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Border Alerting System for Boaters Using Zigbee Network

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ABSTRACT: Most of the times, unknowingly the boaters cross their area of limit and enters into another country area. By doing so they may be caught by the officials of neighbouring countrymen. In order to solve this issue, we enable the boaters to identify their border area in the sea. The proposed system comprises of GPS (Global Positioning System) and ZIGBEE technology, which helps to identify the boater either inside or outside the border. Which results in saving of human lives.

KEYWORDS: GPS, ZIGBEE

I. INTRODUCTION

In this system, we will be incorporating mainly Arduino Board, Zigbee and Global Positioning system (GPS). GPS provides a wide range of navigation services[1][2][4]. The boat is attached with the GPS system, the buzzer and motor drive are connected with GPS system. Latitude and longitude of the place and location of the boat can be obtained with the help of GPS[9]. The graphical location of the boat in the sea is received by GPS system and the obtained information transmitted with the help of Zigbee wireless network[10][13]. After obtaining the latitude and longitudinal position of the boat, the transmitter sends the control signal to the receiver antenna which is located in the boat and once the boat crosses the target area then the controlling unit displays the boat position by incorporating LCD display and alert the fisherman through the alarm and the relay makes the motor OFF and which in turn stop the boat, and thereby lives of fishermen can be saved. The process is fully automated[7][8][9].

II. LITERATURE SURVEY

The application that can be widely used by people in the border to find the appropriate path to reach the destination. The notification will be sent to the border security forces which act as the server to all other devices that are operated by people in ships[8]. In this system using GPS and GSM, where GPS is used to find the location of the boat. If the boat nearer to the boundary primarily it warning for a fishermen with the alarm and emits the location of the boat to the nearest coast office via GSM communication. When it further nears the maritime boundary an interferer is sent to the Engine Control Unit which controls the speed of the engine with the help of the electronic fuel injector. and its low cost maritime. By this method, we can alert the fishermen and also monitor them thereby avoiding banned activities such as smuggling, intruders, etc[2][9][10]. In this system using only GPS to receive the information from the satellite and stored border locations to detect whether the boat has crossed the border or not which covers wide area[11]. In this system, it uses DGPS and GSM and this system uses DGPS to track the location of the boat and to activate an alarm which consists of a Piezo-buzzer, when the border is move toward or crossed. Also, in addition, the DGPS information is sent to control office, and also the information is sent to the family at regular time intervals that are in expectation about their family member's safety.

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III. PROPOSED ARCHITECTURE

A. Design Considerations:

The proposed architectural design comprises of Arduino Board, GPS and ZIGBEE. The heart of this system is the ATmega328 Microcontroller. The operating voltage of microcontroller is 5-12V. DC motor is connected to the microcontroller with the help of relay. The GPS get the information about boat location and it is monitored through the PC.

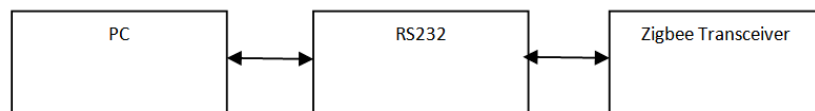


Fig.1: Block diagram of system at the Transmitter side

As illustrated in Fig.1., The block diagram shows the Zigbee transceiver is connected indirectly with the PC and the RS232 serving as an interface between PC and Zigbee transceiver.

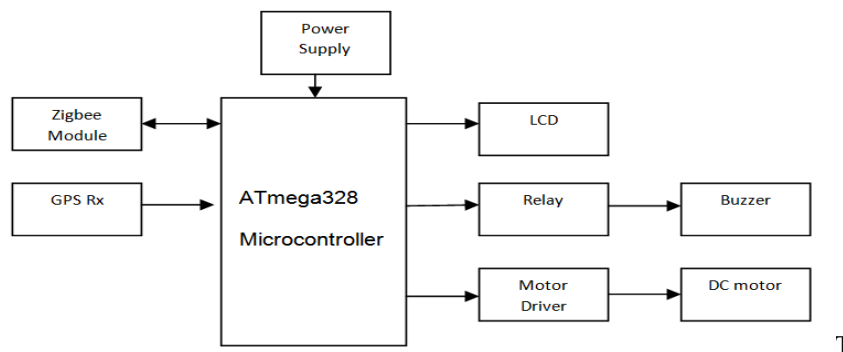


Fig.2: Block diagram of system at the Receiver side

The figure 2., illustrates the block diagram of the system at the receiver side which comprises of Microcontroller, which is heart of the system and controls the entire operation. The power supply provides DC voltages in the range between 0-12V. Zigbee Module is bidirectional. The buzzer controlled by relay and DC motor is driven by the motor driver.

B. Description of the Proposed System:

[1] ZigBee System for Area Detection: Zigbee is based on an IEEE 802.15 standard and it's a specification for a suite of high level communication protocols which is used to create Personal Area Networks built from small, low-power digital radios. Despite low powered, Zigbee devices can transmit data over long distances by passing data through intermediate devices to reach more distant ones, creating a mesh network; i.e., a network with no centralized control or high-power transmitter/receiver able to reach all of the networked devices. The decentralized nature of such wireless ad hoc networks makes them suitable for applications where a central node can't be relied upon.

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[2]Microcontroller (Arduino):The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts.

[3]16x2 LCD display: A 16x2 LCD in the sense it can display 16 characters and there are 2 lines. In this LCD each character is displayed in 5x7 pixel matrix. Black text on Green background. LCD has two registers, namely, Command and Data registers. The command register stores the instructions given to the LCD. A command is predefined instruction to perform task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed. The data is the ASCII code of the character to be displayed.

[4] Buzzer: A buzzer or beeper is a signalling device, The word "buzzer" comes from the rasping noise that buzzers made when they were electromechanical devices, operated from stepped-down AC line voltage at 50 or 60 cycles. Other sounds commonly used to indicate that a button has been pressed are a ring or a beep.

[5]DC Motor: DC motors operate from a direct current power source. Movement of the magnetic field is achieved by switching current between coils within the motor. This action is called "commutation". Many DC motors (brush-type) have built-in commutation, meaning that as the motor rotates, mechanical brushes automatically commutate coils on the rotor. Motor speed control of DC motor is nothing new. A simplest method to control the rotation speed of a DC motor is to control its driving voltage. The higher the voltage is, the higher speed the motor tries to reach. Pulse Width Modulation method (PWM) is employed in many DC motor controlling applications. In the basic Pulse Width Modulation (PWM) method, the operating power to the motors is turned on and off to modulate the current to the motor. The ratio of "on" time to "off" time is what determines the speed of the motor.

[6]Relay: The traditional method of switching current through a load, which requires isolation from the controlling circuit, involves the use of an electromechanical relay. Such devices offer a simple, low-cost solution to the problem of maintaining adequate isolation between the controlling circuit and the potentially lethal voltages associated with an AC mains supply. Relays do, in fact, offer many of the desirable characteristics of an 'ideal' switching device (notably a very low 'on' resistance and virtually infinite 'off' resistance coupled with a coil to contact breakdown voltage which is usually in excess of several kV). Unfortunately, relays also have several shortcomings, which prevent their use in a number of applications.

IV. SYSTEM INTERFACE

Arduino board powered by and 5-12V DC supply is given to the LCD display. R/W pin of the LCD is grounded. RS pin of the LCD module is connected to digital pin 3 of the arduino. Enable pin of the LCD module is connected to digital pin 4 of the arduino. In this project, the LCD module and arduino are interfaced in the 4-bit mode. This means only four of the digital input lines (DB4 to DB7) of the LCD are used.

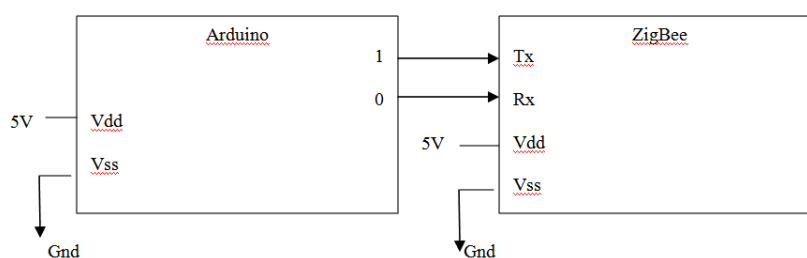


Fig.3: Interfacing diagram for transmitter

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Fig.3, illustrates the interfacing between Zigbee and Arduino microcontroller. The mode is selected depending on the Zigbee is selected as transmitter or receiver. If the data is to be transmitted from microcontroller then logic '1' is chosen else logic '0' will be chosen.

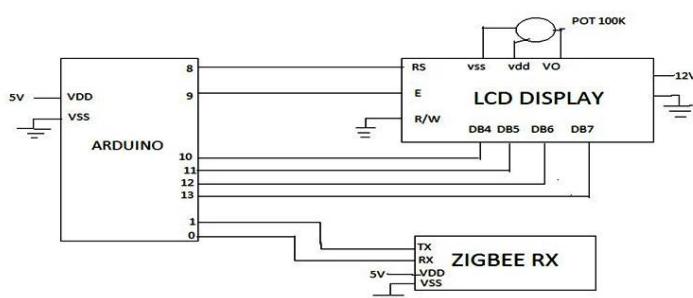


Fig.4: Interfacing diagram for receiver

Fig.4, illustrates the method which is very easy and simple, it requires less connections and you can almost utilize the full potential of the LCD module. Digital lines DB4, DB5, DB6 and DB7 are interfaced to digital pins 5, 6, 7 and 8 of the arduino. The 100K potentiometer is used for adjusting the contrast of the display. Pin 0&1 of the arduino are connected to Serial port communication of the Zigbee transceiver.

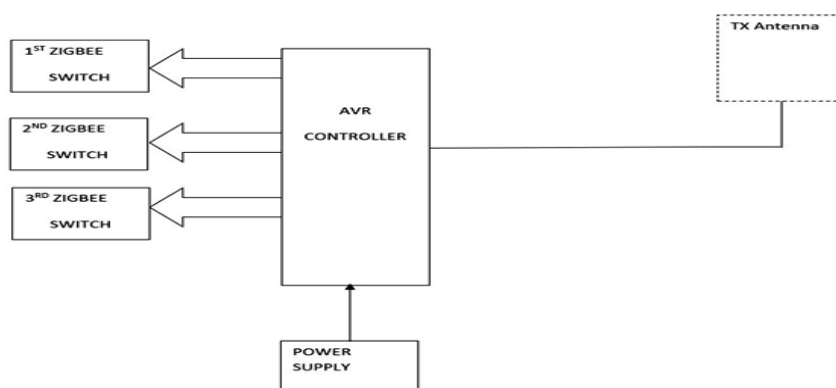


Fig.5. Transmitter Section

Figure.5, shows the Zigbee transmitter is incorporated at the border area. It continuously transmits RF signals within the particular limit. Here we have used HC-12 which has a range limit of 1km.

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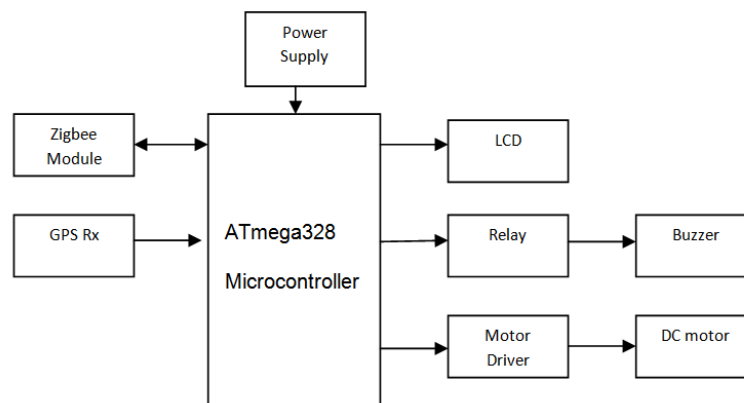


Fig.6. Receiver Section

Figure.6 illustrates the Zigbee receiver along with the microcontroller unit is connected at the boat side. When the boat reaches the targeted area, the RF signals are received by the receiver and given to the microcontroller unit. The microcontroller analyses the signal and calculates the distance and sends corresponding message to the LCD display. If it crosses the limit, the microcontroller activate the warning buzzer for 1st level as small buzzer, if boater neglects and moves further at 2nd level again horn will blow, here the speed of the motor will be drastically reduced.

V. CONCLUSION

From the proposed system, Border Alerting System for Boaters Using Zigbee Networks, its results and discussions proved that this system works well, and can be put forward to practical applications. The main feature of this project is when someone crosses the border line, the receiver module shows indication of warning message to the fisherman on his LCD display. Thus by using this, we can protect the fishermen from crossing the border.

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