MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE GWALIOR

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Project

Report on

"GeoFencing With GPS Tracking For Children Monitoring"

SUBMITTED BY
Ayushi Yadav (0901AI211016)
Shivam Thakare(0901AI211060)
V semester

Artificial Intelligence and Robotics

Under the guidance of
Dr.Vibha Tiwari
Faculty Mentor

CENTRE FOR ARTIFICIAL INTELLIGENCE

Madhav Institute of Technology & Science
Gwalior - 474005 (MP) est. 1957

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CERTIFICATE

This is certified that Ayushi Yadav (0901AI211016) and Shivam Thakare (0901AI211060) has submitted the project report titled "**GeoFencing With GPS Tracking For Children Monitoring**" under the mentorship of **Dr.Vibha Tiwari**, in partial fulfillment of the requirement for the award of degree of Bachelor of Technology in **Artificial Intelligence and Robotics** from Madhav Institute of Technology and Science, Gwalior.

Dr.Vibha Tiwari
Faculty Mentor
Centre for Artificial Intelligence

22/11/23

Dr. R. R. Singh
Coordinator
Centre for Artificial Intelligence

23/11/2023

Dr. Sunil Kumar Shukla
Project Coordinator
Centre for Artificial Intelligence

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DECLARATION

I hereby declare that the work being presented in this project report, for the partial fulfillment of requirement for the award of the degree of Bachelor of Technology in **Artificial Intelligence and Robotics** at Madhav Institute of Technology & Science, Gwalior is an authenticated and original record of my work under the mentorship of **Dr.Vibha Tiwari, Assistant Professor, Centre for Artificial Intelligence.**

I declare that I have not submitted the matter embodied in this report for the award of any degree or diploma anywhere else.

Ayushi Yadav (0901AI211016)
Shivam Thakare(0901AI211060)
V Semester,
Centre for Artificial Intelligence

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Ayushi Yadav (0901AI211016)
Shivam Thakare(0901AI211060)
V Semester,
Centre for Artificial Intelligence

सार

जियोफेंसिंग के साथ जीपीएस ट्रैकिंग बच्चों की मॉनिटरिंग के लिए एक स्थापित प्रौद्योगिकी है जो माता-पिता को उनके बच्चों के स्थान का पता लगाने में मदद करती है। यह माता-पिता को बच्चों के स्थान की जानकारी प्रदान करता है। कई बार माता-पिता किसी विशेष स्थान से बाहर गए हुए अपने बच्चों की कृत्रिम स्थिति को प्राप्त करने में कठिनाई का सामना करते हैं। 2021 में, भारत में 77 हजार से अधिक बच्चे गायब थे। पिछले वर्षों की तुलना में, देश में गायब बच्चों की संख्या में सार्थक वृद्धि हुई थी। यह स्थिति माता-पिता की ओर से उनके बच्चों की सुरक्षा की प्रति असुरक्षा बढ़ाती है। इस पेपर का पहला उद्देश्य है किसी बच्चे के स्थान के बारे में जीपीएस ट्रैकर का उपयोग करके वास्तविक समय में लैटिट्यूड और लांगिट्यूड जानना। दूसरा उद्देश्य है किसी विशेष भूगोलीय क्षेत्र से बाहर निकलते ही माता-पिता को चेतावनी भेजना; इस तकनीक को सामान्यत: जियोफेंसिंग कहा जाता है। यह जीपीएस एक लचीले रूप में पैकेज किया गया है ताकि यह माता-पिता को अपने बच्चों का पर्यवेक्षण करने को सरल बना सके और जब उनके माता-पिता से अलग होते हैं, तो उनके बच्चों की स्थिति को पता करने में मदद कर सकता है। बच्चे अपने माता-पिता द्वारा उनकी उपस्थिति का निर्धारण करने के लिए वायरलेस मीडिया की उपस्तिति में रह सकते हैं। बच्चों की सुपरविजन में सुधार की आवश्यकता है बिना यह कि बच्चों की स्वतंत्रता को कम किया जाए जिससे वे अपने आस-पास के पर्यावरण को सीखें और अन्वेषण करें।

ABSTRACT

Geofencing with GPS Tracking for Children Monitoring is a well-established technology that helps parents track the location of their children. It provides the parents with the location of the children. Parents often face difficulties in getting hold of the whereabouts of their children when they are not in sight. In 2021, more than 77 thousand children in India were missing. In comparison to previous years, the number of missing children in the country increased significantly. This situation increases the insecurity of parents toward the safety of their children. The first objective of this paper is to obtain latitude and longitude information about a child's location in real-time using a GPS tracker. The second objective is to send an alert to the parents as soon as their child exits a particular geographical area; this technique is often referred to as geofencing. This GPS is packaged in a flexible form so that it can help make it easier for parents to supervise their children in the range of areas that are still accessible to them and find the child's position when separated from their parents.Children can be traced to the presence of wireless media by their parents. Improved supervision of children is needed without reducing the freedom of children to learn and explore their environment.

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Chapter 1: Project Overview

1.1 Introduction:

In terms of the growth of reason, children from the age of four to five years have a great curiosity about the surrounding environment and all information related to it . Children at this age have advantages in the form of an adventurous spirit, high spirits, and like challenges.At this stage of growth and development which is in the golden phase tends to be more interested in exploring things around them . When exploring this, children are interested in the surrounding environment, for example in open spaces where parents play an important role in monitoring the activities of children who are outside . Train children to prepare themselves to face this sometimes-dangerous world, first develop a sense of security in themselves. It is natural to occasionally remind a child of the possibility of being abducted or cheated by someone he has not yet known or has known .Increased supervision of children is needed without reducing the freedom of children to learn and explore their environment. For this reason, is needed a tool or system is needed that can help make it easier for parents to supervise their children in the range of areas that are still reachable by them and find the child's position when separated from their parents.

1.2 Project Features:

This project contains a GPS module which provides the longitude and latitude of a child's current location and SIM800L module to send the alert notification to the parent.

1.3 Feasibility:

This project can be used in various fields like –

1.Women safety: this project can also be used for women for their safety purpose.

2.Baggage Tracking- this project can improve efficiencies in baggage handling operations to meet the changing demands of passengers as the air transport.

Chapter 2: Micro Level Analysis

2.1 Tools Used

2.1.1 Hardware tools:

- **ARDUINO UNO**

Fig. 2.1 Microcontroller [Arduino Uno]

Arduino UNO is based on an ATmega328P microcontroller. It is easy to use compared to other boards, such as the Arduino Mega board, etc. The board consists of digital and analog Input/Output pins (I/O), shields, and other circuits. The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms.

In this particular project it is responsible for converting the raw location data received from the SIM808 module.

- **NEO 6M GPS Module:**

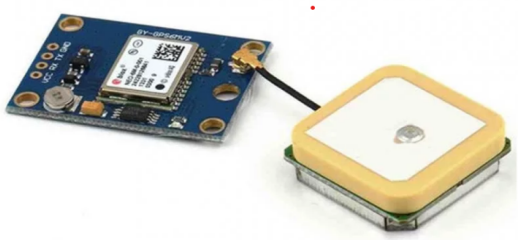

Fig 2.2 NEO 6M GPS Module

This is a complete GPS module that is based on the Ublox NEO 6M GPS. This unit uses the latest technology from Ublox to give the best possible positioning information and includes a larger built-in 25 x 25mm active GPS antenna with a UART TTL socket. A battery is also included so that you can obtain a GPS lock faster. This is an updated GPS module. This GPS module gives the best possible position information, allowing for better performance.The Ublox GPS module has serial TTL output, it has four pins: TX, RX, VCC, and GND.

- **SIM800L module:**

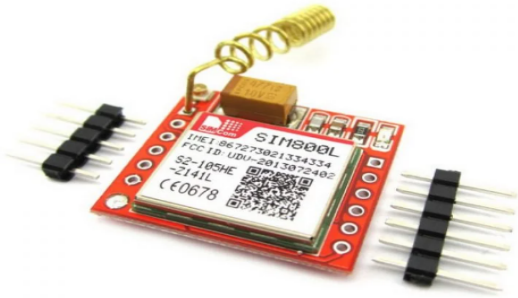

Fig 2.3 SIM800L module

SIM800 is a quad-band GSM/GPRS module.SIM800 can be controlled/configured using simple AT commands. A host microcontroller can send AT commands and control the SIM800.SIM800 operates on a supply in the range of 3.4 to 4.4V.It can be used for sending/receiving messages, making calls, sending/receiving data over the internet, etc.

• JUMPER WIRES

Fig 2.4 Jumper Wires

Jumper cables is a smaller and more bendable corrugated cable which is used to connect antennas and other components to network cabling.

• DC ADAPTOR:

Fig 2. 5 DC Adaptor

DC adapters are commonly used external power supply units for electrical equipment which cannot directly draw power from the mains network.

2.1.2 Software Tools:

- **Arduino IDE**

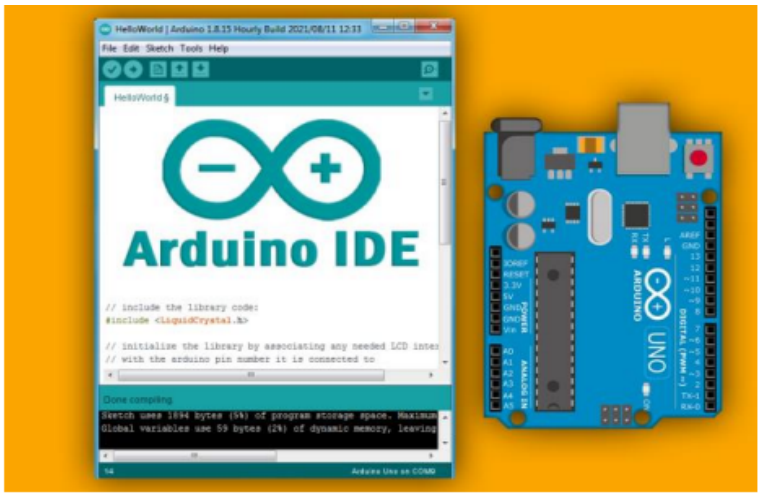

Fig. 2.6 Arduino IDE

Arduino IDE (Integrated Development Environment) is a software platform used for programming and developing projects with Arduino boards. It provides a user-friendly interface for writing, compiling, and uploading code to Arduino microcontrollers. With a vast library of pre-built functions, it simplifies the process of creating interactive electronic projects.

2.2 Libraries Used:

- **TinyGPS++**

  TinyGPS++ is a new Arduino library for parsing NMEA data streams provided by GPS modules. Like its predecessor, TinyGPS, this library provides compact and easy-to-use methods for extracting position, date, time, altitude, speed, and course from consumer GPS devices. However, TinyGPS++'s programmer interface is considerably simpler to use than TinyGPS, and the new library can extract arbitrary data from any of the myriad NMEA sentences out there, even proprietary ones.

- **SoftwareSerial**

  The SoftwareSerial library allows serial communication on other digital pins of an Arduino board, using software to replicate the functionality.It is possible to have multiple software serial ports with speeds up to 115200 bps. A parameter enables inverted signaling for devices which require that protocol.

- **AltSoftSerial Library**

  AltSoftSerial emulates an additional serial port, allowing you to communicate with another serial device.

Chapter 3: Preliminary design and code

3.1 Circuit Diagram:

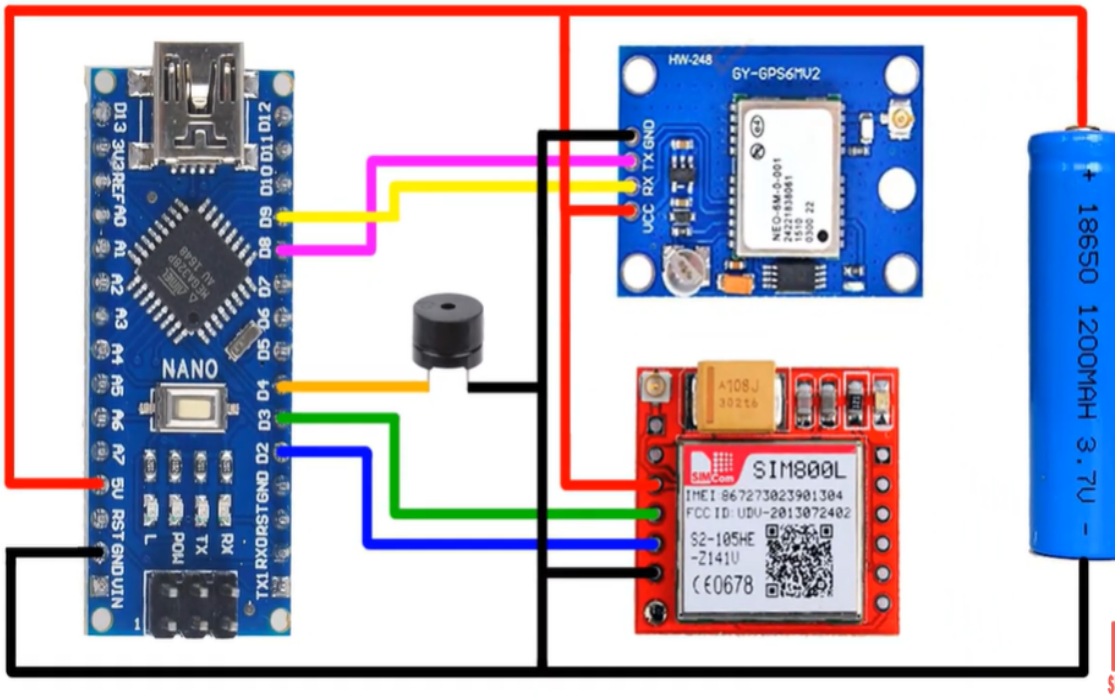

Fig 3.1 circuit diagram

3.2 Code:

```
#include <TinyGPS++.h>

//sender phone number with country code.
//not gsm module phone number
const String PHONE = "Enter_Your_Phone_Number";

//GSM Module RX pin to ESP32 2
//GSM Module TX pin to ESP32 4
#define rxPin 4
#define txPin 2
HardwareSerial sim800(1);

#define RXD2 16
#define TXD2 17
HardwareSerial neogps(2);

TinyGPSPlus gps;

String smsStatus,senderNumber,receivedDate,msg;
boolean isReply = false;

void setup() {
  //delay(7000);

  Serial.begin(115200);
```

```
  Serial.begin(115200);
  Serial.println("esp32 serial initialize");

  sim800.begin(9600, SERIAL_8N1, rxPin, txPin);
  Serial.println("SIM800L serial initialize");

  neogps.begin(9600, SERIAL_8N1, RXD2, TXD2);
  Serial.println("neogps serial initialize");

  smsStatus = "";
  senderNumber="";
  receivedDate="";
  msg="";

  sim800.println("AT+CMGF=1"); //SMS text mode
  delay(1000);
  sim800.println("AT+CMGD=1,4"); //delete all saved SMS
  delay(1000);
} //setup function ends

void loop() {
//************************************************
  while(sim800.available()){
    parseData(sim800.readString());
```

```
  while(Serial.available())  {
    sim800.println(Serial.readString());
  }
//*************************************************
} //main loop ends

//MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
void parseData(String buff){
  Serial.println(buff);

  unsigned int len, index;
  ////////////////////////////////////////////////////
  //Remove sent "AT Command" from the response string.
  index = buff.indexOf("\r");
  buff.remove(0, index+2);
  buff.trim();
  ////////////////////////////////////////////////////

  ////////////////////////////////////////////////////
  if(buff != "OK"){
    index = buff.indexOf(":");
    String cmd = buff.substring(0, index);
    cmd.trim();
```

```
    if(cmd == "+CMTI"){
      //get newly arrived memory location and store it in temp
      //temp = 4
      index = buff.indexOf(",");
      String temp = buff.substring(index+1, buff.length());
      temp = "AT+CMGR=" + temp + "\r";
      //AT+CMGR=4 i.e. get message stored at memory location 4
      sim800.println(temp);
    }
    else if(cmd == "+CMGR"){
      extractSms(buff);
      Serial.println("Sender Number: "+senderNumber);
      Serial.println("PHONE: "+PHONE);
      if(senderNumber == PHONE){
        if(msg == "get location"){
          sendLocation();
        }
        else if(msg == "get speed"){
          sendSpeed();
        }
      }
      sim800.println("AT+CMGD=1,4"); //delete all saved SMS
      delay(1000);
```

```
//MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
void extractSms(String buff){
   unsigned int index;
   Serial.println(buff);

    index =buff.indexOf(",");
    smsStatus = buff.substring(1, index-1);
    buff.remove(0, index+2);

    senderNumber = buff.substring(0, 13);
    buff.remove(0,19);

    receivedDate = buff.substring(0, 20);
    buff.remove(0,buff.indexOf("\r"));
    buff.trim();

    index =buff.indexOf("\n\r");
    buff = buff.substring(0, index);
    buff.trim();
    msg = buff;
    buff = "";
    msg.toLowerCase();

```

```
    if (newData)      //If newData is true
    {
      Serial.print("Latitude= ");
      Serial.print(gps.location.lat(), 6);
      Serial.print(" Longitude= ");
      Serial.println(gps.location.lng(), 6);
      newData = false;
      delay(300);
      ///*
      sim800.print("AT+CMGF=1\r");
      delay(1000);
      sim800.print("AT+CMGS=\""+PHONE+"\"\r");
      delay(1000);
      sim800.print("http://maps.google.com/maps?q=loc:");
      sim800.print(gps.location.lat(), 6);
      sim800.print(",");
      sim800.print(gps.location.lng(), 6);
      delay(100);
      sim800.write(0x1A); //ascii code for ctrl-26 //sim800.println((char)26); //ascii code for ctrl-26
      delay(1000);
      Serial.println("GPS Location SMS Sent Successfully.");
      //*/
    }
  }
```

3.3 Output:

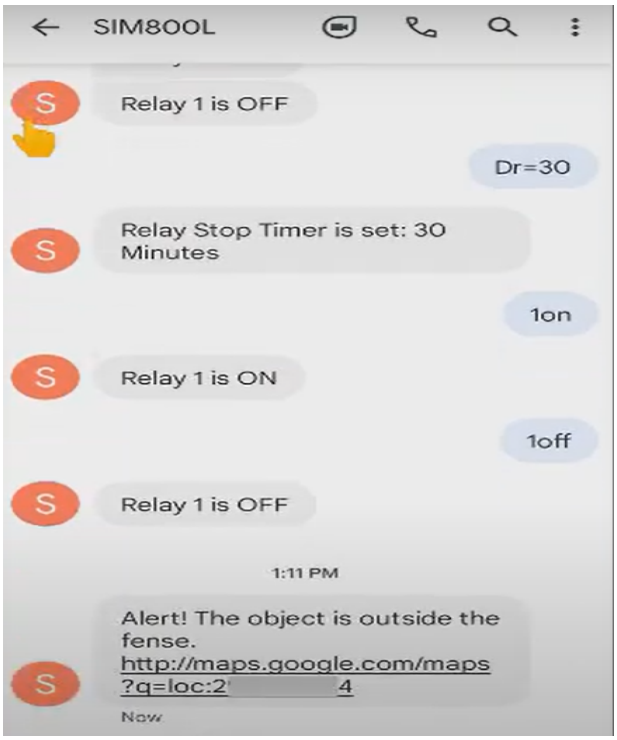

Fig 3.2 output of the code

Chapter 4: Final Analysis

4.1: RESULT

The tracking device is used by children. Child's current location can be viewed on the map and the circle on the map represents the geofence areas which are determined by the parents.As the child that is holding the GPS tracker enters or exits the geofence area, a notification will be sent to the parent.

As shown in the figure, users can get a child's location information, such as latitude and longitude coordinates, through which they can know the real-time location of their child as he steps out of the geofence boundary.

Fig4.1: Show the child current location

Fig 4.2 visualization of Geofencing

4.2 CONCLUSIONS

In this paper, we proposed the GPS Tracking for Children Monitoring aimed to provide parents with the location of the children as they exit a particular geographical boundary set by their parents.In accordance with the system design concept and can be used by both parents of the child because the display is easy to understand overall.The proposed system includes a wearable/carriable small device for the child that contacts a main system server which in turn is connected to the parent'.The proposed CT application and the GPS tracker were successfully developed and tested. For future work, a variety of services can be added to this system by using sensors or actuators and size can be reduced .As shown by the results, the CT application is capable of helping parents to track the location of their child .

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[6]https://youtu.be/mpeNx7yEh6w?si=j-da6er9f4Dopdz8