IoT Enabled Things Finder Device using Node MCU

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Abstract

Frequently, we face the challenge of recalling the location where we have kept essential items such as official documents, laptops, keys, briefcases and many more. To address this problem, we propose a smart IoT-enabled device that can locate lost items. The prototype model utilizes Node MCU ESP8266, an IoT-enabled Wi-Fi platform, and includes an LED along with a buzzer as indicating devices. The proposed prototype architecture is designed to assist individuals in finding their misplaced valuable things by identifying their last known location. This feature enables users to locate their lost belongings quickly, with just a click using the Blynk application on their smartphone.

Keywords: Node MCU, IoT, GPS Module, Microcontroller

1. Introduction

In today's world, the average person spends 10 to 12 hours a day at work, with a workload of 8 to 10 hours per day, also an additional 2 to 4 hours of travel time. With just 24 hours in a day, a person spends a significant portion of their time at work, leaving little time for other responsibilities such as family, social activities, child education, and caring for aging parents. This lifestyle often leads to stress, which can result in health issues such as lack of sleep and short-term memory loss. Other factors such as alcoholism and depression also contribute to memory loss, with recent research indicating that stress can cause a person to forget 56% of things within an hour, 66% after a day, and 75% after six days [1]. This forgetfulness can cause significant stress and problems, such as misplacing important items and spending valuable time searching for them.

In this context, the Internet of Things (IoT) has emerged as a promising technology that uses sensors connected to the internet to monitor events in real-time. The IoT system is fully automated and requires minimal human intervention. The Node MCU is a low-cost open-source hardware and software environment used for the IoT platform, while GPS sensors provide accurate location data.

This paper addresses one of the common problems faced by individuals in their daily lives - forgetting the location of important items such as car keys, home keys, and laptops. As individuals go through their busy daily schedules, they may forget the location of these items, resulting in lost time and added stress. The proposed solution is an IoT-based Things Finder device that individuals can attach to valuable items. When a person forgets the location of an item, the IoT-based device informs them of the item's location, thanks to the connectivity provided by the internet and the GPS sensor's accurate location data.

2. Internet Of Things (IoT)

The Internet of Things, IoT is an Ecosystem of interconnected computing devices, digital and mechanical machines, objects, animals or human beings with unique identifiers and with the ability to transfer the data across the network without human to computer or human to human interaction. An IoT Ecosystem consists of internet enabled devices that use embedded systems like processors, sensors and communication hardware to collect, process and send the data across the networks. The IoT Ecosystem collects the data based on particular events that occurred in the real environment. The IoT devices collected data from the environment and sent it to the IoT gateway where data is analyzed. The result of analysis transfers to the user interface like mobile applications, business applications or any other backend system. IoT devices do the most of the task without human intervention.

Fig.1 diagram shows the data flow within IoT Ecosystem. IoT Ecosystem has three major components: IoT Device, IoT Gateway and Application. Here an IoT device has a kind of sensor that monitors the environment and reacts on particular events. Sensors

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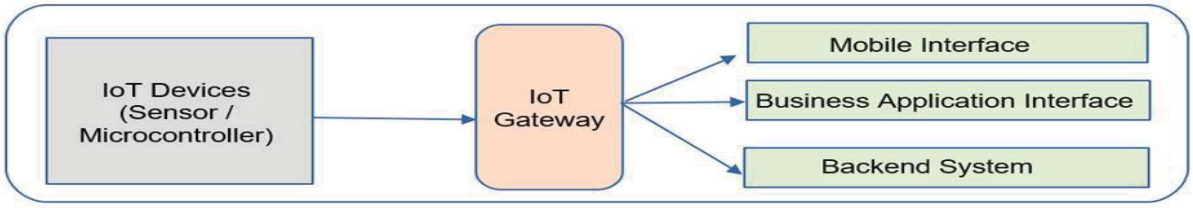

Fig 1. IoT Eco System.

capture the data and transmit to the IoT Gateway. IoT Gateway acts as an intermediate between IoT Devices and Application. IoT Gateway made from the combination of data processing and computing environment. Applications provide an interface to end users to manage the IoT Ecosystem.

IoT makes the life of people very easy. The IoT enabled device provides a facility to monitor the concerned environment from the remote location and take necessary action as and when required. It offers various applications like smart home, smart city, smart framing, smart grids, health monitoring etc. Eventually IoT is the result of people's curiosity to lead a convenient and connected lifestyle with reducing work. That's why we propose IoT enable things finder by this research paper. The research paper is focused on IoT based solutions for the things finding process.

3. Related Work

IoT or Node MCU has been used in various applications related to monitoring, controlling and tracking of objects. [4],[5],[7],[8],[10],[11],[13],[14],[15],[17],[19],[20] Some of the applications are as mentioned below:

Sejal Bagde et. al [2] has proposed an IoT based Smart Switch. They designed and constructed an economical Wi-Fi based automation system for smart home and industrial usage prototype by using ESP8266 Wi-Fi module and smart switch. The proposed research work has developed an Android application with a unit consisting of ESP8266 Wi-Fi module, relay, logic level converter module, capacitive touch sensor module and also a Wi-Fi technology has been used to control the switches.

Kesevan et.al [3] proposed and integrated IoT-based technologies to create an interactive cultivation sensing system to assist farmers in growing their crops in optimum condition and also overcome the problem of the labor shortage. An interactive cultivation sensing system consisting of IoT-based technologies is designed and realized to ensure the continuous growth of crops in optimum conditions daily. With this, progress will be made in determining the efficient cultivation conditions for machine learning, and in finding solutions to future problems of agriculture.

P Siddarth et.al [6] has proposed the IoT based wheelchair fall detection system. They used the accelerometer sensors, Node MCU and RFID technology operating through indoor and outdoor tracking using the embedded system with the thresholds.

Dileep Reddy et.al [9] developed a system to fully automate the petrol bunks with the help of various electronic devices, components, and circuits. Mainly this project is featured on the microcontroller and Radio Frequency Identification (RFID)/Wi-Fi card in which the microcontroller acts as an active device while RFID/Wi-Fi card acts as a passive device. Automatic petrol pump provides the feature of instant recharge. It gives accurate information about selling and control over any adulteration.

Ajay Prakash et.al [12] developed an automated irrigation system that is specifically meant to be used for crops. The system includes a soil moisture sensor which is used to monitor the condition of the soil. The proposed irrigation system is based on the Internet of Things (IoT) technology. The main objective of this model is to monitor contaminated water and protect the field from the light emitted by AC loads and light pillars that fall on LDR. The system employs soil moisture sensors and LDR to measure the current value of the physical parameters. The data collected by the sensors is then transmitted to the microcontroller which displays it on a screen and also sends it wirelessly.

Lukito Hasta Pratopo et.al [16] developed the system to monitor the Temperature and pH level of the Cocoa Beans. They used various components such as Node MCU ESP32, DS18B20 temperature sensor, and SKU SEN0161 pH sensor. The proposed system combined with communication media between smartphones and sensor detection devices via internet, a temperature and pH monitoring system has been successfully created in the cocoa bean fermentation process. Based on the results of the performance test, the monitoring system succeeded in reading the temperature and pH during the fermentation process.

Mardianus et.al [18] developed the prototype smart security tools on doors using RFID with a Node MCU-based telegram monitor in the process of opening the door. They developed a system with the aim to provide security and comfort and make work

easier to make it faster, more effective and efficient. The prototype was built using the C programming language with the Arduino IDE (Integrated Development Environment) application, and the system in the form of WEB using the PHP Native programming language using the Sublime Text 3 application and using the MySQL database and using the Telegram application as a medium for receiving notifications in the form of messages to be received by head of the Computer Laboratory. Based on the results of testing, the smart security prototype on the door using RFID can function properly, where each device can function properly and notifications are also sent according to the process of opening the door.

3. Proposed Architecture for IoT Based Thing Finder Device

Many times, we faced the problem of not remembering where we have kept our important things such as: important official documents, briefcase, Laptop, home keys, car keys etc. To provide a reliable solution to cope up with such problems the proposed architecture is based on a smart IoT enabled things finder device. The proposed prototype model is based on IoT, consisting of Node MCU ESP8266 an IoT WI-FI enabled platform. As an indicating device the proposed prototype involves the use of an LED and a buzzer. The proposed architecture will also be able to provide the current location of the lost valuable things using the Blynk IoT mobile application. The proposed architecture involves the interfacing of the Buzzer, LED and GPS module with the Node MCU. Node MCU can be programmed for the required application of the prototype with Arduino IDE. Node MCU needs to be connected with wi-fi with which other components interfaced with Node MCU can be controlled with Blynk application. Using the proposed prototype, the real time monitoring of the precious stuff can be made possible from anywhere at any time. If proper internet connectivity is provided to the node MCU then it can send real time feedback to the Blynk IoT server.

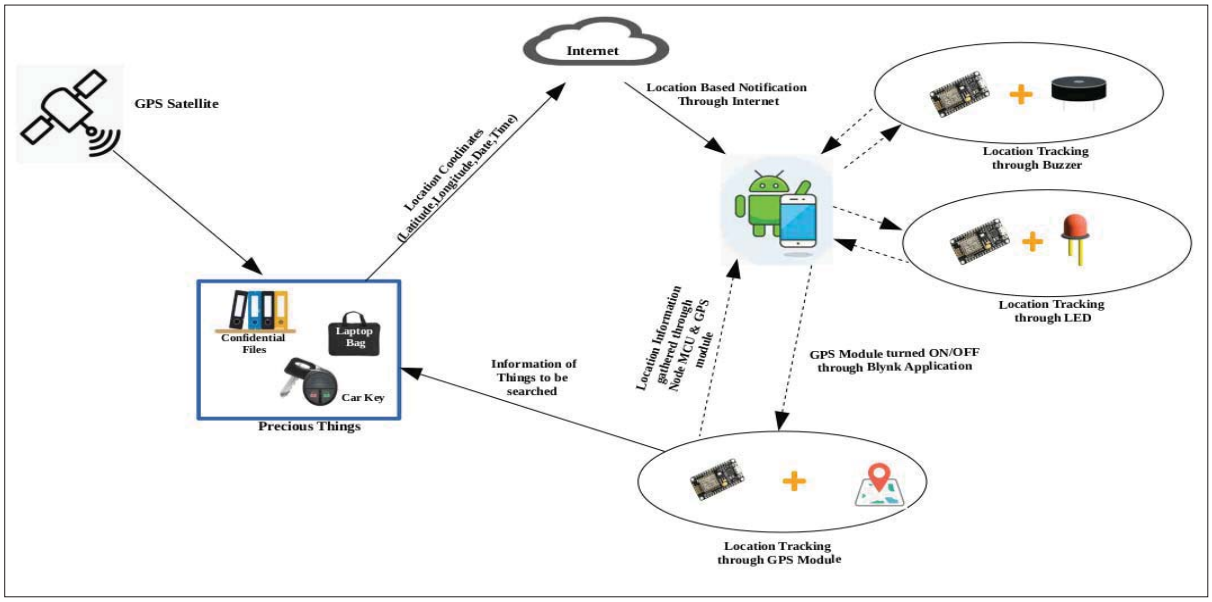

Fig. 2. IoT Based Things Finder Architecture.

The real time detection of the lost stuff can be made in three ways: In the first scenario using the Blynk IoT application we can make LED turn ON interfaced with node MCU which is in contact with the precious device. With the blinking of LED attached with node MCU the stuff can be detected. The second scenario is based on detecting the lost stuff but instead of LED we want to raise a buzzer sound from the place where exactly the stuff is. To do so we can operate a module for the buzzer to turn ON to indicate its position. The third scenario arises when the lost stuff is completely out of our reach and can't be detected with the help of a buzzer and LED module. In such cases the live location of the lost stuff can be made using a GPS module. The GPS module is interfaced with node MCU and displays the GPS data such as coordinates of latitude, longitude date and time on a local web server.

4. Prototype Implementation

The major components of the proposed prototype consist of Node MCU, GPS module, Buzzer and an LED. Interfacing of the components such as GPS module, Buzzer and Led is done with Node MCU. For real time indication of the precious stuff Blynk IoT app is used. Connection establishment is done between Node MCU and Blynk IoT application. Fig. 3 shows the implementation of the things finder system. In the proposed prototype first of all interfacing of Node MCU with GPS module, buzzer and LED is done. The VCC, GND, Rx and Tx pins of the GPS module are connected with 3.3V, GND, D1 and D0 pins of

Node MCU. LED and a Piezo-Buzzer is connected to D5 and D6 pins of Node MCU. Buzzer, Led and GPS module will work as indicating factors in identifying the lost precious stuff such as: laptop bag, car keys and confidential files etc. The coding for the proposed prototype is to be done in Arduino IDE. Blynk IoT application needs to be installed on an android phone for real time tracking of the object. Blynk IoT is set up on an android phone by creating a Blynk account. Once the account is created the authentication code is sent on the registered email id. To establish connection between the Blynk IoT app and Arduino IDE authentication key received on registered mail id is added in the code. Also, Wi-Fi id and password also needs to be added in the code to have seamless internet connection mandatory for working of Node MCU and Blynk IoT application. Once the whole setup is completed as per the mentioned scenarios the lost stuff can be detected either by using GPS module, Buzzer or an LED light depending upon the vicinity of the object.

The proposed prototype includes a Node MCU, GPS module, buzzer, and LED as its main components. The components are interfaced with Node MCU to work together. Real-time tracking of the object is achieved through the Blynk IoT app. The connection between Node MCU and Blynk IoT application is established first. The GPS module, buzzer, and LED are then interfaced with Node MCU. The GPS module's VCC, GND, Rx, and Tx pins are connected to the 3.3V, GND, D1, and D0 pins of Node MCU. The LED and Piezo buzzer are connected to the D5 and D6 pins of Node MCU.

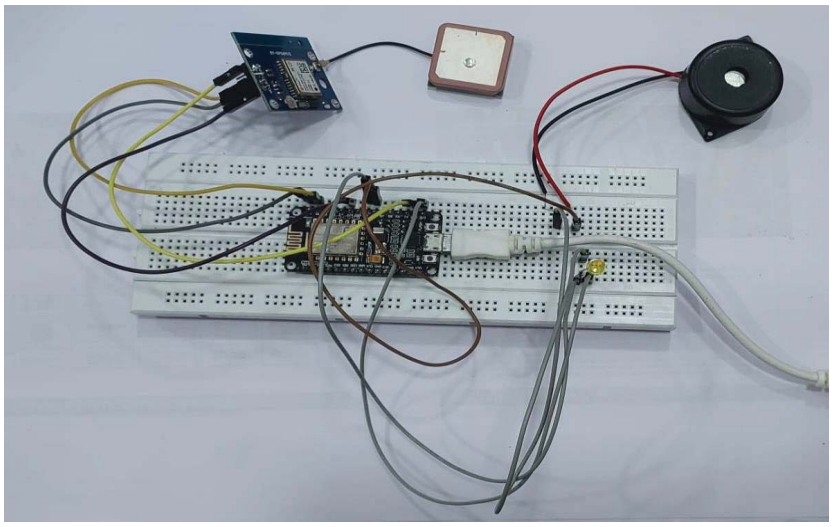

Fig 3. Things Finder Implementation.

The buzzer, LED, and GPS module work together to indicate the presence of lost items such as a laptop bag, car keys, confidential files, etc. The coding for the prototype is done in the Arduino IDE. The Blynk IoT app is installed on an android phone for real-time tracking of the object. To set up Blynk IoT on an android phone, a Blynk account is created, and the authentication code is sent to the registered email ID. To establish a connection between the Blynk IoT app and Arduino IDE, the authentication key received on the registered email ID is added to the code. The Wi-Fi ID and password are also added to the code for seamless internet connection, which is mandatory for the Node MCU and Blynk IoT application to work together. Once the setup is completed according to the mentioned scenarios, the lost items can be detected using the GPS module, buzzer, or LED light depending on the visibility of the object.

5. Conclusion

The proposed architecture aims to enhance the conventional process of locating objects within or beyond defined boundaries by utilizing an IoT-enabled Node MCU-based remote tracking and notification system for individuals. With this system, users can obtain real-time GPS location data of the object via a mobile application. The buzzer-based location tracking feature assists in finding objects within enclosed areas, while the GPS module-based location tracking feature aids in locating objects in large, unbounded open spaces in real-time.

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