator SIM biked and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily.

The modem can either be connected to PC serial port directly or to any microcontroller. It can be used to send and receive SMS or make/receive voice calls.
This GSM modem is a highly flexible plug and play quad band GSM modem for direct and easy integration to RS232 applications. Supports features like Voice, SMS, Data/Fax, GPRS and integrated TCP/IP stack



Applications

- SMS based Remote Control & Alerts
- Security Applications
- Sensor Monitoring

Features

- Highly Reliable for 24x7 operation.
- Simple to Use & Low Cost.

Our package includes

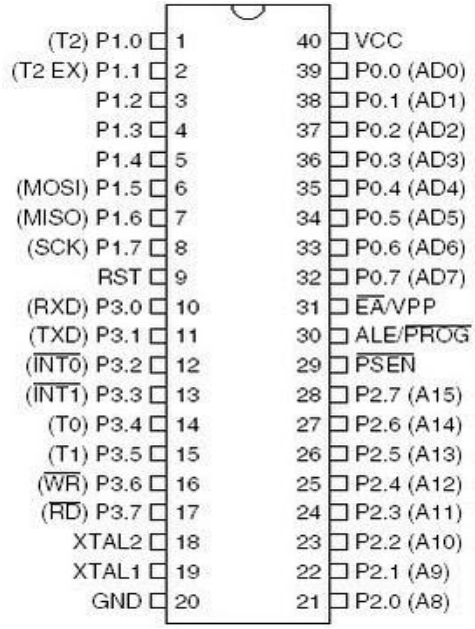
- GSM Modem - Assembled & Tested
- GSM Antenna
- 12V/1.5A SMPS

IX. MICROCONTROLLER-AT89S52

8051 is the name of a big family of microcontrollers. The device which we used in our project was the 'AT89S52' which is a typical 8051 microcontroller manufactured by Atmel™. The block diagram provided by Atmel™ in their datasheet that showed the architecture of 89S52 device seemed a bit complicated.

The 89S52 has 4 different ports, each one having 8 Input/output lines providing a total of 32 I/O lines. Those ports can be used to output DATA and orders do other devices, or to read the state of a sensor, or a switch. Most of the ports of the 89S52 have 'dual function' meaning that they can be used for two different functions.

The first one is to perform input/output operations and the second one is used to implement special features of the microcontroller like counting external pulses, interrupting the execution of the program according to external events, performing serial data transfer or connecting the chip to a computer to update the software. Each port has 8 pins, and will be treated from the software point of view as an 8-bit variable called 'register', each bit being connected to a different Input/output pin.



Features-

- Compatible with MCS®-51 Products
- 8K Bytes of In-System Programmable (ISP) Flash Memory – Endurance: 10,000 Write/Erase Cycles
- 4.0V to 5.5V Operating Range
- Fully Static Operation: 0 Hz to 33 MHz
- Eight Interrupt Sources
- Full Duplex UART Serial Channel
- Low-power Idle and Power-down Modes
- Interrupt Recovery from Power-down Mode
- Watchdog Timer
- Dual Data Pointer
- Power-off Flag
- Fast Programming Time
- Flexible ISP Programming (Byte and Page Mode)

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable flash on a monolithic chip,

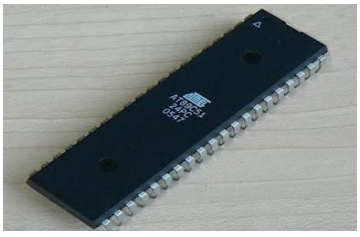
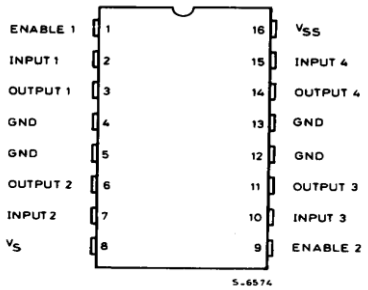


Figure-06: Microcontroller 89S52

The Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of

RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM con-tents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset

L293D:



The device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoids, DC and stepping motors) and switching power transistors.

To simplify use as two bridges each pair of channels is equipped with an enable input. A separate
supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included.
This device is suitable for use in switching applications at frequencies up to 5 kHz.
The L293D is assembled in a 16 lead plastic package which has 4 center pins connected together and used for heat sinking

X. CONTROLLER

Microcontroller receives the data from the GPS receiver through UART. The data received contains latitude and longitude. The current positions are compared with already stored latitude and longitude of countries boundary locations. At first the latitude is compared with stored latitude which identifies if the current position is located near to the boundary. If the latitude matches then the adjacent latitudes and longitudes of the present latitude is retrieved from the microcontroller. The current position received from GPS is stored as S1(latitude), S2 (longitude). The latitude S1 is compared with stored latitudes. If latitude match, then adjacent latitude and longitudes (X1, Y1 and X2, Y2) are retrieved from stored table and substituted in the equation given below:

Position	Latitude	Longitude
Position I	$10^0$05'.0N	$80^0$03'.0E
Position II	$11^0$16'.0N	$82^0$24'.4E
Position III	12^0 08'.4 N	82^0 09'.5 E
Position IV	12^0 33'.0 N	82^0 46'.0 E

By simplification, we get ax + by = c Now, S1 and S2 are substituted in above equation of line. Here two cases are possible:

Case 1: If LHS<RHS, then vessel is inside country's border. Latitude and longitude is extracted and manipulation with the new locations is done by the microcontroller.

Case 2: If LHS>RHS, then vessel has crossed border. When vessel crosses border, an alarm is on and motor stops working. Motor will move in reverse direction only and not in forward direction. GSM module will transmit message to desired sender. Alarm continues until the vessel comes back inside the country's border.

CONSEQUENCE
Boat Position and Navigation System contains,
Layer I: Green LED will be on
Layer II: Red LED will be on

Layer III: Buzzer indication &speed reduction
Layer IV: Motor off

XI. APPLICATIONS

- The hijack of the ship by the pirates can be eradicated.
- 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 we can use our kit to assist the traffic.
- Location of any lost vehicle could be found
- Smuggling of goods can be controlled along with traffic control.
- It can be used as bomb detector.

XII. ADVANTAGES

- Accuracy determination of location
- Maintenance cost is low
- Easily replaceable

XIII. FUTURE SCOPE

- We can use the EEPROM to store the previous Navigating Positions up to 256 locations.
- We can reduce the size of the kit by using GPS and GSM on the same module of GPS navigator.
- We can increase the accuracy up to 3m by increasing the cost of the GPS receiver.

XIV. CONCLUSION

Thus the fishermen can easily identify the national sea borders and therefore prevents them from entering their area. The system provides high accuracy and high precision values of the Latitude and Longitude. This model proves to challenge the already existing model which just uses a GPS device to track the border and make the boat move backwards .Hence; along with saving lives it also establishes good relationship with the neighbouring countries. Piracy of ship can be controlled.

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