# *Child Tracking using IoT Device*

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***Abstract*— IoT-based child tracking has drawn a lot of interest as a way to guarantee children's protection and safety in a variety of settings. A GPS module, a microprocessor, and wireless communication modules are included in the suggested system. The microcontroller manages and analyses the information after the GPS module has collected the child's location data. This platform, which is accessed through a smartphone application, enables parents or guardians to track the whereabouts of their children in real time. The GPS module is used by the child tracking system to continuously collect the child's position data. Real-time tracking is made possible by the platform, which receives and maintains the location data. Parents or guardians can use the smartphone application to track the child's location on a map. They are able to create predetermined safe zones and get alerts any time the child enters or exits them. The Internet of Things-based child tracking system offers a complete solution that enhances child safety and gives parents and other carers peace of mind.**

***Keywords—Node MCU, GPS, IoT, Child Tracking.***

## I. INTRODUCTION (*Track your child*)

Global Positioning Systems, or GPS systems, are widely used in today's society. These gadgets, like other devices that may record and save data, can be used as evidence in both civil and criminal trials.

Understanding the implications of the precision of data collected by these devices, as well as the likelihood of error in data interpretation, is critical when using GPS data as evidence. Although navigation is the most well-known use of global positioning, it is also utilized in field surveying to identify and record correct positions. GPS systems are also used in communication systems for timing and frequency reasons due to the precision of the satellite onboard clocks. "GPS satellites have highly accurate clocks that can tell you the time to within 40 nanoseconds, or four billionths of a second (0.000000040)." GPS functionality might appear in unexpected locations.

Businesses use GPS devices to locate trucks and the employees who drive them. GPS devices are included in many rental vehicles for both navigation and recovery of lost or stolen vehicles. The social media site Twitter can track your location. Also, telephony applications such as Facebook Places can send information about a user's current location to network pages. You can also use your smartphone to tag someone else's location and post it to Facebook. Tracking systems are commonly used to track where cars, planes, pets, and children are [3].

In general, there are three segments that make up the GPS system: the user segment, the ground segment, and the space segment. The following [4] is how certain segment descriptions are interpreted:

Space segment: The space segment is a component of a network of GPS satellites that are in geostationary orbit around the Earth.

Ground section: The system's primary control station, which is run by the Air Force, is located in the ground segment, along with ground antennas and monitoring stations. The Air Force oversees the satellite system at the primary control station. Ground antennas provide accuracy correction orders and data to satellites and receive telemetry data from satellites.

User segment: The user segment includes devices that receive and utilize GPS satellite data to conduct navigation, such as marine, aerospace, and automobile units.

Many years ago, there were numerous documented incidents of missing youngsters aged 14 to 17. Parents are always concerned about the risk of their children being kidnapped or lost. Technological advancements, such as the introduction of microcontrollers and sophisticated navigation and tracking algorithms in Google Maps, have necessitated the resolution of the aforementioned issues. This project will involve the creation of a tiny, low-cost gadget that can be worn around a child's neck or pocket and monitored using Google Maps. Furthermore, you may use this gadget to monitor your pet, or you can track your pet using your car or bike, so you always know where your pet is.

## II. UTILIZED HARDWARE

This portion of the paper describes the hardware components that were used to create this work, including the GPS module and Node MCU.

### 2.1 NodeMCU Microcontroller

In order to aid in the hunt for missing or missing children, this work was produced. The proposed approach in this study uses the extensive capabilities offered by Android mobile devices. GPS satellites and IoT technology are the system's two fundamental building blocks, which form the system architecture.

Researching similar and already published works was necessary in order to generate this work. Some of these duties demand server operation or Internet connection. A NodeMCU

microcontroller board, which supports IoT, GPS, SQL Server, and Android applications, was used to construct the prototype. In essence, the NodeMCU Microcontroller Kit is an open-source component used to create Internet of Things applications. The ESP8266 Wi-Fi SoC from Espresso if Systems is compatible with the firmware in this kit. Its hardware is based on the ESP-12 kit and is offered in this kit as an integrated chip.

It can read analog and digital signals from the real world and may be used in many conventional applications, including smart houses, smart irrigation systems, and robotics. It is similar to Arduino microcontroller kits in this regard. The 10 digital pins (D1–D10) in the NodeMCU kit can be used to read digital inputs or produce digital outputs. Such pins also have analog outputs for PWM technology, except pin D0 does not output his PWM. Analog output is provided via the PWM system utilized.

Vary the pulse width (that is, the time of the signal). Additionally, for reading the analog input signal, the kit has one pin (A0).

### 2.2 GPS Module

In fact, GPS devices operate by examining their distance from the number of satellites. similar to the gadget has GPS satellite location pre-programmed. The satellite is a device that transmits information in the form of radio waves, including the time and position of the earth. Satellites are located and receivers are discovered in these wavelengths. one among the most typical The NEO-6M GPS chip, sold by U-Blix, is the module used for GPS applications. business, page 4 of 13. Smaller than a postage stamp, this chip is distinguished by its size. Yet it manages to cram a surprising lot of functionality into its little block. Utilize 50 distinct channels to track up to 22 satellites, and control the most effective satellites. The greatest sensitivity for tracking is (-161 dB). only uses 45mA of the power source, which might be a battery or power supply. It can be upgraded, unlike certain GPS units. Position up to 5 times per second with a 2.5 m horizontal position accuracy U-Blix 6's positioning engine has a sub-second initial fix time. among the top This module's capability to offer a power-saving mode. it enables a decrease in the amount of System power used by just turning on or off specific receiver segments. It significantly lowers the module's power consumption to just 11mA, making it appropriate for current-sensitive applications like GPS wristwatches. The NEO-6M GPS chip's fundamental data pins are detached via a 0.1-inch pitch header. By doing this, the pins needed for UART communication are removed. kit for a microcontroller. Additionally, this module supports baud rates between 4800 bps and 230400 bps. The default value is 9600.

### 2.3 SQL Server

Microsoft created and offers the relational database management system known as SQL Server. It is a piece of software whose main job is to store and quickly retrieve data from other software programs. Numerous transaction processing, business intelligence, and analytical applications are supported by SQL Server.

SQL Server is available in different editions such as Enterprise, Standard, Web and Express. Enterprise Edition offers the most comprehensive range of features. However, for development and testing purposes, SQL Server 2022 Developer Edition is free for non-production use.

SQL Server Management Studio (SSMS) and SQL Server Data Tools (SSDT) are two tools that are frequently used with SQL Server. While SSDT is a development environment for building SQL Server databases, managing database objects, and deploying database updates, SSMS is an integrated environment for managing your SQL Server infrastructure.

Microsoft provides cloud-based SQL Server options, such as Azure SQL Database and SQL Server on Azure Virtual Machines, in addition to on-premises SQL Server deployments, enabling cheaper total cost of ownership (TCO), high availability/disaster recovery, and hybrid connectivity.

## III. System Design and Implementation

The required procedures for creating and putting into practice the real-time kid-tracking system based on the NodeMCU microcontroller, GPS module, and Blynk software are presented in this chapter's subsection. We suggest a fix for the issue that relies mostly on GPS and IoT technology. It makes use of the two key rich features now available on modern, high-tech smart mobile platforms.
The project's operational hardware and software components are as follows:
Android App
NodeMCU Microcontroller Board
GPS Module

### 3.1 Real-time tracking system

The suggested approach is introduced in this section of the chapter. The device is accountable for monitoring kids. Based on his Internet of Things technology, this gadget uses a NodeMCU microcontroller. The GPS module is utilized for in-the-moment tracking. Figure 5 illustrates how a specific Android app is configured to track the device's position using Google Maps. The program will show the child's GPS-measured speed and direction as well as the longitude and latitude of their stopping point. Additionally, this app will display your child's current position on Google Maps.

### 3.2 Results of real-time Device tracking subsystem

The GPS will begin connecting with the satellites as soon as the NodeMCU microcontroller is turned on in order to ascertain the device's latitude and longitude. Following that, his NodeMCU microcontroller sends this data to the SQL server. For apps developed on the Android platform and for maps created with Google Maps, SQL servers present data in the form of latitude and longitude. Shown in Figure 5. The suggested technique was tested by slowly shifting the smartphone's location in order to detect changes in latitude and longitude. The NodeMCU microcontroller connects to another internet network via his Wi-Fi network on his TP-Link router, allowing him to follow the device from anywhere in the globe. The smartphone is connected to the internet via WIFI service.

## IV. WORKING

The internet and a microcontroller chip are the device's core components. The database contains the captured location, which is utilized to determine the current location.

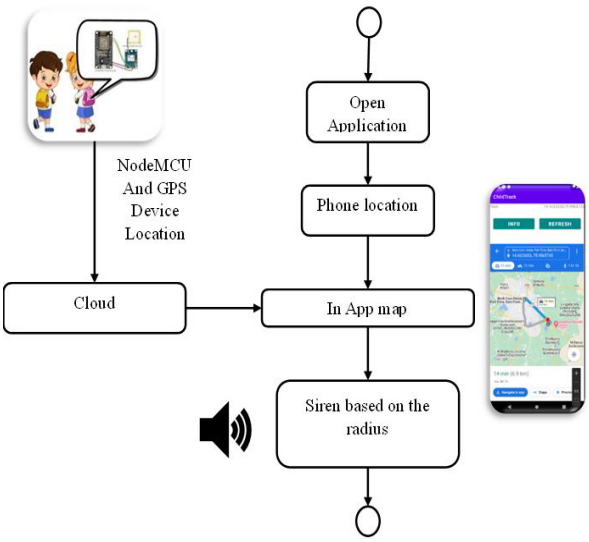


**Figure 1: Working of Child Tracking**

**NodeMCU and GPS module**

This is used to retrieve the device's location information, such as longitude and latitude, and to update the location on the SQL server.

**Phone Location.**

This is used to retrieve phone's location information, such as longitude and latitude, but here we don't update the location to SQL server. instead, this is used as from address to your app

**In app map**

here we are using the google map by them google map ape. Because all Android phones are built with Google Maps, we chose that. This map expects from and to locations. From location is the phone location (source), and to location is the device location from the SQL server (destination). This creates a path from source to destination.

**Siren based on the radius.**

Here we set some radius. like we set four different radiuses. If the child crosses the radius, it alerts the parents or a guardian with different beep sounds.

## V. Circuit Diagram

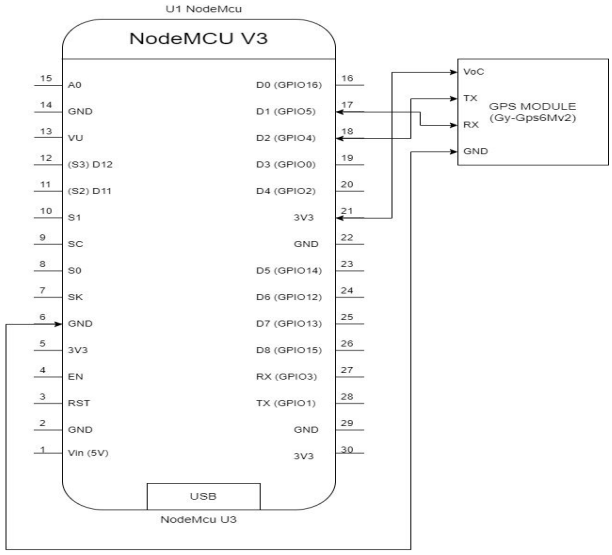


**Figure 2: Circuit Diagram of child tracking**

1. Connect the VCC pin of the GY-GPS module to the 3V pin of the NodeMCU.
2. Connect the GND pin of the GY-GPS module to the GND pin of the NodeMCU.
3. Connect the TX pin of the GY-GPS module to the RX pin (D1) of the NodeMCU.
4. Connect the RX pin of the GY-GPS module to the TX pin (D2) of the NodeMCU.
5. Optionally, we can connect an LED to the NodeMCU to indicate when the GPS module is active.
6. Finally, we use Arduino IDE, to program the NodeMCU to read the GPS data and send it to a server or display it on a screen.

## VI. Results and Snapshots


**Figure 3: IoT Device for Child Tracking**

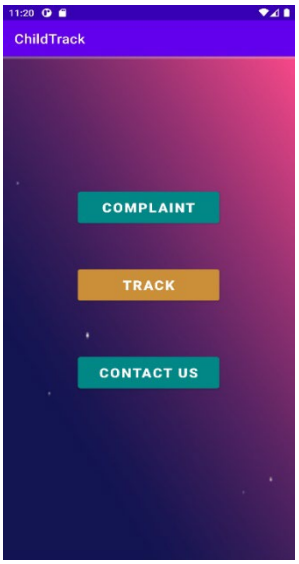


**Figure 4: Home / Main page**

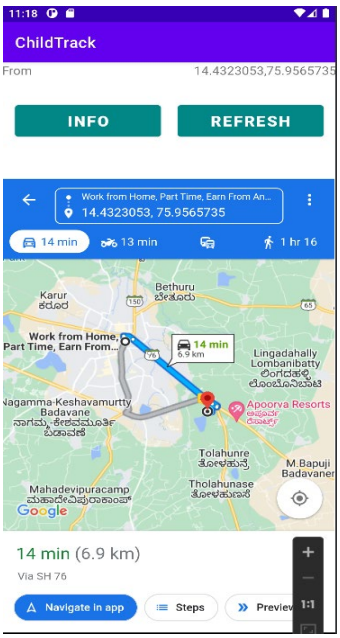


**Figure 5: Tracking page**

## VII. CONCLUSION

The safety and security of children may be increased with the use of IoT devices like NodeMCU, and a GPS module. Using GPS technology, parents and guardians may track their child's exact location in real-time and receive notifications if the device veers outside of a preset range. A Wi-Fi-capable device like NodeMCU may be used to immediately transport data to a server. Using a SQL server, data may be quickly and securely stored and accessed. Overall, this technology can safeguard children's safety while also providing some level of comfort to parents and other caretakers.

## VIII. FUTURE SCOPE

The IoT, NodeMCU, and GPS module-based child tracking system has a lot of room for improvement. Integrating with cutting-edge communication systems like 5G can improve the accuracy and dependability of real-time tracking. By using machine learning algorithms to analyses data patterns, it is possible to predict kid behavior and spot potential dangers. Additional safety features like heart rate monitoring and fall warning can be offered by integrating wearable technology with biometric sensors. Tracking between inside and outdoor situations can be made smooth by integration with smart home systems.

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