ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

Border Alert System for Boats Using Zigbee

Suresh.M[1], Gandhiraj.S[2], Saranya.T[3], Thenmozhi.S[4], Divya.M.M[5]

PG scholars, Department of ECE, Bannari Amman Institute of Technology, Erode, Tamilnadu, India[1, 2, 4, 5]

Assistant Professor, Department of ECE, Bannari Amman Institute of Technology, Erode, Tamilnadu, India[3]

ABSTRACT— The boaters may sometimes cross their area limit without their knowledge. This causes a lot of problems. They may be caught by the other peoples. This project is developed for the boat users to find out their border in the sea area. The main modules in this project are RF transducer, microcontroller unit and LCD display. The Zigbee transmitter is connected at the border area. It transmits RF signals within the particular limit. The Zigbee receiver with the micro controller unit is connected at the boat. When the boat reaches the particular area, the RF signals are received by the receiver and given to the micro controller unit. The micro controller analyses the signal and calculates the distance and sends corresponding message to the LCD display. If it crosses the limit, the micro controller operates the warning buzzer and it switches off the running motor of the boat. Thus the boat may be automatically off and the boater may easily understand the situation. This information is conveyed to the coastal authorities using GSM and they will track the boat using GPS system. The micro controller program is written in embedded c language and the microcontroller used is AT89C51.

KEYWORDS*:* GPS (Global Positioning System), GSM (Global System for Mobile Communications).

I. INTRODUCTION

Wireless Integrated Network Sensors (WINS) combine sensing, signal processing, decision capability, and wireless networking capability called zigbee which is a compact, low power system. On a local, wide-area scale, battlefield situational awareness will provide personnel health monitoring and enhance security and efficiency. Also, on a metropolitan scale, new traffic, security, emergency, and disaster recovery services will be enabled by WINS. Here first it identifies the node where the harmonic signals are produced by the strange objects and the intensity of the signal will be collected .The signal will be sent to the main node. The processing of the regular interval data from the nodes will be analyzed and based on the intensity of the signals and the direction of the detecting nodes gets changing will be observed and the results will be sent to the satellite communication system.

II. SYSTEM ARCHITECTURE

It consists of Client side module which is placed on the boat and Server side module. Client module consists of microcontroller unit connected to the GPS transceiver and indication unit of LED and buzzer. Server module consists of system control unit and GPS transceiver.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

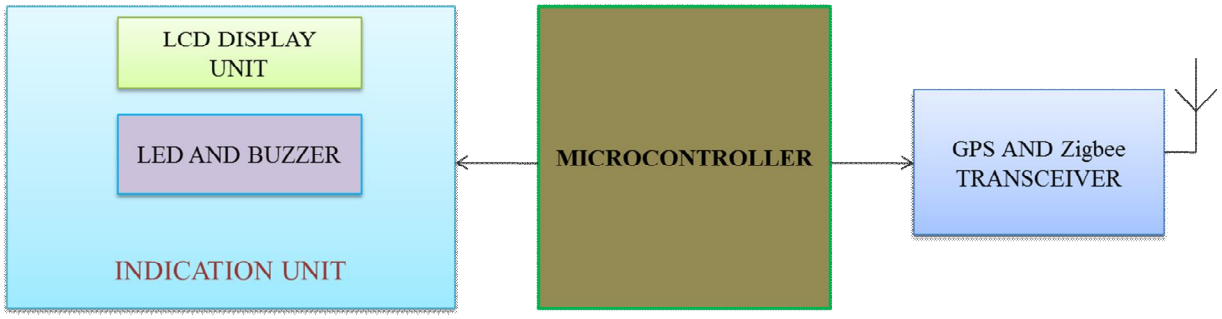

Fig. 1. Block diagram of Client side Module

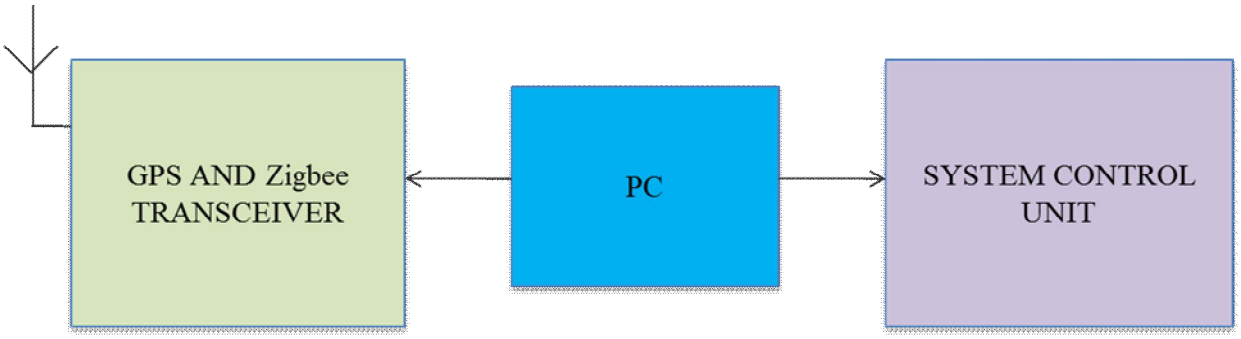

Fig. 2. Block diagram of Server side Module

III. ZIGBEE SYSTEM FOR AREA DETECTION

ZigBee is a specification for a suite of high level communication protocols used to create personal area networks built from small, low-power digital radios. ZigBee is based on an IEEE 802.15 standard. Though 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.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

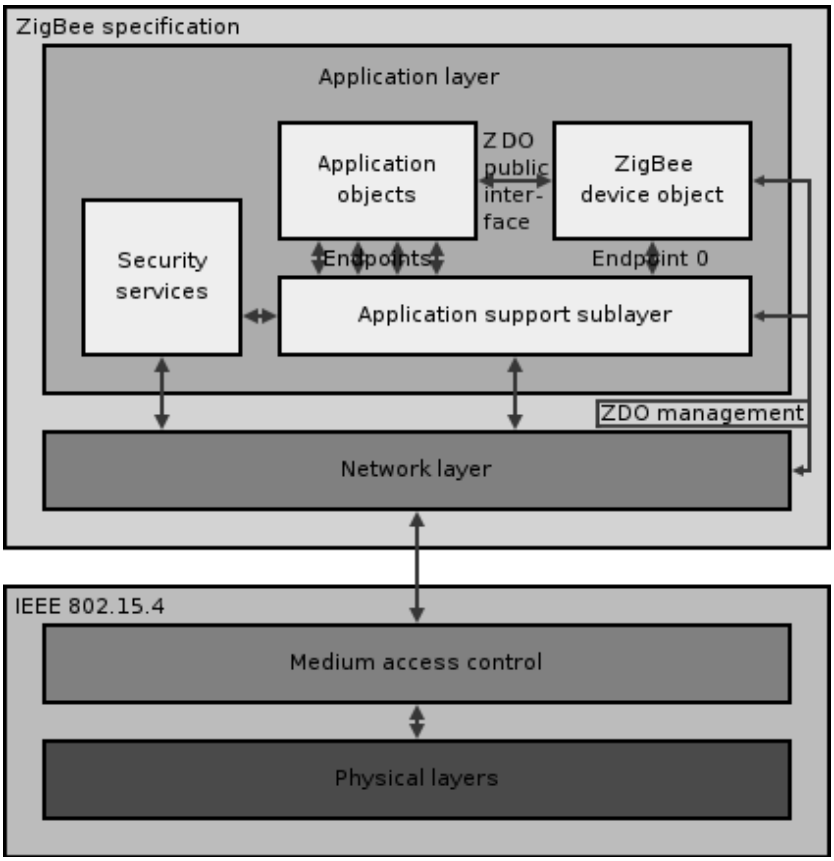

Fig. 3. Block diagram of Zigbee architecture Module

ZigBee is used in applications that require only a low data rate, long battery life, and secure networking. ZigBee has a defined rate of 250 kbit/s, best suited for periodic or intermittent data or a single signal transmission from a sensor or input device. Applications include wireless light switches, electrical meters with in-home-displays, traffic management systems, and other consumer and industrial equipment that requires short-range wireless transfer of data at relatively low rates. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other WPANs, such as Bluetooth or Wi-Fi.

ZigBee networks are secured by 128 bit symmetric encryption keys. In home automation applications, transmission distances range from 10 to 100 meters line-of-sight, depending on power output and environmental characteristics.

Applications:

ZigBee protocols are intended for embedded applications requiring low data rates and low power consumption. The resulting network will use very small amounts of power — individual devices must have a battery life of at least two years to pass ZigBee certification

Typical application areas include:

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

1. Home Entertainment and Control — Home automation, smart lighting, advanced temperature control, safety and security, movies and music
2. Wireless sensor networks — Starting with individual sensors like Telosb/Tmote and Iris from Memsic
3. Industrial control
4. Embedded sensing
5. Medical data collection
6. Smoke and intruder warning
7. Building automation

IV. GLOBAL POSITIONING SYSTEM [GPS]

The Global Positioning System (GPS) is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. The system provides critical capabilities to military, civil and commercial users around the world. It is maintained by the United States government and is freely accessible to anyone with a GPS receiver.

A. GPS Network

A GPS receiver calculates its position by precisely timing the signals sent by GPS satellites high above the Earth. Each satellite continually transmits messages that include

i. The time the message was transmitted
ii. Satellite position at time of message transmission

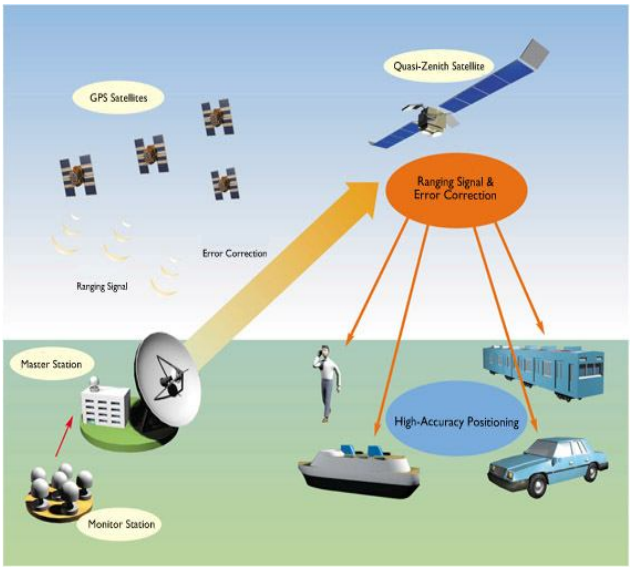

Fig.4. GPS network working model

The receiver uses the messages it receives to determine the transit time of each message and computes the distance to each satellite using the speed of light. Each of these distances and satellites' locations defines a sphere. The

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

receiver is on the surface of each of these spheres when the distances and the satellites' locations are correct. These distances and satellites' locations are used to compute the location of the receiver using the navigation equations. This location is then displayed, perhaps with a moving map display or latitude and longitude; elevation or altitude information may be included, based on height above the geoid (e.g. EGM96).

GPS measurements yield only a position, and neither speed nor direction. However, most GPS units can automatically derive velocity and direction of movement from two or more position measurements. The disadvantage of this principle is that changes in speed or direction can only be computed with a delay, and that derived direction becomes inaccurate when the distance travelled between two position measurements drops below or near the random error of position measurement. To counter this effect, more advanced navigation systems use additional sensors like a compass or an inertial navigation system to complement GPS.

In typical GPS operation, four or more satellites must be visible to obtain an accurate result. Four sphere surfaces typically do not intersect. Because of this, it can be said with confidence that when the navigation equations are solved to find an intersection, this solution gives the position of the receiver along with the difference between the time kept by the receiver's on-board clock and the true time-of-day, thereby eliminating the need for a very large, expensive, and power hungry clock. The very accurately computed time is used only for display or not at all in many GPS applications, which use only the location. A number of applications for GPS do make use of this cheap and highly accurate timing. These include time transfer, traffic signal timing, and synchronization of cell phone base stations.

Although four satellites are required for normal operation, fewer apply in special cases. If one variable is already known, a receiver can determine its position using only three satellites. For example, a ship or aircraft may have known elevation. Some GPS receivers may use additional clues or assumptions such as reusing the last known altitude, dead reckoning, inertial navigation, or including information from the vehicle computer, to give a (possibly degraded) position when fewer than four satellites are visible.

B. The Parts of GPS:

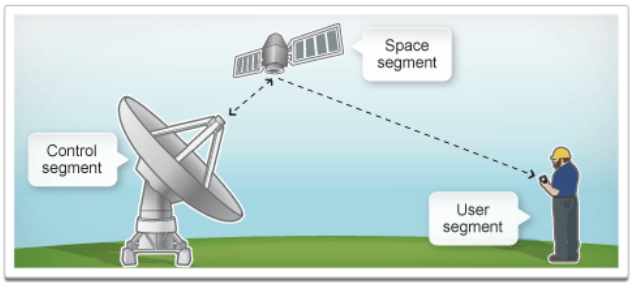

Fig. 5. Parts of GPS network

The Space Segment: This part consists of 24 satellites, manufactured by Rockwell International, which are launched into space by rockets, from Cape Canaveral, Florida. They are about the size of a car, and weigh about 19,000lbs. Each satellite is in orbit above the earth at an altitude of 11,000 nautical miles (12,660 miles), and takes 12 hours to orbit one time. There are 6 orbital planes each having 4 satellites. The orbits are tilted to the equator of the earth by 55° so that there is coverage of the Polar Regions. The satellites continuously orient themselves to ensure that their solar panels stay pointed towards the sun, and their antennas point toward the earth. Each satellite carries 4 atomic clocks.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

The Control Segment: This part consists of 5 worldwide unmanned base-stations that monitor the satellites to track their exact position in space, and to make sure that they are operating correctly. The stations constantly monitor the orbits of the satellites and use very precise radar to check altitude, position and speed. Transmitted to the satellites are ephemeris constants and clock adjustments. The satellites in turn, use these updates in the signals that they send to GPS receivers.

The User Segment: This part consists of user receivers which are hand-held or, can be placed in a vehicle. All GPS receivers have an almanac programmed into their computer, which tells them where each satellite is at any given moment. The GPS receivers detect, decode and process the signals received from the satellites. The receiver is usually used in conjunction with computer software to output the information to the user in the form of a map.

V. SYSTEM IMPLEMENTATION

This circuit consists of a microcontroller unit; it may be of any one of these AT89C52, Atmega 8, Atmega 328 controllers. Whenever the boat crosses the border, the intimation will be provided by the indication module of LCD, LED and buzzer. If the limit exceeds means the warning will be sending and if no response means, the system control unit will makes the boat control to the server side module. The display unit is of a sixteen cross two LCD (Liquid Crystal Display) module.

VI. RESULTS AND DISCUSSION

Present paper is designed using 8051 microcontroller. It is proposed to design an embedded system which is used for automotive security. In this paper AT89C52 microcontroller is used for interfacing to various hardware peripherals. For doing so an AT89C52 microcontroller [8] is interfaced serially to a GPS Transceiver. An EEPROM is used to store the mobile number. The hardware interfaces to microcontroller are LCD display, GPS Transceiver. The design uses RS-232 protocol for serial communication between the modems and the microcontroller. A serial driver IC is used for converting TTL voltage levels to RS-232 voltage levels.

The simulation is carried out by using PROTEUS design tool. Proteus is software for microprocessor simulation, schematic capture and printed circuit board (PCB) design. It is developed by Lab center Electronics.

Proteus Professional - a software package for computer-aided design of electronic circuits. The package is a system of circuit simulation, based on models of electronic components made in PSpice. A distinctive feature of the package Proteus Professional is the possibility of simulating the operation of programmable devices: microcontrollers, microprocessors, DSP and others. Additionally, the package Proteus Professional is a system design of printed circuit boards.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

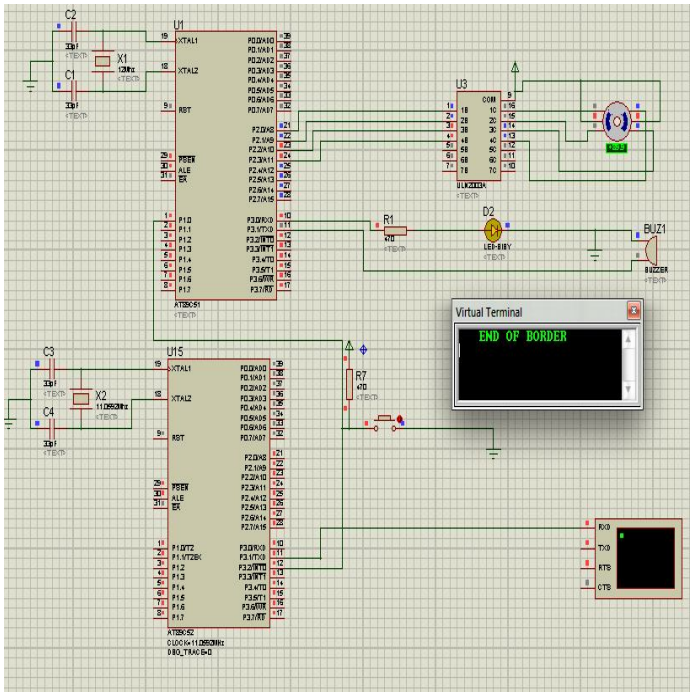

Fig. 6. Simulation results of Border Alert System

The result shows that, it will work well for all kinds of marine applications and it responds immediately to the user's commands.

VII. CONCLUSION

From the proposed system, Border Alert System for Boats Using Wireless Sensor Networks, its results and discussions proved that this system works well, and can be put forward to practical applications. The main feature of this paper is when someone crosses the border line; the client module shows indication of warning message. If no response from the client, then it controls the boat from the server side module by using system control unit.

REFERENCES

[1] Hanjiang Luo, Kaishun Wu, Zhongwen Guo, Lin Gu, Zhong Yang and Lionel M. N "*SID: Ship Intrusion Detection with Wireless Sensor Networks*" International Conference on Distributed Computing Systems on 2011.

[2] Jun Luo, Jean-Pierre Hubaux School of Computer and Communication Sciences EPFL, "A Survey of Inter-Vehicle Communication",CH-1015 Lausanne, Switzerland.

[3] AppaRao.T, Baburao Kodavati, Dr.Narayana.Y.K, Raju.V.K.,"GSM and GPS based vehicle location and tracking system". *IJERA, Internal Journal of Engineering Research and Applications* VOL. Issue 3,pp. 616-625. 15, JULY 2011.

[4] Ericsson L.M, Telefonakie bolaget, "A Method of locating mobile station in a mobile telephone system," *International Patent* PCT/SE93/00 203.

[5] http://www.modemspy.com/serialcommunications.html

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

[6] FranciscoGonzalez-Castano.J, Fernando Isasi de Vicente, Javier Vales-Alonso, Jose Pousada-Carballo.M and Manuel Fernandez-Iglesias.J "Real-Time Interception Systems for the GSM Protocol," *IEEE transactions vehicular technology*, vol 51 no.5, September 2002.

[7] Ahmed.M, Ajaz.S, Asim.M, Ozair.M, Siddiqui.M, Mushtaq.Z, "Autonomous Vehicle Monitoring and Tracking System" *SCONEST* 2005.pp.1 3, 2005.

[8] http://www.Keil.com/ baudratespossiblewiththe8051.html

[9] Chodura.H, Heit-mann.H, Kober.H, Kuhls.B, Miehling.T, "Security module specification," *Tech. Rep., HIS-Her stellerinitiative Software*, Bochum, Germany, July 2006, Version1.

[10] de Vicente F.I, Fernandaz-Iglesias.M.J, Gonzalez-Castano.F.J, Pousada-Carballo. J.M,"Jamming system formobile communications, Electron. Letters" Vol.34,pp. 2166-2167, 1998.

[11] http://www.gsm-modem.de/

[12] Tsugawa.S, Tokuda.K, Kato.S, "Digital Cellular Telecommunication System: Lawful interception requirements for GSM," *ETSI, ETSI Tech*. Rep. ETR 363, 2009.

[13] Alison Brown, Bruce Bockius and Jacob Griesbach, "GPS tracking location-based service using wristwatch geozigbee sensors", I*ON NTM 2007*, San Diego, CA, January 2007.

[14] Pctel V.90/K56 Flex Series AT Command Guide.

[15] J-P. Hubaux, S.C Apkun, and J.Luo, "The security and privacy of smart vehicles," *IEEE Security & Privacy Magazine*, vol. 2, no, 3,pp.49-55, 2004.