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Household Device Tracking System

Dr. Praful N. Yerkewar[1], Tushar Barange[2], Vedant Choudhari[3], Sahil Babhare[4], Suyog Meshram[5], Ritik Kakde[6]
Department of Electronics and Communication engineering Nagpur University, Nagpur, Maharashtra

***Abstract:** As we all know in our daily life We often lose our daily use items such as keys, remote, etc. and scour the entire house for them before finding them after a protracted hunt. Consequently, we suggest in this post to use RF module, a buzzer, and a battery to make a simple smart tracking system called the household device tracking system. This article explains the development of small circuits that can be attached to the devices. The main purpose of the household device tracking system is to make our everyday life easier. The household device tracking system aims to solve this problem so that the tracking and finding of these devices becomes easier and quick. The household device tracking system utilizes RF transmitter and receiver to establish connection between the tags and the remote. The proposed system comprises of various components such as RF transmitter and receiver unit, antenna, encoding unit, decoding unit, buzzer and a battery which are used to create the desired circuit.*

I. INTRODUCTION

In our daily lives, it is common for people to misplace small household items like keys, remotes, mobile phones, or other essential equipment. Searching for these lost items can be time-consuming and frustrating, especially when they are urgently needed. Studies show that a large number of people spend considerable time searching for misplaced items, with car keys and remotes being the most commonly lost items.

To address this problem, we propose a Household Device Tracking System that helps individuals quickly locate their lost items using RF (Radio Frequency) technology. This system consists of a small circuit attached to the item and a remote control. When the user presses a button on the remote, the buzzer in the circuit produces a loud sound, making it easy to identify the location of the lost item.

To address this problem, we propose a Household Device Tracking System that helps individuals quickly locate their lost items using RF (Radio Frequency) technology.

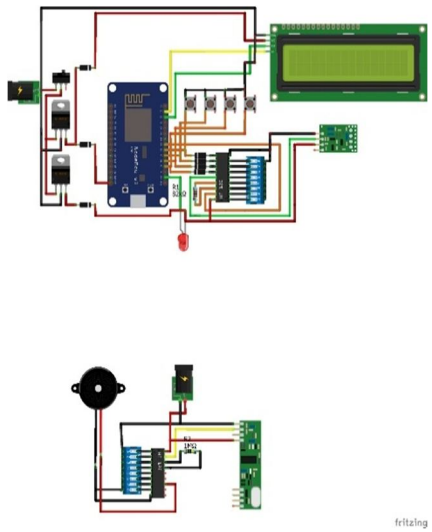


Fig 1. overview of the system

The primary objective of this project is to develop a system that can easily assist in tracking and locating misplaced household items such as keys, remotes, mobile phones, and other small equipment.

This system aims to reduce the time and effort spent searching for lost items by using RF **(Radio Frequency)** technology along with a buzzer alert system.

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II. LITERATURE REVIEW

The proposed Household Device Tracking System aims to provide an efficient, low-cost, and lightweight solution for locating misplaced household items using an RF module, buzzer, and battery. This system is designed to reduce the time spent searching for lost items by allowing users to trigger a buzzer sound through a remote control, instantly locating the misplaced object. Additionally, the small circuit size and lightweight design make it convenient to attach the device to keys, remotes, and other small equipment without adding bulk. This approach not only simplifies item tracking but also reduces dependency on large modules like GPS and Bluetooth, making the system energy-efficient and affordable. The system is also capable of conserving energy as it operates on a small battery, ensuring longer operational time without frequent charging. To overcome these limitations, researchers have explored the use of Radio Frequency (RF) technology as an efficient and affordable solution for tracking misplaced household items. RF technology uses a transmitter and receiver to establish a connection between the lost item and the user. When the user triggers the remote, a buzzer sound is generated from the lost item, allowing easy identification. Unlike Bluetooth and GPS, RF-based tracking systems are more compact, lightweight, and energy-efficient, making them ideal for small household equipment. Moreover, RF modules do not rely on mobile applications, ensuring uninterrupted connectivity and easy usage. Recent advancements have also introduced IoT (Internet of Things) integration in tracking systems, allowing users to control and monitor their lost items through mobile applications. However, adding GPS or Bluetooth modules to such devices often increases their size, weight, and power consumption, limiting their practicality. The need for an efficient and reliable household device tracking system has gained significant attention in recent years due to the increasing problem of misplacing small household items such as keys, remotes, mobile phones, and other essential equipment. Traditionally, people relied on manual searching methods, which often led to wasted time and frustration. To address this common problem, several technological solutions have been developed, including Bluetooth, GPS, and sound-based tracking systems.

III. PROPOSED SYSTEM

The proposed Household Device Tracking System is designed to help individuals quickly locate misplaced household items such as keys, remotes, mobile phones, wallets, or any small equipment using IoT (Internet of Things) and RF (Radio Frequency) technology. The primary objective of this system is to reduce the time and effort spent searching for lost items by triggering an alert sound through a buzzer attached to the lost item. This system offers a simple, cost- effective, and user-friendly solution for locating personal belongings within the house.

IV. WORKING

A. Transmitter

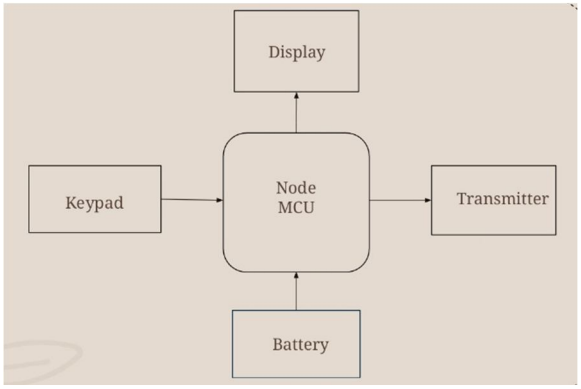


Fig.2: - Block diagram of transmitter section

In the transmitter circuit, we are using the RF transmitter. Arduino Nano, Keypad. Encoder and the battery as a power supply. The Arduino Nano is connected to the power supply to provide the essential power for the system. The above circuit is present inside the remote device which is being used to transmit signals and track items. The RF transmitter, when triggered it will sad the signal to the receiver which help the circuit to understand the presence of the lost item which has the receiver circuit mounted on it near the circuit by which it can process the signal and perform the task assigned nthe main program of Arduino**.**

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1) Ask Transmitter

- The Transmitter module consists of three pins namely Vcc, Din and ground. The Vee pin has a wide range input voltage from 3V to 12V.
- The transmitter consumes a minimum current of 9mA and can go as high as 40mA during transmission. The center pin is the data pin to transmit the signal.
- This signal modulated using the ASK and then sent on air at a frequency of 433MHz.

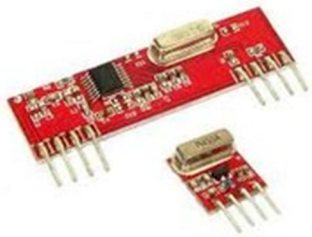


Fig. 3: - ASK TRANSMITTER

2) NODE MCU

The NodeMCU ESP8266 is an open- source microcontroller development board that is widely used for IoT (Internet of Things) applications. It is built using the ESP8266 Wi-Fi module, which allows the device to connect to a wireless network (Wi-Fi) and communicate with other devices or the internet. The NodeMCU board is powered by the ESP8266 microcontroller, which is known for its low-cost, low-power consumption, and high-efficiency.



Fig 4: - Node MCU

3) Membrane Keypad

This DC 12V 4×1 Key Matrix Membrane Switch Keypad is a high-quality product at very low cost for your application needs.

This 4-button keypad provides a useful human interface component for microcontroller projects. Convenient adhesive backing provides a simple way to mount the keypad in a variety of applications.

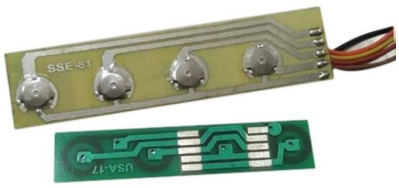


Fig 5: - Membrane keypad

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4) LCD Display

A 16x2 LCD Display (Liquid Crystal Display) is a widely used electronic display module that can display text, numbers, and special characters in electronic projects. The "16x2" means it has:

- 16 Columns: It can display 16 characters per row
- 2 Rows: It has 2 rows for displaying text.
- Total Characters: You can display a total of 32 characters (16x2) at a time.



Fig 6: - LCD DISPLAY

5) Voltage Regulator IC

A Voltage Regulator IC (Integrated Circuit) is an electronic component used to maintain a constant and stable voltage output regardless of variations in the input voltage or load current. It regulates the voltage supplied to various electronic components to ensure that they receive a steady and fixed voltage, preventing damage from voltage fluctuations.



Fig 7: - voltage regulator IC

6) Slide Switch

A Slide Switch is a mechanical switch that is used to turn ON or OFF the flow of current in an electronic circuit by sliding a knob from one position to another. It is called a Slide Switch because its operation is based on sliding the switch from left to right (or up and down) to make or break the electrical connection.



Fig 8: - voltage regulator IC

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B. Receiver

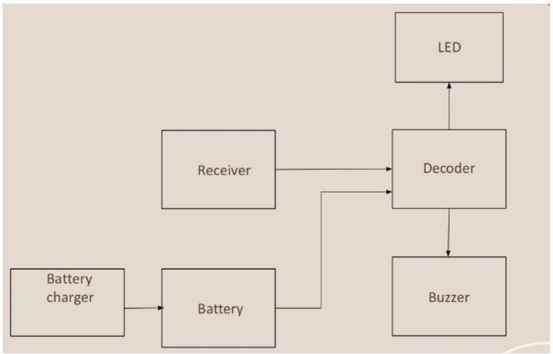


Fig.9: - Block diagram of Receiver section

In the receiver circuit the main thing is the RF Receiver and the decoder. In the receiver section the RF Receiver which is the main brain of the receiver section, it is implemented in a way such that when the receiver receives the signal from the transmitter it processes the signal and performs the task assigned to it which is to trigger the buzzer and create a beeping sound. The RF receiver is connected to the decoder such that the signal received by the receiver with the help of the antenna is sent to the decoder to decode the signal before performing any kind of operation as the signal is encoded before transmitting, then with the help of the decoded signal the further operation is carried out.

1) Ask Receiver

RF receiver module has four pins namely Vee, Dout, Linear out and Ground as shown above. The Vee pin should be powered with a regulated 5V supply. The operating current of this module is less than 5.5mA.
The pins Dout and Linear out is shorted together to receive the 433Mhz signal from air. This signal is then demodulated to get the data and sent out through the data pin.



Fig 10: -ASK RECEIVER

2) HT12D Decoder IC

The HT12D IC (Holtek 12-bit Decoder) is an RF Decoder Integrated Circuit (IC) that is widely used in RF (Radio Frequency) wireless communication systems. The HT12D IC is mainly used to decode the incoming signal received from an RF Transmitter and convert it into a 4-bit parallel output. This output is then sent to a microcontroller (NodeMCU ESP8266) to perform a specific task, such as turning ON the buzzer, displaying text on LCD, or triggering an alert in your project.



Fig 11: - HT12D IC

3) LED

LED (Light Emitting Diode) is a semiconductor device that emits light when an electric current flows through it. It is widely used in electronic projects for indication, signaling, and visual output.



Fig 12: - LED

4) Buzzer

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectic or mechanical type. The main function of this is to convert the signal from audio to sound.



Fig 13: - BUZZER

V. CIRCUIT DIAGRAM

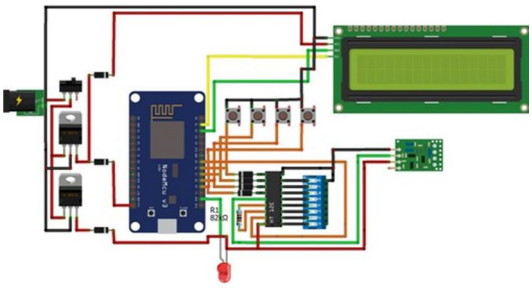


Fig 14: - Transmitter Diagram

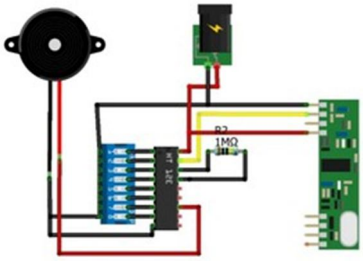


Fig 15: - Receiver Diagram

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VI. PROGRAM

```
#include <Wire.h>  // This library is already built in to the Arduino IDE
#include  <LiquidCrystal_I2C.h>  //This  library  you can add via Include Library > Manage Library >
LiquidCrystal_I2C lcd(0x27, 16, 2);

// Define the pins for the tracking tags #define dev1 D3
#define dev2 D4 #define dev3 D5 #define dev4 D6

void setup()
{
  Serial.begin(9600); pinMode(dev1, INPUT); pinMode(dev2, INPUT); pinMode(dev3, INPUT); pinMode(dev4,
  INPUT);

     lcd.begin(); Wire.begin(D2,D1); lcd.backlight();
// Enable or Turn On the backlight lcd.clear();
     lcd.setCursor(0,0); lcd.print("DEVICE TRACKING");
     lcd.setCursor(0,1); lcd.print("SYSTEM"); delay(2000);
}

void loop()
{
 int d1,d2,d3,d4; d1=digitalRead(dev1); d2=digitalRead(dev2); d3=digitalRead(dev3); d4=digitalRead(dev4); if(d1==0)

{
  Serial.println("Device 1"); lcd.clear(); lcd.setCursor(4,0); lcd.print("DEVICE 1 "); lcd.setCursor(4,1);
     lcd.print("TRACKING"); delay(500);
 }

else if(d2==0)
 {
  Serial.println("Device 2"); lcd.clear(); lcd.setCursor(4,0); lcd.print("DEVICE 2"); lcd.setCursor(4,1);
     lcd.print("TRACKING"); delay(500);
 }


 //device 3

 else if(d3==0)
 {
  Serial.println("Device 3"); lcd.clear(); lcd.setCursor(4,0); lcd.print("DEVICE 3"); lcd.setCursor(4,1);
     lcd.print("TRACKING"); delay(500);
 }
//device 4

else if(d4==0)
{
 Serial.println("Device 4"); lcd.clear(); lcd.setCursor(4,0); lcd.print("DEVICE 4"); lcd.setCursor(4,1);
    lcd.print("TRACKING"); delay(500);
}
 else
```

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```
{
  Serial.println("No Device "); lcd.clear(); lcd.setCursor(3,0); lcd.print("PRESS 1 FOR"); lcd.setCursor(4,1);
  lcd.print("DEVICE 1"); delay(500);
  lcd.clear(); lcd.setCursor(3,0); lcd.print("PRESS 2 FOR"); lcd.setCursor(4,1); lcd.print("DEVICE 2"); delay(500);
  lcd.clear(); lcd.setCursor(3,0); lcd.print("PRESS 3 FOR"); lcd.setCursor(4,1); lcd.print("DEVICE 3"); delay(500);
  lcd.clear(); lcd.setCursor(3,0); lcd.print("PRESS 4 FOR"); lcd.setCursor(4,1); lcd.print("DEVICE 4"); delay(500);
 }
```

VII. FUTURE SCOPE

Integration with AI: Future household tracking systems will leverage AI to learn user habits and preferences, allowing for predictive automation. This means devices can anticipate needs, such as adjusting lighting or temperature based on the time of day or occupancy.

5G Connectivity: The rollout of 5G technology will enhance the speed and reliability of device communication, enabling real-time tracking and control of household devices without lag.

Miniaturization: Devices will continue to become smaller and more efficient, making it easier to integrate tracking technology into everyday household items without compromising aesthetics or functionality.

Facial Recognition and AI Monitoring: Future systems will incorporate advanced security features, such as facial recognition for access control and AI-driven monitoring to detect unusual activities, enhancing home safety.

Cybersecurity Protocols: As household devices become more interconnected, robust cybersecurity measures will be essential to protect sensitive data and prevent unauthorized access.

Smart Energy Management: Future tracking systems will focus on optimizing energy consumption, allowing households to monitor and manage energy use effectively, potentially integrating with renewable energy sources.

Water and Waste Management: Systems will also track water usage and waste production, promoting conservation and efficient recycling practices within the home.

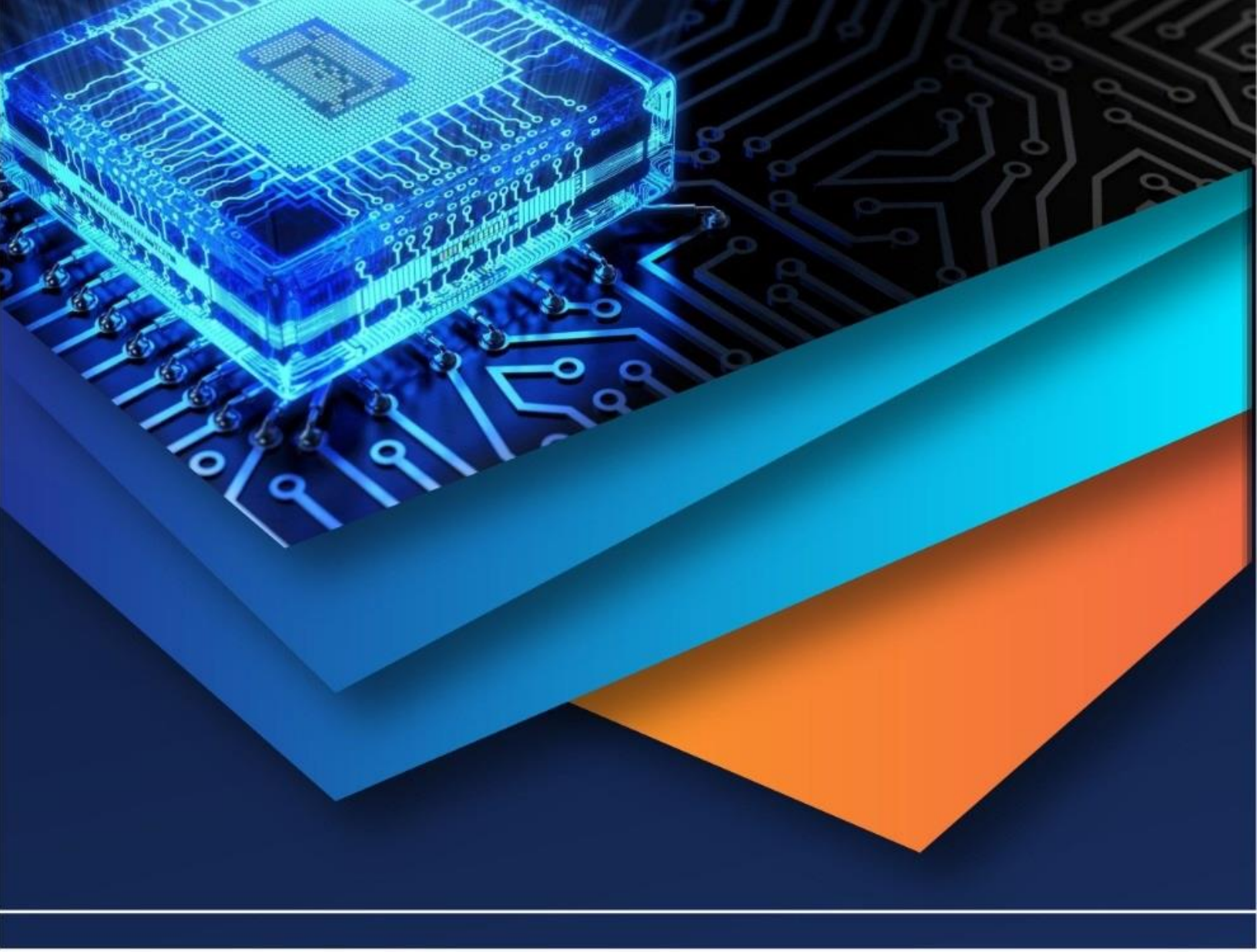
VIII. CONCLUSION

In conclusion, The Household Device Tracking System is a cost-effective and user-friendly solution designed to locate misplaced household items such as keys, remotes, and mobile phones in minimum time and effort. By utilizing NodeMCU ESP8266, RF Module, Buzzer, and LCD Display, the system provides both audio and visual alerts, allowing users to quickly find their lost items. This project effectively demonstrates the application of IoT and RF communication in daily life problem-solving. With further enhancements like GPS, Bluetooth, and Mobile App integration, this system can be widely adopted to prevent the loss of essential items, ensuring greater convenience and time efficiency.

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