Design of Smart GSM and GPS Based Rescue System for International Maritime Boarder Crossing of Indian Fisherman Using AVR Microcontroller

VSR Subrahmanyam, P.B.Natraj, SVS Prasad. Arulananth T S, Nehru

Abstract--- This paper deals Smart design which would saves life of fishermen community in India. The fishermen boats may sometimes cross their boundary limit without their knowledge. This causes a lot of problems. They may be caught by the neighbor country Coast guard like Srilanka. So in order to overcome this problem we have designed a smart vigilant and rescue system using (ATmega 16) microcontroller, GPS and GSM module. This paper contracts with a system of locating the place of the boat using GPS and directs the data to microcontroller which triggers an alarm that contains of a Piezo-buzzer, when the border is approached or crossed. Also , in addition, the GPSevidence is sent to control room where it is read and then through a GSM device, information is sent to the family at methodical time intervals who are in anticipation about their family member's safety. The paper aims at providing a system that will vigilant the fishermen well in advance and ensure maximum protection and peace at the borders and also notify the family members.

Keywords: GPS tracking, GSM mobile, ATmega16, MicroC

1. INTRODUCTION

Steering in shipping is one of the most vital application which is utilized by the drivers in both road and seaways carriage. Maritime navigation is not as easy as road transportation since its spread widely and lack of path. Generally Global Positioning system (GPS) gives a broad range of services in the aspect of steering and timing. GSM technology can be employed in the nested range of applications like border security, tracking of yachts, ships in the oceans and in the seas. The peninsula, island and the coastal countries had their boundary limit in the sea, the people live in those types of country has the work of fishing in the sea.

The governments of the republic of India and the republic of Sri Lanka sign up an agreement on March 23, 1976 launching maritime boundaries in the Gulf of Mannar and the Bay of Bengal and these agreements enter into force on May 10, 1976, two years after the two countries negotiated a boundary a Palk Strait. Normally, the distance in sea is measured in nautical miles. The Palk Strait between the Tamil Nadu state of India and the Mannar district of the northern province of the island nation of Sri Lanka is 32 to 50 miles (53-80 km) wideasshown in figure below.

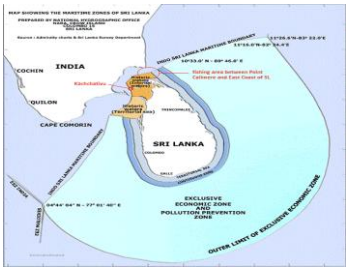

Fig.1 Satellite picture of India - Sri Lankan border

The contemporarydispute of Indian fishermen being abducted by the Sri Lankan navy is of sombre concern. This is because of the lack of knowledge of their position across the sea. In such situation the lives of fisherman continue to be difficult. They are being abducted and their boats are being captured. Nowaday'speople living in coastal areas are lost their valuable life unknowingly. A lot of simple fisher man's life has been lost due to their ignorance for the border areas and their life has been always in the danger situation.

2. LITERATURE SURVEY

As a prerequisite of the existing work, we now discuss several nonfictions either on the same topic or on the related topics. Most of the work cited here is used to overcome the major problem between India and Sri Lanka border. Today, the problem of fisherman is increasing in a vast range. In Tamil Nadu nearly 20,000 boats perform fishing in the coastal area and it is there economical income to their family. [4] Says that nearly 530 fisherman were killed by Sri Lankan navy in the past years. Thus, so many thesis works are discussed to overcome this problem. The design of the system by [1][2] includes three units with the microcontroller, GPS and GSM module. The three units consist of the data collection unit, processing unit and the controlling unit. The collection unit collects the data from the GPS and the processing unit processes the obtained data.

Revised Manuscript Received on December 22, 2018.

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The controlling unit is used to send and receive the SMS about the position of the boat. This unit is the main unit to alert them. Most of the microcontroller used by [5],[4] are ATMEL microcontroller which are CISC based architecture. The CISC architecture executes a multi-step operation or addressing mode with a single instruction set so that the execution time increases for this architecture. Also, the code for the CISC architecture is written in assembly language. The assembly language codes are difficult for the user and it is not user-friendly.

To find the exact location and as an alert to the user the interfacing of GPS with microcontroller [7] is made and the GPS displays the latitude and longitude values to find in which position the boat is moving. The authors of [4] find the location of the boat by calculating the distance with a formula and predicting whether the boat is in safe or unsafe region. If the region is unsafe with the displayed values then an alarm triggers and as an advanced method the electronic control unit makes the engine of the system to reduce its speed and makes it OFF as explained in [1]. The system proposed by [3],[5] can provide accuracy within the shorter range. To extend this method and to provide safer region the interfacing of GSM with microcontroller is made and the SMS is sent to the coastal guard and they can save the fisherman and also if there is any intruder it can also be found. The SMS is sent to the microcontroller by the GSM module with the help of the AT commands. With the help of AT commands one can make voice call and send SMS by their GSM module. These systems are less efficient since they are CICS architecture and their codes are difficult to execute. So, as an advanced method we are using AVR microcontroller. The AVR microcontroller is a RISC based architecture [10] which can execute 131 powerful instructions in one machine cycle. The RISC architecture can execute simple instructions in single clock cycle. In this the code are written in MikroC which is a user- friendly compiler to execute the code.

The border alert system is real-time system and it mostly depends on time. So, this can be an efficient system with the use of AVR microcontroller. The interfacing of GPS, GSM module with the AVR microcontroller is communicated with the help of UART communication. UART is a cheap communication line between the PC and the embedded application system. It acts as a full duplex communication for the transferring of data. With the help of AVR microcontroller the UART doesn't need a separate port. It has an inbuilt provision in our AVR microcontroller kit.

3. EXISTING SYSTEM

Presently, there are few surviving systems only identify to recognize the direction of the current position of the boats and ships. GPS mainly used to identify the fisherman in which they are using the GPS72h equipment. GPS72h mainly used for the navigation in sea. It gives the quick and accurate approach for mariners to steer, calculate speed, and find the location in form of latitude and longitude value. This system enables improved levels of safety and efficiency. It ensures whether the ship reaches its destination safely or not. But the cost is too heavy.

Fig.2 GPS72h

Fig.3 Single Side Band

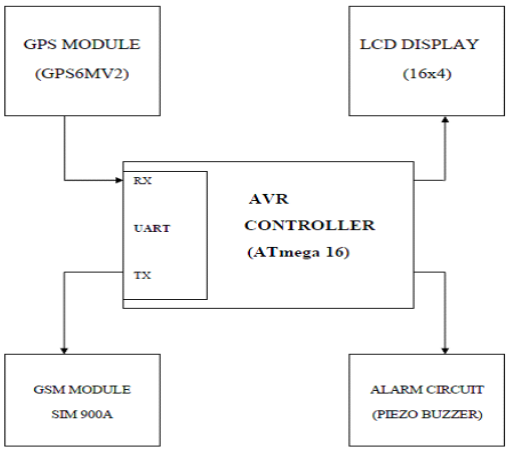

Fig.4 Overall block diagram of the system

Further, fisherman also used SSB (Single Side Band) radios which offer reliable for ship to ship and ship to coast guard communications. It is a "party line" system, and everyone can hear your communication and they also chat with their neighbours within the sea limit. SSB are expensive and require sophisticated installation which increase the cost of the device. They require training for use that device and a commercial operator's license, or a ship station license. So, it is not a better choice and the cost of the device is above Rs50,000. Then further, a device with GPS and GSM based border alert system was implemented. In which they have used ARM 7 processor or PIC microcontroller.

4. RECOMMENDED SYSTEM

The suggested system is implemented by using GPS (GPS6MV2), GSM (SIM900A) and AVR (ATmega 16) microcontroller. The main aim of using the AVR (ATmega 16) microcontroller is to increase the execution speed with cost effective and high performance of the system. Since, we are going to transmit as well as receive the data. So the

design cost can be increased. In order to reduce the cost of the system we are going for AVR (ATmega 16) microcontroller which has both transmitter and receiver in the form of USART serial communication interface. So that the cost of the system can be reduced considerably and the system can be much efficient.

In this project we have connected GPS MODULE (GPS6MV2) transmitter to PORTD0 and receiver of ATmega16 (PORT D1) is connected to GSM MODULE (SIM900A). The usage of SIM900A has more specification than SIM300. The LCD display is connected to the PORTC. The GPS module sends the data to microcontroller. The microcontroller analyse the data with fixed data and display the latitude and longitude value in the LCD display. If the vessel further moves the latitude and longitude value will change. If it further moves then microcontroller will trigger the buzzer and intimate that they crossed their border and OUT OF BORDER statement was displayed on the LCD display and the message is sent to the appropriate person by means of GSM module. Thus, a fisherman can able to identify whether they are in safe or in unsafe region.

5. DESIGN AND CONSTRUCTION

The projected architectural design consists which is interfaced to the AVR Microcontroller which in turn is related to the alarm circuit. The DGPS traced in the control room is sent to family members' througha GSM system and the evidence is immediately sent to the border security and the necessary action is taken.

The design and function block and circuit diagram of the system is given below.

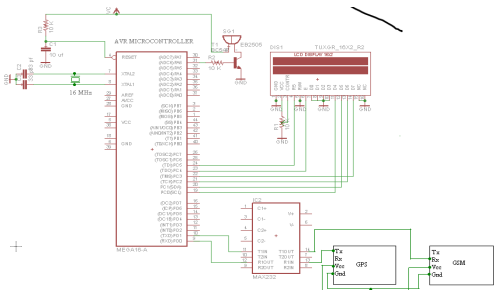

Fig.5 Overall circuit diagram of the system

6. IMPLEMENTATION OF THE SYSTEM

The architectural views of the project were deliberated earlier and the system implementation is discussed below. The main systems to be executed are the interface of the circuit with the AVR microcontroller and the ALARM to it.The other interface would be the recovery of the information from the device and then system will send the SMS.

7. WORKING OF THE SYSTEM

The main aim of our project is to design and implement the border alert system for the fisherman when they are crossing the border. If this system is implemented we can reduce the conflict between two countries and with the help of the system they can live a safety life.

The process takes place with the help of receiving data by the GPS.The Global Positioning system receives the data from the satellite in the form of NMEA frame format. There are various forms of NMEA format such as GPGLL, GPGGA and GPGSV etc.., with the help of MikroC coding we obtain the NMEA frame format**.** The obtained value is transmitted to the microcontroller with the help of UART and displays the latitude and longitude values on the LCD display.

Since our paper deals with the border alert for the user, we want to find only the latitude and longitude values to track the position of a person or vehicle to locate them easily. We track the GPGGA value of the NMEA format and with the MikroC code we find the location of a person. (Ex. Tracking of student position in the college specifically in which department they are in).

Next with the help of GSM a message can be send to the user mobile with the help of AT commands. The command used to send a message is AT+CMGF=1->AT+CMGS="8807347134"->CTRL+Z. The commands are first checked with the HyperTerminal and it gives response that they are in the border or out of the border.

Then the GSM is connected to the microcontroller and by combining the code for both GPS and GSM in MikroC the message is sent to the user mobile. For example if they are in the ECE Block the message displays "ECE BLOCK" if they are in the out of the block then the message displayed is "OUT OF BLOCK"

8. PSEUDO CODE

STEP1: START the program

STEP2: Initializing PORTC as input

PORTC=0XFF;

STEP3: Initialise the LCD and clear the display

SYNTAX: Lcd_Init ( );

Lcd_cmd(_LCD_CLEAR);

STEP4: Initialise the UART by the command UART1 Init (9600), where 9600

indicates the baud rate for GPS and GSM module.

STEP5: Create an endless loop

SYNTAX: while (1) {……}

STEP6: Creating a condition in order to receive the GPS value (UART_DATA_READY==1) and store it in a datatype (receive)

STEP7: If the received value start with '$' then it starts to receive the data (GZPXXXX)

$GPGGA: 092204.999,4250.5589,S,14718.5084,E,1,04,24.4,19.7,M,,,0000*1F

STEP8: In order to get only latitude and longitude value we are using the AND condition to get GPGGA value we are describing in which region we are

SYNTAX: if (NMEA [11] =1 &&NMEA [12] =2 &&)

STEP10: If we are in safe region LCD displays we are in safe region and send an SMS by AT command (AT+CMGF=1), AT+CMGS ="9876543210"and ctrl+Z.

9. RESULT AND DISCUSSION

We implemented the design of border alert system using GPS and GSM module. During implementation we faced several problems like obtaining a data from GPS and how to send and receive SMS from the GSM.

At first we have gone for testing the hardware modules. While testing the GPS module we didn't face any problems so we continue to proceed with this module. To get a full NMEA standard format we wrote a coding in EMBEDDED C and we dumped the coding in to the microcontroller. The outcome result what we obtained is the garbage value.

Fig.6 GPS garbage value.

So we come to know that the GPS and microcontroller is not synchronized with each other. The problem with synchronization is fixing the baud rate. Baud rate is nothing but a number of symbols transmitted per second. So we started to increase our baud rate from 4800 to 9600. At 9600 baud rate value we obtained the exact NMEA format.

Fig.7 GPS data along with predicted location.

From that we developed our code to interface GPS with AVR (ATmega16) microcontroller to obtain the exact latitude and the longitude value.

After then we moved to interface a GSM with a microcontroller. We tested a GSM module with the help of HyperTerminal and got the response. So, we moved to software coding. The command used to send the message from the microcontroller is AT+CMGF=1 and AT+CMGS="9876512340". These commands are written with the help of the syntax UART1_Write("AT\r") but we cannot receive any message from the microcontroller. So, we created an array with these commands and with help of FOR loop we call that array in the loop by fixing the exact delay. We obtained the exact message from the microcontroller (eg. ECE BLOCK).

Fig.8 GSM Output

10. CONCLUSION AND FUTURE ENHANCEMENT

In this paper we designed the embedded application system as a border alert for the user with the combined interlocked usage of GPS and GSM module. This system executes the instruction fast with the help of AVR microcontroller. Thus an efficient and reliable real-time system is built. In this method the exact location of latitude and longitude are displayed on the LCD and the message is sent to the user showing their exact position as a message to their mobile phone. Since, today the usage of mobile phone is increased in a vast range and if the user can able to find their position easily then this is much beneficial.

In future if we incorporate to wireless camera and wireless communication, means the camera can capture the position of the boat and sent the image to the controlling unit through wireless communication. We can reduce the size of the kit by using the GPS and GSM on the same module.We can also use our kit to assist the traffic, by keeping the kit in the entire boat and by knowing the location of all the boats. The process of increasing the accuracy will be achieved greater in the future.If anybody steals our boat we can easily find our boat around the globe.With the help of high sensitivity vibration sensor we can detect the accident. Whenever boat unexpectedly had an accident on the sea with the help of vibration sensor we can detect the accident and we can send the location to the owner, hospital and police. We can use our kit for detection of bomb by connecting to the bomb detector.

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