

## DEVICE TRACKING USING EMBEDDED GPS AND ZIGBEE TECHNOLOGY

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**Abstract:** GPS is one of the technologies that are used in a huge number of applications today. One of the applications is tracking various Portable Devices and keeps regular monitoring on them. This tracking system can inform you the location of Equipment which is embedded this hardware, and that information can be observed from any other remote location. This system enables us to track target in any weather conditions. This system uses GPS and Zigbee technologies. A method for tracking Device using a terrestrial system similar to GPS is presented. With GPS and public Google Map API functionalities, global location and sensor information are sent over networks to a cell-phone embedded with a simplified Zigbee technology used to track device, in addition combination of these technologies resulting feasible and efficient tracking of various devices.

To develop a prototype project that can help to assist user in detect a missing Device. To create a pair of device used Zigbee and GPS technology that can detect each of devices which is will emit a Message and latitude & longitude coordinates when it reach the distance limit. To help user to guide to find stolen device from any location and aware from any lost occur in limitation distance. Virtually anything on the world can be mapped, and anyone can create a map, given the knowledge of the location of attractions relative to the latitude and longitude boundaries. This can be useful not only for vehicles lost or stolen on any place, but for cars, bicycles and key-chains etc. This product may have a high potential market for many people with their many loved devices want to ensure the safety of their devices.

**Keywords:** Transmitter, Receiver, Tracking device, GPS, Zigbee, GSM

### I. INTRODUCTION

GPS is one of the technologies that are used in a huge number of applications today. One of the applications is tracking Mobile or Any Portable Device and keeps regular monitoring on them. This tracking system can inform you the location and route travelled by Equipment which is embedded this hardware, and that information can be observed from any other remote location. This system enables us to track target in any weather conditions. This system uses GPS and Zigbee technologies. A method for tracking Device using a terrestrial system similar to GPS is presented. This system enables simultaneous tracking of thousands of Equipment's with transmitters that are lighter, longer lasting, more accurate and cheaper than other

automatic positioning tags. An open architecture for Device tracking systems using various sensors built into a compact prototype, easily embedded in any Device. With GPS and public Google Map API functionalities, global location and sensor information are sent over networks to a Cell phone, embedded with a simplified Zigbee technology used to track device when closing by with an adaptive alert Message to the receiver for monitoring and searching. In addition, to efficiently save the battery power and cost of the tracking system, and then implemented resulting in feasibility and efficiency of battery power and data transmission. Now a day's technology is growing higher and higher pick level, because of this the common people are ready to absorb these technology facilities in their daily life. In their day to day life peoples are demanding to protect their instruments, devices etc. by using the available resources. Hence this project is made on the platform of this demand. Problem statements:

- People's difficult to monitor their devices when they are busy or at public area.
- The disappearance of the device at the public's attention often occurs.
- Difficulties in finding the device which stolen from them.

Components Required:

- Arduino
- GSM-GPS Module
- 16x2 LCD
- Power Supply
- Connecting Wires
- Zigbee
- SIM Card
- Cell Phone

A. Arduino UNO ATmega328:

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB - to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.



Fig 1: Arduino UNO R3

Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.

Revision 3 of the board has the following new features:

- 1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible with both the board that uses the AVR, which operates with 5V and with the Arduino Due that operates with 3.3V. The second one is a not connected pin that is reserved for future purposes.

- Stronger RESET circuit.
- ATmega 16U2 replace the 8U2.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform.

**B. GPS-GSM Module(SIM 808)**

GPS-GSM Module (SIM808) module is a complete Quad-Band GSM/GPRS module which combines GPS technology for satellite navigation. This compact design which integrated GPRS and GPS in a SMT package will significantly save both time and costs for customers to develop GPS enabled applications. Featuring an industry-standard interface and GPS function, it allows variable assets to be tracked seamlessly at any location and anytime with signal coverage.



Fig2: GPS-GSM (SIM808) Module

**C. LCD 16x2**

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.



Fig 3: LCD 16x2

The receiver module is activated when its within the range of transmitter module. Which is decoded and send message to the LCD screen (Pin D4 to D7) to display the confirmation message (Module is Found). If the receiver is in the range of transmitter module then Zigbee module activated and sends the confirmation signal to Arduino (Pin 2 DATA to D12).

**D. Power Supply**

Power supply device for the conversion of available power of one set of characteristics to meet specified requirements Typical application of power supplies includes converting raw input power to a controlled or stabilized voltage and/or current for the operation of electronic equipment.



Fig 4: Power Supply Adapter

**E. Zigbee**

ZigBee is a wireless networking standard that is aimed at remote control and sensor applications which is suitable for operation in harsh radio environments and in isolated locations.



Fig 5: Zigbee Module

ZigBee is a low rate, low cost, low power wireless communication standard, which aims to be used in home automation and remote control applications. ZigBee standard has been designed to offer minimum cost and power connectivity for devices which require battery life for durations ranging from several months to several years. ZigBee devices are expected to cover 10–75 meters based on the RF environment and output consumption required for a given application. Each ZigBee network involves three main components as shown in Figure 2: coordinator (ZC), routers (ZR) and end-devices (ZED). Only one coordinator is required for each ZigBee network, and it initiates the network formation. A router is an optional network component. It may associate with coordinator, and participates in the multi-hop routing of messages. And finally, an end-device which is optimized for low power-operation and only connects to one coordinator or router.

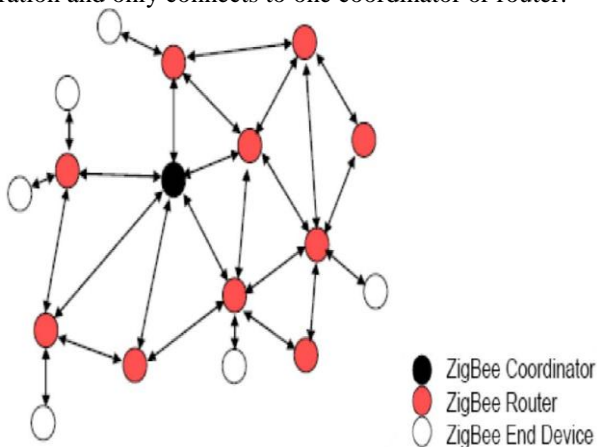


Fig 6: ZigBee mesh network  
 (see online version for colours)

Zigbee is to guide and confirm the Detected location when the receiver module is in the range of Zigbee transmitter. The GSM send the coded co-ordinates to Cell phone and returns a signal to Arduino (Pin D0) for the conformation of operation completed. At the same time the Arduino activate the Zigbee transmitter module (Pin D12) till the operation completed and provides the 5 V supply

The receiver module is activated when its within the range of transmitter module. Which is decoded and send message to the LCD screen (Pin D4 to D7) to display the confirmation message (Module is Found). If the receiver is in the range of transmitter module then Zigbee module activated and sends the confirmation signal to Arduino (Pin 2 DATA to D12). We can track the stolen dead mobile or any device by following detected co-ordinates (Latitude and longitude) and confirm the location by detecting the respective Zigbee signal received from the stolen device.

**ZigBee Wireless Network:** This is the section which physically doesn't exist. It consists of the wireless communication between the ZigBee modules attached to the Transmitter and Receiver Arduino board and microcontroller board.

II. FLOW DIAGRAM  
 A. Operational Flow Diagram Of Transmitter Module

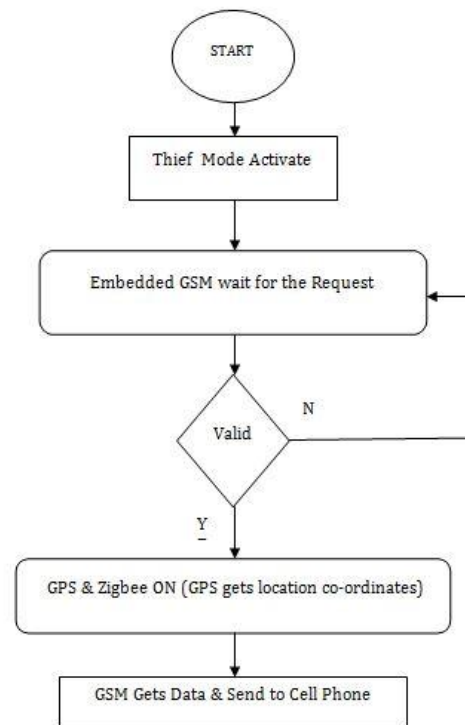


Fig.7: Operational Flow Diagram Of Transmitter Module  
 B. Operational Flow Diagram Of Receiver

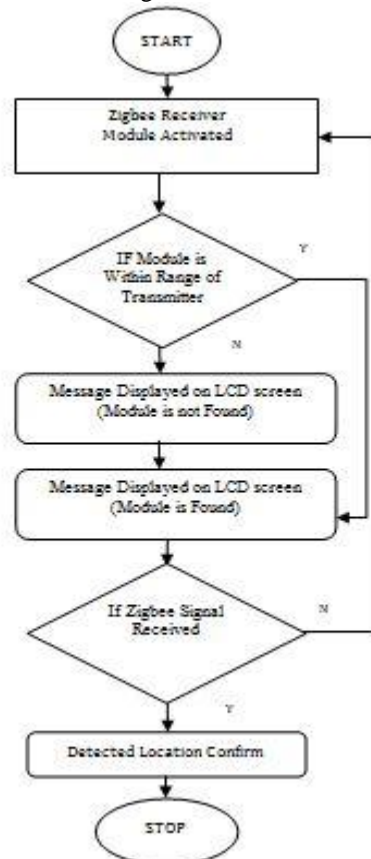


Fig 8:Operational Flow Diagram Of Receiver

**Description**

To know the working of this system we describe the system in two parts as per its module.

**Transmitter Module**

This transmitter prototype designed to get active and send the location co-ordinates to the registered mobile number on cell phone when device is stolen. As per the circuit diagram we use the Arduino as control unit, GPS for to the detect location co-ordinates, GSM (Any strong future technology is used instead of GSM is used to send the detected co-ordinates to the cell phone. It can be replaced) is used to send the detected co-ordinates, and Zigbee is to guide and confirm the Detected location when the receiver module is in the range of Zigbee transmitter.

When your Device is stolen by thief then the thief's will not know ,we track them. After that now in current devise we have no tech to detect or track our stolen mobile or any device. The transmitter prototype having the switch to replicate the situation as per above mention. When this switch is pressed or got the power the transmitter is active and detects the current location and send to the cell phone  
 Now in this prototype when transmitter module is active then the GPS module is get the co-ordinates and send to the control unit (Arduino Uno R3) to the pin D10. The Arduino decodes the data and send to the GSM module (Pin D1). The GSM send the coded co-ordinates to Cell phone and returns a signal to Arduino (Pin D0) for the conformation of operation completed. At the same time the Arduino activate the Zigbee transmitter module (Pin D12) till the operation completed and provides the 5 V supply.

**Receiver Module**

The receiver module is activated when its within the range of transmitter module. Which is decoded and send message to the LCD screen (Pin D4 to D7) to display the confirmation message (Module is Found). If the receiver is in the range of transmitter module then Zigbee module activated and sends the confirmation signal to Arduino (Pin 2 DATA to D12). We can track the stolen dead mobile or any device by following detected co-ordinates (Latitude and longitude) and confirm the location by detecting the respective Zigbee signal received from the stolen device.

As per our requirement we can used this technology in many devices.

**III. CIRCUIT DIAGRAM**

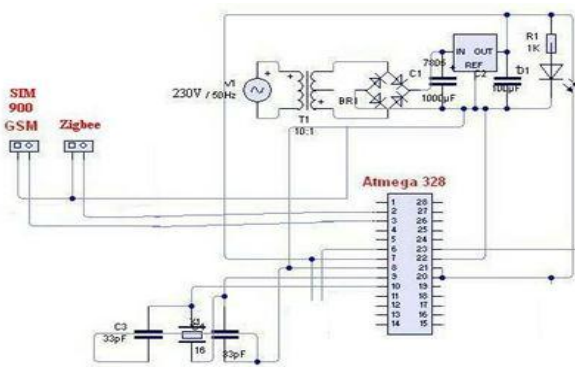


Fig 9: Transmitter Module

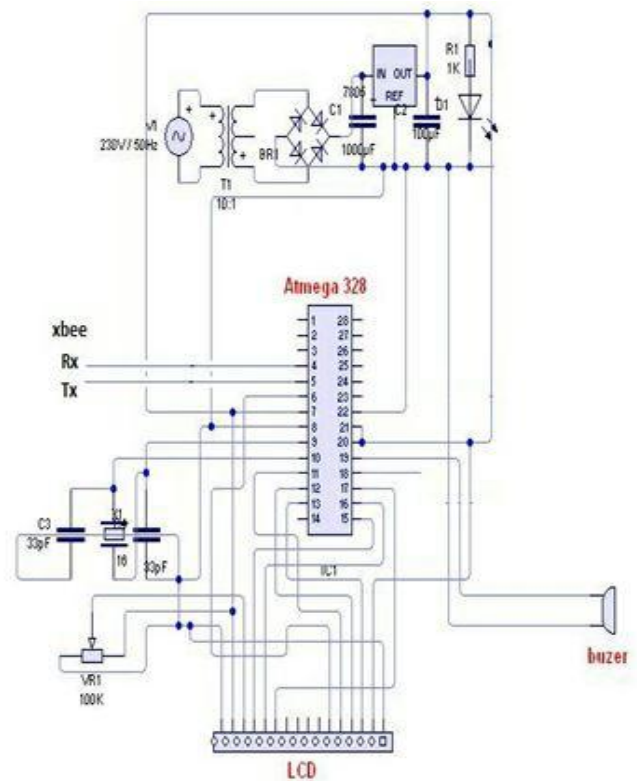


Fig 10: Receiver Module

**IV. LITERATURE SURVEY**

Real-time tracking and management of Device has been a field of interest for many researchers and a lot of research work has been done for tracking system.

Recently the various anti-theft modules like steering wheel locked equipment, network tracking system and traditional electronic alarm are developed along with client identification and real time performance monitoring.

The paper presented by El-Medany, W.; Al-Omary et al describes a real time tracking system that provides accurate localizations of the tracked vehicle with low cost. GM862 cellular quad band module is used for implementation.

A monitoring server and a graphical user interface on a website is also developed using Microsoft SQL Server 2003 and ASP.net to view the proper location of a Device on a specific map. The paper also provides information regarding the vehicle status such as speed, mileage.

Hu Jian-ming; Li Jie; Li Guang-Hui describes an automobile anti-theft system using GSM and GPS module. The system is developed using high speed mixed type single-chip C8051F120 and stolen Devices is detected by the use of RF technology.

The system remains in contact with Device owner through the GSM module, for the safety and reliability of Device. Fleischer, P.B.; Nelson et al describes development and deployment of GPS (Global Positioning System)/GSM (Global System for Mobile Communications) based Device Tracking and Alert System. This system allows various device manufacturer companies to track their Devices in

real-time and provides security from armed robbery and any incident occurrences.

Le-Tien, T.; Vu Phung describes a system based on the Global Positioning System (GPS) and Global System for Mobile Communication (GSM). It describes the practical model for routing and tracking with mobile device in a large area outdoor environment.

The system includes the RF transmitter to confirm moving direction of a Device. The system will acquire positions of the Device via GPS receiver and then sends the data to supervised center by the SMS (Short Message Services) or GPRS (General Package Radio Service) service. The supervised center comprises of a development kit that supports GSM techniques-WMP100 of the Wavecom Company. Finally, the position of the mobile or Device will be displayed on screen.

#### V. APPLICATIONS

- Provide security to vehicles
- Taking care of the elderly
- Police & private detectives
- Camping enthusiasts
- Company vehicle fleet tracking
- Pets
- Painting/artwork security

#### VI. FUTURE SCOPE

- The size of the object reduces with the time, the background becomes more dominant than the object being tracked.
- Latitude longitude coordinates display in form of global map at receiver site.
- Multi-view tracking can be implemented using multiple cameras.

#### VII. RESULT



Fig 11: Tracking Device

#### VIII. CONCLUSION

Thus we have designed a Device tracking system using two technologies mainly GPS and Zigbee. The system is already exist but only limited to GPS that is only get Latitude and Longitude Coordinates and track them. But we extend that system to add Zigbee technology which is capable of to confirm your exact location for minimizing searching time (Secondary confirmation to us). And also this system is capable in those places like a forest area there is no GPS signal to Find them our device. So,that time our Zigbee will work and within 200 meter range we can find our device easily. It offers to track not only portable devices but also for Pets, Painting/Artwork security, Camping enthusiasts and Police-Private detectives. Future work is to reduce the size of system and Multiview tracking can be implemented using multiple cameras.

#### IX. REFERENCES

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