LOCATION TRACKER USING GSM AND GPS MODULE

# A PROJECT REPORT

***Submitted by***

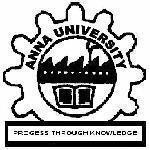
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***in partial fulfillment for the award of the degree of***

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# COMPUTER SCIENCE AND ENGINEERING



**RAJALAKSHMI ENGINEERING COLLEGE,**

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**RAJALAKSHMI ENGINEERING COLLEGE, CHENNAI**

**BONAFIDE CERTIFICATE**

Certified that this project report titled **“LOCATION TRACKER USING GSM AND GPS MODULE”** is the bonafide work of **“VAISHARLI S (210701296), VAISHNAVI C (210701298)”** who carried out the work under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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# ABSTRACT

The advent of the Internet of Things (IoT) has revolutionized various industries by enabling real-time data acquisition and intelligent automation, with location tracking systems emerging as a crucial technology in logistics, healthcare, personal safety, and asset management. This overview presents a location tracking system using IoT components to provide efficient, accurate, and real-time location monitoring. The system integrates IoT devices like GPS modules, RFID tags, and wireless communication technologies such as Bluetooth, and LoRaWAN to collect and transmit location data. These devices are strategically placed on objects or worn by individuals to continuously monitor their whereabouts, with data transmitted to a central server via IoT gateways, where it is processed and stored. Advanced data processing algorithms and machine learning techniques enhance the accuracy and reliability of the location data, while a user-friendly interface, accessible through web and mobile applications, allows users to visualize real-time locations on a map. The system also includes alert mechanisms that notify users of unusual activities or deviations from predefined routes, thereby enhancing security and operational efficiency.

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**CHAPTER 1**

**INTRODUCTION**

In moments of urgency where swift action is imperative, a dependable GPS tracker can serve as a lifeline. From first responders navigating crisis situations to worried family members seeking reassurance, the demand for prompt and accurate location updates cannot be overstated. Unlike many conventional GPS trackers that entail cumbersome manual procedures, our innovative solution is engineered to streamline this process into a single step. By simplifying tracking procedures, we're introducing unprecedented ease in accessing vital location information precisely when it's needed most. Whether it entails pinpointing a lost hiker amidst rugged terrain or expediting assistance during a medical emergency within urban confines, our GPS tracker is tailored to deliver swift and pinpoint location data with unparalleled ease.

# 1.1 MOTIVATION

* Providing accurate and real-time location information.
* Enhancing safety and security by tracking assets, vehicles, and individuals.
* Optimizing logistics, improving efficiency, and facilitating emergency response.

**1.2 OBJECTIVES**

* Integrate Arduino, GPS Neo-6M module, and SIM800L GSM module to create a comprehensive GPS tracking system.
* Develop a circuit design that enables real-time GPS location tracking and GSM communication for remote monitoring and control.
* Ensure seamless integration and communication between the components to achieve accurate and reliable tracking functionality.
* Provide a cost-effective and customizable solution for various applications such as vehicle tracking, asset management, and personal safety.

**CHAPTER 2**

**LITERATURE REVIEW**

[1] IoT Based GPS Location Tracker Using NodeMCU and GPS Module published in the year 2020. A local web server displays location details, including a link to view the location directly on Google Maps

[2] GPS Tracking System Using LoRaWan published in the year 2018.This paper focuses on integrating GPS modules in buses to track their locations and transmit data to a central server2.

[3] Real-Time Bus Tracking System published in the year 2019.This paper that emphasizes on integrating GPS modules in buses for location tracking and transmitting data to a central server.

[4] Human Location Tracking Device using IoT published in May 2018. It leverages IoT and machine learning data models with serverless architecture based on cloud computing.

[5] ReachOut Smart Safety Device published in the year 2018. It leverages IoT and machine learning data models with serverless architecture based on cloud computing.

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# 2.1 EXISTING SYSTEM

The current system relies on a manual input from users, requiring a significant amount of human effort. In emergency situations, users must manually send their location, which can be problematic and time consuming. However, our project offers a streamlined alternative. With

Just one simple step pressing a push button our system initiates location transmission automatically. This improvement not only enhances efficiency but also ensures rapid response times during critical moments.

* + 1. **Advantages of the existing system**
* Easy to implement and use
* Users are accustomed to manual input methods, potentially reducing the learning curve and increasing comfort with the system.

# 2.1.2 Drawbacks of the existing system

# Rise of network issue.

* Manual input of location data in the existing system can lead to delays and potential errors during emergency situations.

**2.2 PROPOSED SYSTEM**

The proposed system simplifies location transmission through a single-button interface, enhancing user experience. It automates the process, eliminating the need for manual input, thereby reducing the risk of errors and saving valuable time. The system ensures rapid response times in emergencies by swiftly transmitting accurate location information. Its streamlined design improves reliability and usability, making it an efficient solution for critical situations

**2.2.1 Advantages of the proposed system**

* Easy to implement
* Reliable Cost
* Flexible to adopt
* Faster response
* Reduced errors

# CHAPTER 3

**SYSTEM DESIGN**

**3.1 DEVELOPMENT ENVIRONMENT**

* + 1. **Hardware Requirements**
* Arduino UNO
* GPS module
* GSM SIM Module
* Jumper wires
* Switch

**Arduino UNO**

The Arduino UNO is a versatile microcontroller board offering digital and analog input/output pins, USB connectivity and programmable with the Arduino IDE.

**GPS Module**

The GPS NEO-6M module is a compact and affordable device designed to accurately determine your location using signals from satellites orbiting the Earth. It features a built-in receiver that captures these signals and calculates your precise coordinates, including latitude and longitude. This information is then sent to the device it's connected to, such as a smartphone or GPS navigation system, enabling them to display your location on a map or provide directions to your desired destination. Its low power consumption and small size make it suitable for a wide range of applications, from car navigation systems to drones and wearable devices.

**GSM SIM Module**

The SIM800L GSM module is a compact piece of hardware that enables devices, such as microcontrollers or IoT gadgets, to communicate with the outside world through mobile networks. It functions similarly to a miniature cell phone, allowing the device to access the internet, make phone calls, and send text messages using a SIM card. Its small size and low power consumption make it ideal for projects where space and energy efficiency are important.

**Jumper Wires**

Jumper wires are used to connect various electronic components to the Arduino, facilitating the creation of the circuit. They come in different lengths and genders (male-to-male, female-to-female and male-to-female) to ensure flexible and reliable connections.

**Switch**

A switch is a handy tool for controlling something's flow, like electricity turning on a light or data packets zipping between devices on a network. With a simple on/off function, it acts like a gatekeeper, allowing or stopping the flow depending on its state.

**3.1.2 SOFTWARE REQUIREMENTS**

**Arduino IDE**

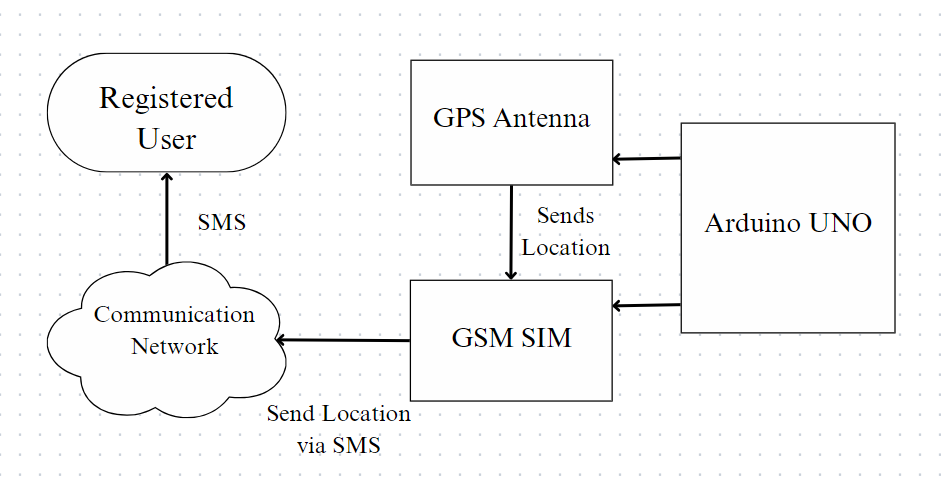
The Arduino Integrated Development Environment (IDE) is a software platform for programming Arduino microcontroller boards, offering a user-friendly interface to write, compile and upload code. With built-in examples and a vast library of community-contributed code, the IDE simplifies prototyping and development for projects.

**CHAPTER 4**

**PROJECT DESCRIPTION**

The GPS location tracker project involves creating a device that can pinpoint its own location using GPS technology. This device typically consists of a GPS module to receive location data from satellites, a microcontroller to process the data, and possibly additional components like a GSM module for transmitting the location data to a remote server or a display for local visualization. Users can track the device's movements in real-time through a web or mobile app, making it useful for applications such as vehicle tracking, asset management, or personal safety.

**4.1 SYSTEM ARCHITECTURE**

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**Fig 4.1 System Architecture**

**4.2 METHODOLOGY**

The methodology for developing a location tracker using a GPS module, GSM SIM module, and Arduino Uno begins with connecting the hardware components, including the GPS module, GSM SIM module, Arduino Uno, and a switch. When the switch is turned on, it activates the system, prompting the Arduino Uno to read real-time geographic coordinates from the GPS module. The Arduino Uno then formats this location data into a text message. The GSM SIM module, pre-configured with a registered user’s phone number, receives this message from the Arduino and transmits it via SMS to the user. This process ensures that whenever the switch is on, the GPS module continuously tracks the location, and the GSM module sends periodic SMS updates with the location information to the registered user, providing real-time tracking and communication.

**CHAPTER 5**

**RESULTS AND DISCUSSION**

The implementation of the location tracker using the GPS module, GSM SIM module, and Arduino Uno proved successful in providing real-time location updates via SMS. When the switch was turned on, the system reliably captured and transmitted geographic coordinates. The GPS module accurately tracked the location, and the Arduino Uno effectively processed and formatted this data. The GSM SIM module then successfully sent the location information to the registered user’s phone number. This setup demonstrated consistent performance, with timely and accurate SMS alerts whenever the switch was activated. The discussion highlights the system’s reliability and effectiveness in real-world scenarios, showing that it can serve as a practical solution for real-time location tracking and emergency communication. Future improvements could focus on optimizing power consumption and enhancing the user interface for broader applicability.

**CHAPTER 6**

**CONCLUSION AND FUTURE WORK**

**6.1 CONCLUSION**

In conclusion, the location tracker project utilizing a GPS module, GSM SIM module, and Arduino Uno successfully achieved its objective of providing real-time location updates via SMS. The system demonstrated reliable performance in tracking and communicating geographic coordinates when activated by a switch. This project showcases a practical and efficient solution for real-time location tracking, offering significant benefits for personal safety and emergency response. Future enhancements could further refine the system’s efficiency and expand its applications, ensuring even broader utility in various contexts.

**6.2 FUTURE WORK**

Integrating a more energy-efficient power management system would extend battery life, making the device more practical for long-term use. Adding a feature to store location data on a cloud server would enable historical tracking and analysis. Enhancing the user interface, possibly with a mobile app, would improve usability and provide additional functionalities like geofencing and push notifications. Additionally, incorporating more advanced communication technologies, such as LTE or NB-IoT, could improve the reliability and coverage of the system. These improvements would make the location tracker more robust, versatile, and user-friendly.**APPENDIX**

**SOFTWARE INSTALLATION**

**Arduino IDE**

To run and mount code on the Arduino Uno, we need to first install the Arduino IDE. After running the code successfully, mount it.

**SAMPLE CODE**

**//locationtracker.ino**

#include <SoftwareSerial.h>

#include <TinyGPS++.h>

// Define pins for GPS module

#define RXPin 4

#define TXPin 3

// Define pins for GSM module

#define GSM\_RX 7

#define GSM\_TX 8

#define GSM\_PWR 9

// Define pin for the switch

#define switchPin 2

// Create instances of the software serial and GPS objects

SoftwareSerial gpsSerial(RXPin, TXPin);

SoftwareSerial gsmSerial(GSM\_RX, GSM\_TX);

TinyGPSPlus gps;

void setup() {

// Initialize serial communication

Serial.begin(9600);

gpsSerial.begin(9600);

gsmSerial.begin(9600);

// Set pin modes

pinMode(GSM\_PWR, OUTPUT);

pinMode(switchPin, INPUT);

// Power on the GSM module

digitalWrite(GSM\_PWR, HIGH);

delay(1000);

digitalWrite(GSM\_PWR, LOW);

delay(1000);

digitalWrite(GSM\_PWR, HIGH);

delay(2000);

// Wait for GSM module to initialize

Serial.println("Initializing GSM module...");

gsmSerial.println("AT");

delay(1000);

gsmSerial.println("AT+CMGF=1"); // Set SMS mode to text

delay(1000);

gsmSerial.println("AT+CSCS=\"GSM\""); // Select TE character set

delay(1000);

}

void loop() {

if (digitalRead(switchPin) == HIGH) {

Serial.println("Switch is ON. Tracking location...");

while (gpsSerial.available() > 0) {

if (gps.encode(gpsSerial.read())) {

if (gps.location.isUpdated()) {

float latitude = gps.location.lat();

float longitude = gps.location.lng();

sendSMS(latitude, longitude);

}

}

}

} else {

Serial.println("Switch is OFF. Waiting...");

}

delay(1000);

}

void sendSMS(float latitude, float longitude) {

char message[160];

sprintf(message, "Location: https://maps.google.com/?q=%f,%f", latitude, longitude);

// Replace with your phone number

char phoneNumber[] = "+9043741112";

gsmSerial.print("AT+CMGS=\"");

gsmSerial.print(phoneNumber);

gsmSerial.println("\"");

delay(1000);

gsmSerial.print(message);

delay(100);

gsmSerial.write(26); // Ctrl+Z ASCII code to send the SMS

delay(1000);

Serial.println("SMS sent:");

Serial.println(message);

}

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