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GPS and GSM based Border Alert System using MSP430G2553

Ms. P. Kavitha Reddy[1], K. Rohith Kumar[2], CH. Kranthi Kumar[3], M. Avinash[4], K. Sai Chandan Reddy[5]
[1, 2, 3, 4, 5]*B. V. Raju Institute of Technology, Medak*

Abstract: ***For every Country there will be border and many restricted zones, which are the places where a common people are restricted to approach in those zones.***
But for the people who are living near to those regions are to be able to know that the specific region is restricted. GPS present in product will receive the latitudes and longitudes of the instant location. If the location is present in restricted zone given by the country, the device will pop a message using GSM.
The proposed system consists of microcontroller, GPS and GSM which are the major components integrated together to perform the Application.

I. EXISTING SYSTEM

We have the Existed project worked only with GPS Only. So that, the user can only read the values displayed on the display and also the previous project is build with inbuilt Transmitter and receiver of PIC16f877A. In this model they have connected only GPS and display, so that with the help of an electronic map, they are able to identify that the surrounded regions is restricted or not.

II. PROPOSED SYSTEM

The proposed system consists of GPS receiver which receives signal from the satellite and gives the present position of the vehicle. And it is used to detect the border of the country through the specified longitude and latitude of the position. It is designed with a tracking unit separately and monitoring unit separately. If someone crossing the border the coastal guards will get the alert message about the person.
The particular layer level i.e. the geographical values of a border can be predefined and these values can be stored in memory of the microcontroller.
The present geographical values of the vehicle are compared with predefined values and if these values are matched then the microcontroller sends alert message to the person through the GSM module, and also displays the current location of the vehicle in LCD display.

III. LITERATURE SURVEY

A. D. JimIssac (2015) /Advanced Border Alert System UsingGPS and with intelligent engine control unit / International Journal of Electrical and Computing Engineering (IJECE)vol.1 issue 4.
B. P. Satheesh, Maritime Border Refuge System [MBR] /National Conference on Emerging Trends in Computer, Communication & Instrumentation in Strengthening National Security.
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IV. INTRODUCTION

In the Coastal regions and local restricted zones, many people are crossing the boundaries unknowingly and facing problems while getting out of the restricted zone.
To get rid of this issue, a system is developed for helping the people to let them know that the zone is restricted while entering into it using GSM and GPS by receiving the geographical parameters and alerting through GSM module.
The Microcontroller takes the values from the GPS verify with the predefined values. If the values matched, microcontroller sends output to GSM module and the GSM sends the alert message to the saved contacts.

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V. BLOCK DIAGRAM

The major components used in this product are Microcontroller (MSP430G2553), GSM 900A, GPS module, 16*2 LCD Display and a Buzzer.

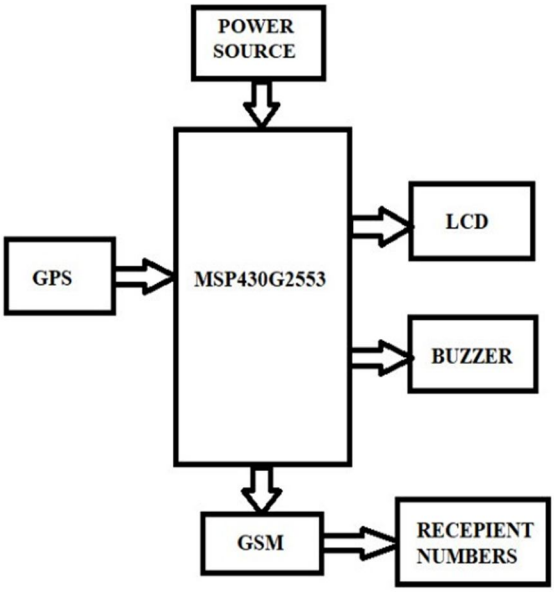


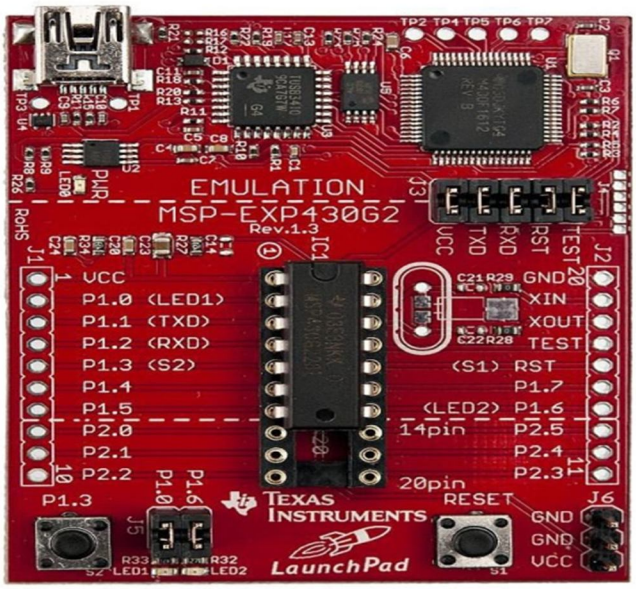
Fig. Block diagram

VI. HARDWARE USED

The Major components used are discussed further.

A. Microcontroller (MSP430G2553)

The MSP430G2553 is an Ultra low power microcontroller featuring different types of peripherals integrated for various applications. It consists of five power modes optimized to achieve good battery life in portable application. It consists of 16-bit RISC CPU, 15 bit resistors and constant generators for code efficiency. It also consists of 16-bit timers, 24 I/O capacitive touches enabled pins, an analog comparator and the universal serial communication interface. The below shown are some of the features of MSP430G2553.



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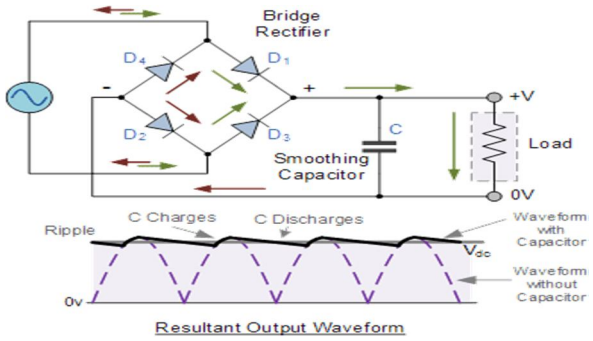
B. Features of MSP430G2553

1) Operating Voltage 5V
2) Input Voltage (recommended) 7-12V
3) Input Voltage (limits) 6-20V
4) Digital I/O Pins 14 (of which 6 provide PWM output)
5) Analog Input Pins 6
6) DC Current per I/O Pin 40 mA
7) DC Current for 3.3V Pin 50 mA
8) Flash Memory 32 KB of which 0.5 KB used by
9) SRAM 2 KB
10) EEPROM 1 KB
11) Clock Speed 16 Mhz



C. GPS

GPS stands for Global Positioning System (GPS) which is a satellite-based navigation system made up of minimum 24 satellites. It is used to locate or position the object around the world in any weather conditions anytime (i.e., 24 hours a day)

Fig. GPS Module

D. How GPS Works

GPS satellites circle the world tries on a daily basis in a very precise orbit. Each satellite transmits a novel signal and orbital parameter that allow GPS devices to decode and compute the precise location of the satellite. GPS receiver uses this information and trilateration to calculate the user's exact location. Essentially, the GPS receiver measures the gap to every satellite by the quantity of your time; it takes to receive a transmitter signal. With distance measurement from more satellites, the receiver can determine a user's position and display it electronically to live running note, find some way home, or adventure anywhere.

E. How Accurate the GPS is?

Today's GPS receivers are highly accurate because of their parallel multi channel design. Our receivers are quick to lock onto satellites when they first turned on. They maintain a tracking lock in dense tree cover or in urban areas with tall buildings. Certain atmospheric conditions and some other error sources can affect the accuracy of GPS receivers. Garmin GPS receivers are typically accurate to below 10 meters of range.

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F. GSM

A GSM modem is a device which can be either a mobile or a modem device which is be used to make a computer or any other processor communicate through a network. A GSM modem needs a SIM card to be operated and operates over a network range subscribed by the network operator. It can be connected to a computer through a serial, a USB or Bluetooth connection.

A GSM modem can also be a standard GSM mobile with the appropriate cable and software driver to connect to a serial port or a USB port on your computer. GSM modem is usually preferred to a GSM mobile phone. The GSM modem has wide range of applications in transaction terminals, supply chain management, security systems and at weather stations.

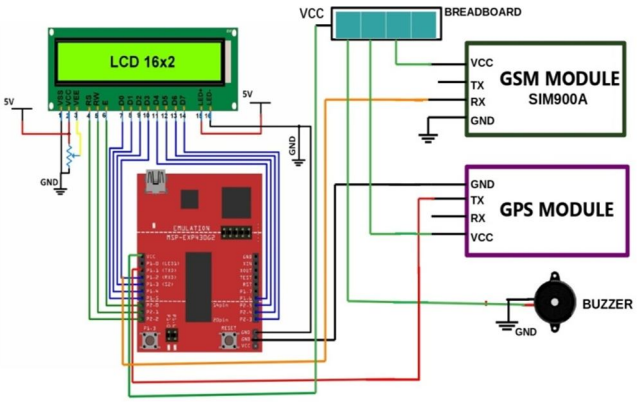
Fig. GSM Module

The below shown are some of the features of GSM Module.

G. Features of GSM Module

1) Improved spectrum efficiency
2) Compatibility with integrated services digital network (ISDN)
3) Support for new services.
4) SIM phonebook management
5) Real time clock with alarm management
6) High-quality speech
7) Uses encryption to make phone calls more secure
8) Short message service (SMS).

H. Interfacing of Hardware Components



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I. Flow Chart

Each module should be tested to whether they are giving the desired results. The errors were analyzed and studied before attempting it, and were corrected accordingly.

The Flow process of the product is explained below. As the project starts the GPS returns the longitude and latitudes values to microcontroller. If the fetched values are matched with the restricted zones values, the microcontroller will respond to GSM by sending the values. As the response is obtained, GSM will pop a message into the mobile with the specified number.

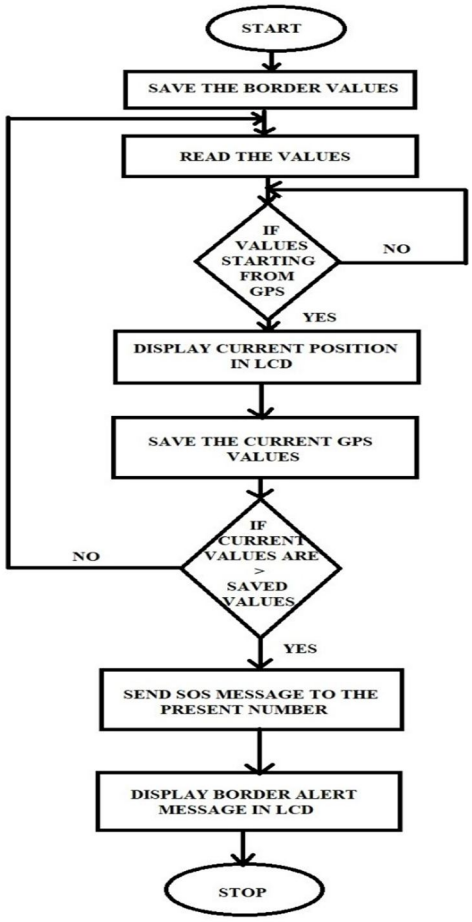

Fig. Flow chart

J. Working of the project

The main aim of our project is to design and implement the border alert system for the boats or ships when they are crossing the border unknowingly. 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.

As the Building of project is done by assembling the components integrated based upon the Block Diagram produced. For the Running of application, the power supply is given to the microcontroller MSP430G2553 (which has the operating voltage of 3.3v – 5v). GPS is connected to microcontroller which acts as input device to the microcontroller. In Order to give power supply to GPS, inbuilt voltage regulator is present in the microcontroller as the GPS requires 3.3v of voltage to work. When the GPS is started, it determines the latitude and longitudes of specific location of the person and displays the current position in the LCD display. When the person moves from one location to another location, the latitudes and longitudes will change. These values will be keeping on updated to the microcontroller, if the present location is cross or about to cross the restricted area then the microcontroller will send the alert message to the person through the GSM module. This GSM module will sends the alert message to the contact which is predefined in it. And also buzzer is connected to the equipment which produces beep sounds when the person is about to cross the restricted area, then the person can able to notice that he is entering into restricted area So that he can changes his direction. And it makes the person to move safe zones.

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VII. SOFTWARE USED

A. Energia IDE

Energia can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. The microcontroller on the board is programmed using the Energia programming language (based on Wiring) and the Energia development environment (based on Processing). Energia projects can be stand-alone or they can communicate with software on running on a computer (e.g. Flash, Processing, MaxMSP). Energia is a cross-platform program. You'll have to follow various instructions for your personal OS.

B. The Development Process

Here is the process for creating a program to run on your Energia:

1) Create the sketch in the Energia software
2) Verify the sketch
3) Correct any errors that are indicated (like typos or misspelled variable names)
4) Compile the sketch
5) Upload the resulting program to your Energia
6) Test your program
7) Rewire or rewrite code as needed
8) Return to Step.

VIII. EXPERIMENTAL RESULTS

Border alert system is used to detect the boundary location and warn the person who is about to cross the boundary unknowingly. It is not only finding the GPS value, but also compares with the predefined value in the microcontroller, and makes a decision, if the persons location is nearer to the predefined location then the microcontroller sends the alert message through the GSM module to the saved contacts in the GSM module.

Fig : Kit Photo

Fig. Showing location on LCD display

Fig. Showing alert message.

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IX. ADVANTAGES AND DISADVANTAGES

A. *Advantages*

1) Easy to install
2) It makes connecting to different devices convenient.
3) It is wireless.
4) It is free to use if the device is installed with it.
5) Real time monitoring.
6) Portable & globally usage.
7) It can be used in any cell phone and doesn't necessarily require an expensive smart phone.

B. *Disadvantages*

Possibility of failure due to communication problems.

C. *Applications*

1) Ocean borders.
2) Heavy ships.
3) Transport department.
4) Speed limiters.

X. CONCLUSION

The "Border alert system" is a system that implements GPS and Embedded system together to create a guiding system for boats. The person, while navigating crosses the maritime boundary unknowingly as they are unable to visualize it in the ocean. In that case, this system will make that person move to Authorized locations.

A. *Future Scope*

This project can be further enhanced with IOT technology to achieve high performance to current technology; we can also develop android application for the user to make it easier operation side part. We can attach a camera for vision based environment sensing and Google API.

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[4] P.Satheesh, Maritime Border Refuge System [MBR]/ National Conference on Emerging Trends in Computer, Communication & Instrumentation in Strengthen Security.

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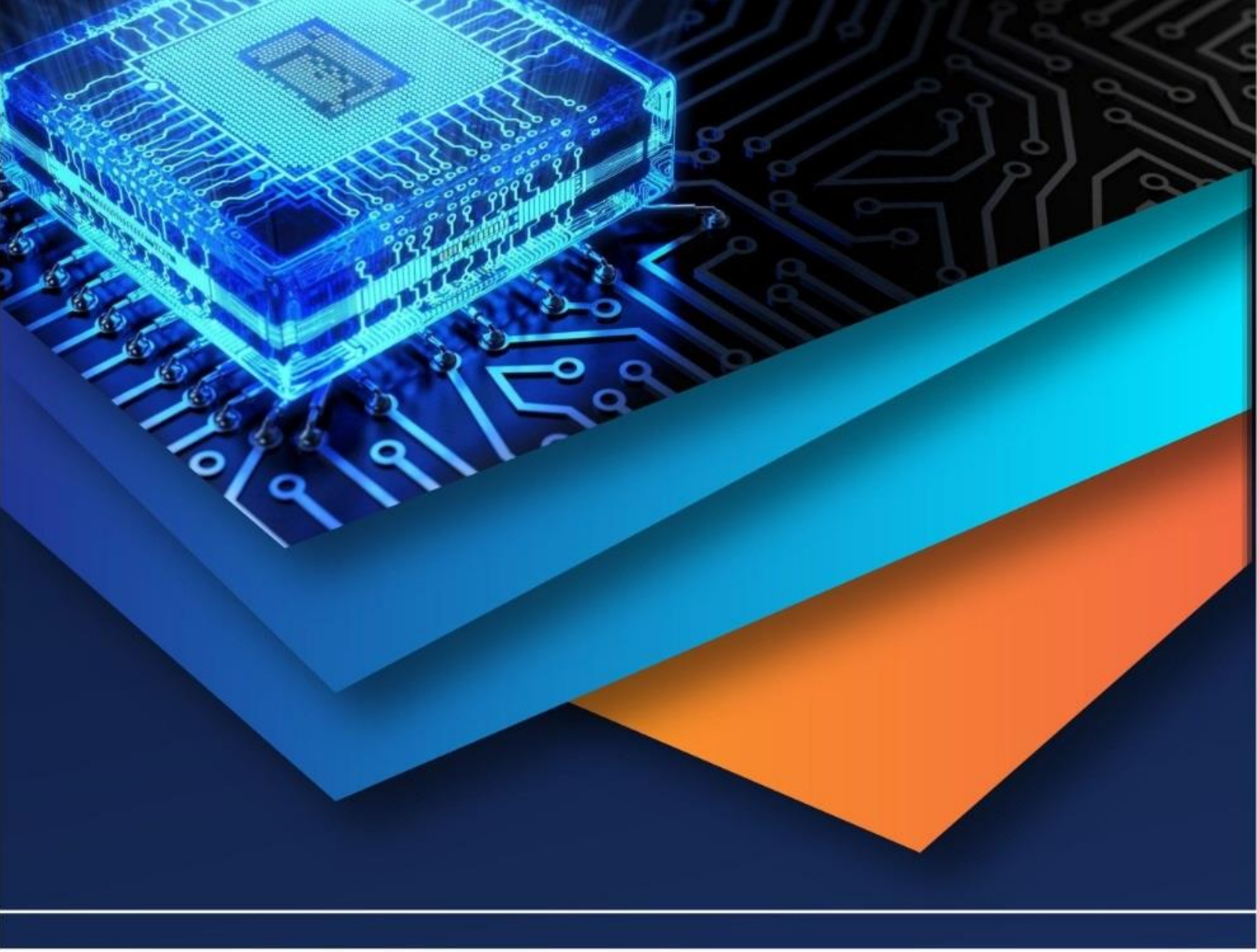

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