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IOT based Smart Key Finder

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ABSTRACT: Losing keys is a common yet frustrating experience in daily life. This article presents an IoT-based smart keychain designed to assist in locating keys within close proximity. This article introduces a Smart Key Finder system designed without Bluetooth, utilizing an Arduino Uno, a Wi-Fi module ESP8266, and a voltage regulator to help users locate their misplaced keys. The key finder comprises an aArduino Uno microcontroller, a Wi-Fi module ESP8266, a voltage regulator, and a smartphone application. The Arduino Uno serves as the central processing unit, interfacing with the Wi-Fi module to track key location. The Wi-Fi module connects the system to the user's home Wi-Fi network, enabling remote access and control. The voltage regulator ensures a stable power supply to all components. The system operates by establishing a connection between the Arduino Uno and the user's smartphone via the WiFi module. Users can send commands from a smartphone application to trigger sound or light signals on the key finder device, assisting in locating misplaced keys within the home. Additionally, the system can provide real-time location information through the smartphone application. This Smart Key Finder offers an affordable, efficient, and user-friendly solution to the problem of lost keys, without relying on Bluetooth technology. The use of Arduino Uno, Wi-Fi connectivity, and a voltage regulator enhances its functionality and ease of use, making it a valuable addition to everyday life.

KEYWORDS: Arduino Uno, Smart Key Finder, Internet of things, Connected component labelling.

I. INTRODUCTION

The **Internet of things** (**IoT**) is the extension of Internet connectivity into physical devices and everyday objects. Embedded with electronics, Internet connectivity, and other forms of hardware (such as sensors), these devices can communicate and interact with others over the Internet, and they can be remotely monitored and controlled. An IoT system consists of sensors/devices which "talk" to the cloud through some kind of connectivity. Once the data gets to the cloud, software processes it and then might decide to perform an action, such as sending an alert or automatically adjusting the sensors/devices without the need for the user. Just like Internet has changed the way we work & communicate with each other, by connecting us through the World Wide Web (internet), IoT also aims to take this connectivity to another level by connecting multiple devices at a time to the internet thereby facilitating man to machine and machine to machine interactions. Fig 1 shows the internet of things and Fig 2 describes the working of IOT.

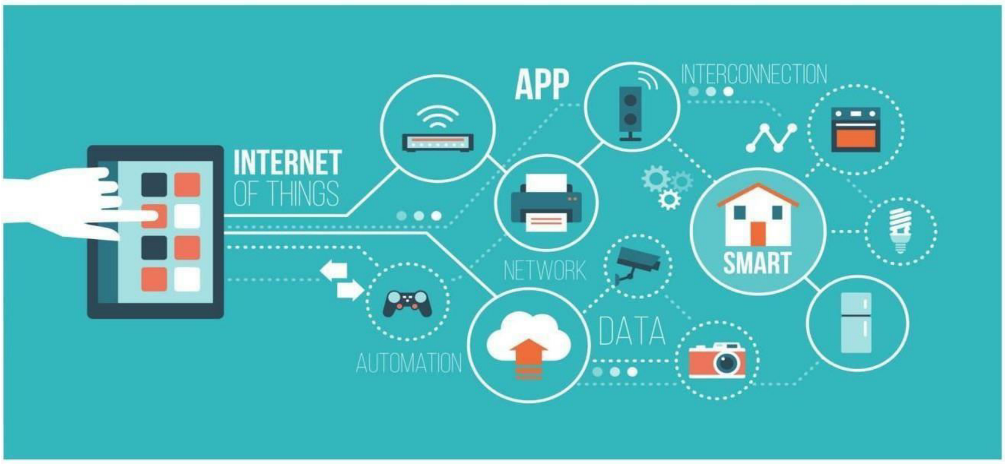

Fig 1. IOT

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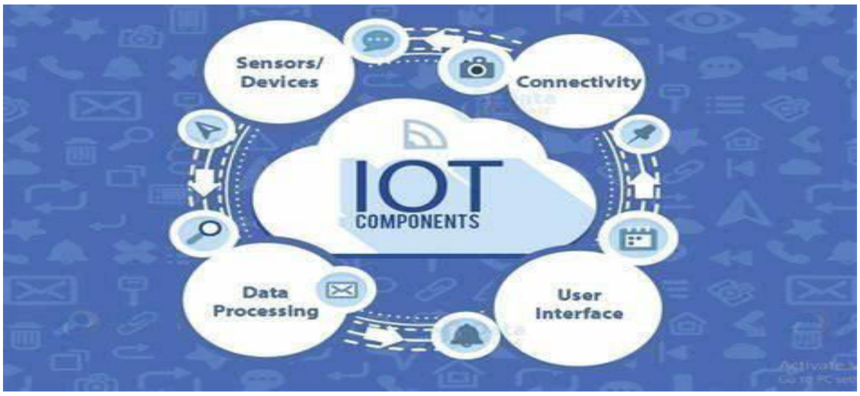

Fig 2 Working of IOT

Here, 4 fundamental components of IoT system, which tells us how IoT works.

i. Sensors/Devices

First, sensors or devices help in collecting very minute data from the surrounding environment. All of this collected data can have various degrees of complexities ranging from a simple temperature monitoring sensor or a complex full video feed. A device can have multiple sensors that can bundle together to do more than just sense things. For example our phone is a device that has multiple sensors such as GPS, accelerometer, camera but our phone does not simply sense things.

The most rudimentary step will always remain to pick and collect data from the surrounding environment be it a standalone sensor or multiple devices

ii. Connectivity

Next, that collected data is sent to a cloud infrastructure but it needs a medium for transport.

The sensors can be connected to the cloud through various mediums of communication and transports such as cellular networks, satellite networks, Wi-Fi, Bluetooth, wide-area networks (WAN), low power wide area network and many more.

Every option we choose has some specifications and trade-offs between power consumption, range, and bandwidth. So, choosing the best connectivity option in the IOT system is important

iii. Data Processing

Once the data is collected and it gets to the cloud, the software performs processing on the acquired data. This can range from something very simple, such as checking that the temperature reading on devices such as AC or heaters is within an acceptable range. It can sometimes also be very complex, such as identifying objects (such as intruders in your house) using computer vision on video.

But there might be a situation when a user interaction is required, example- what if when the temperature is too high or if there is an intruder in your house? That's where the user comes into the picture.

iv. User Interface

Next, the information made available to the end-user in some way. This can achieve by triggering alarms on their phones or notifying through texts or emails.

Also, a user sometimes might also have an interface through which they can actively check in on their IOT system. For example, a user has a camera installed in his house, he might want to check the video recordings and all the feeds through a web server.

However, it's not always this easy and a one-way street. Depending on the IoT application and complexity of the system, the user may also be able to perform an action that may backfire and affect the system.

For example, if a user detects some changes in the refrigerator, the user can remotely adjust the temperature via their phone.

There are also cases where some actions perform automatically. By establishing and implementing some predefined rules, the entire IOT system shown in Fig 3 can adjust the settings automatically and no human has to be physically present. Also in case if any intruders are sensed, the system can generate an alert not only to the owner of the house but to the concerned authorities.

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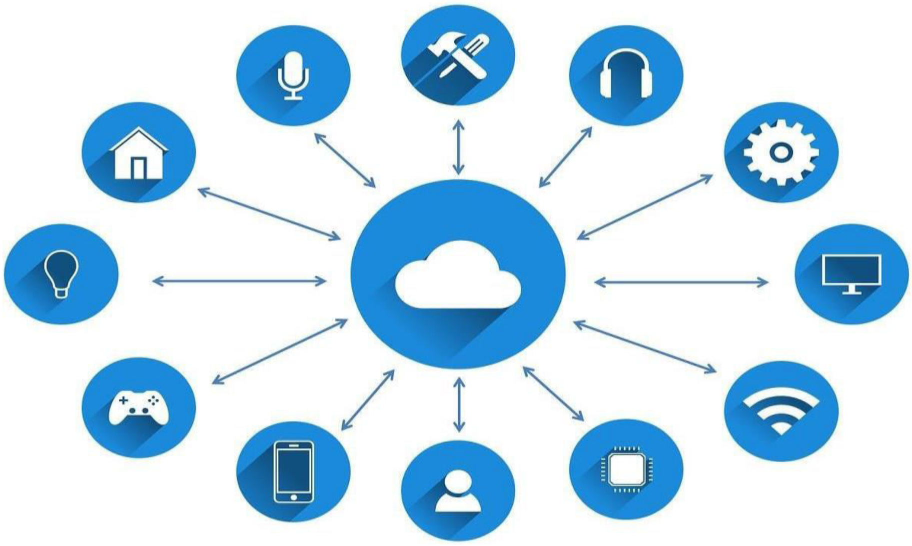

Fig 3 IOT devices

II. LITERATURE SURVEY

The rapid advancement of wireless communication and Internet of Things (IoT) technologies has enabled significant innovations in areas such as remote control, security, and tracking systems. This review synthesizes insights from diverse studies to highlight the evolution of these technologies.

Remote Control of Sensors and Actuators

Aranguren et al. (2002) [1] introduced a GSM-based framework for managing sensors and actuators remotely. Their work demonstrated the practicality of GSM networks in providing real-time control and monitoring, highlighting their applicability in industrial and environmental scenarios. The Arduino Uno platform [2], known for its user-friendly interface and flexibility, further complements such systems by facilitating the integration of multiple sensors and actuators, making it an ideal tool for IoT-based projects.

Advancements in Smart Lock Systems

Smart lock technologies have undergone substantial innovation to enhance security and user convenience. For instance, Rodenbeck et al. (1999) [3] presented a wireless-controlled security system aimed at improving accessibility while maintaining stringent security standards. Similarly, Scalisi (2013) [8] proposed advanced methods for developing smart locks, emphasizing automation and enhanced control mechanisms. Further contributions by Segev and Gan (2004) [4] introduced an intelligent locking system that adapts to interactive inputs, demonstrating a move toward context-aware and user-friendly solutions.

GSM in Communication Systems

The integration of GSM technology into modern applications has proven effective for secure and reliable communication. Lodenuis (1998) [5] explored GSM's role in multimedia-enabled mobile systems, providing a foundation for its adoption in IoT devices. These advancements paved the way for GSM to be utilized in a variety of IoT-based control systems, combining its widespread coverage with robust communication capabilities.

IoT-Enabled Wireless Sensor Networks

IoT's integration with wireless sensor networks (WSNs) has been transformative in domains like environmental monitoring and healthcare. Cabra et al. (2017) [6] proposed a wireless IoT framework for monitoring environmental parameters in healthcare settings, highlighting the potential of IoT to transmit real-time data over WSNs. Similarly, Priyanka et al. (2019) [7] devised a child tracking and safety system leveraging IoT technologies, demonstrating the versatility of IoT in addressing safety concerns through location-based services.

IoT in Smart Devices for Tracking and Security

The development of IoT-enabled smart devices has significantly improved tracking and security applications. For

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instance, Nasir and Noradzmi (2022) [8] designed an IoT-based smart finder system to assist users in locating lost items efficiently. This innovation emphasizes convenience and accessibility, making everyday tasks easier. Kulasekara et al. (2019) [9] focused on creating a smart key system tailored for electric bikes, addressing specific challenges related to environmental factors in Vietnam while enhancing security and user experience.

III. METHODOLOGY

We present the methodology for the development of a Smart Key Finder using Arduino, ESP8266, and a Voltage Regulator. The primary objective of this article is to create a cost-effective and power-efficient key tracking system without relying on Bluetooth, a buzzer, or GPS tracker technologies. This methodology chapter outlines the key steps involved in achieving this goal.

BLOCK DIAGRAM

The block diagram shown in the fig 4 illustrates the core components and their interactions in our Smart Key Finder system. It includes the following components:

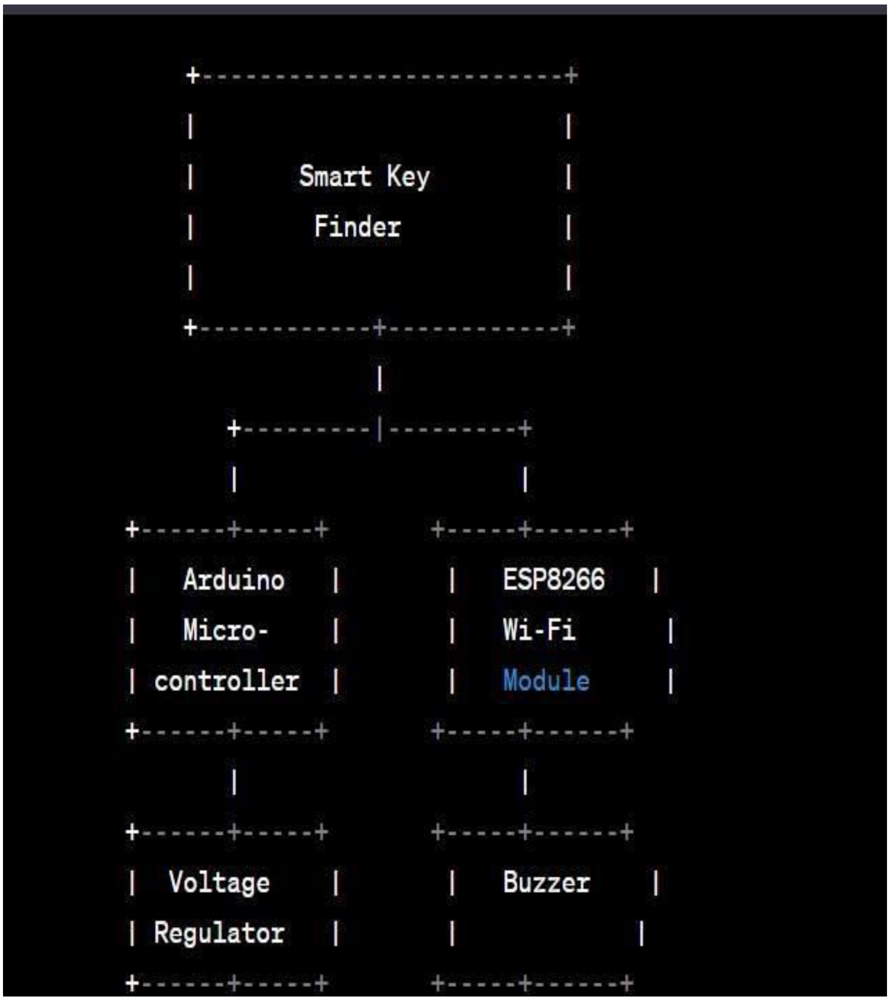

Fig 4 Block Diagram

- **Arduino:** This microcontroller is responsible for key detection and overall system control.
- **ESP8266:** The ESP8266 module is used for wireless communication, transmitting key status to the user's device.
- **Voltage Regulator:** The voltage regulator ensures a stable power supply to all components, enhancing the system's reliability.

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Circuit Diagram

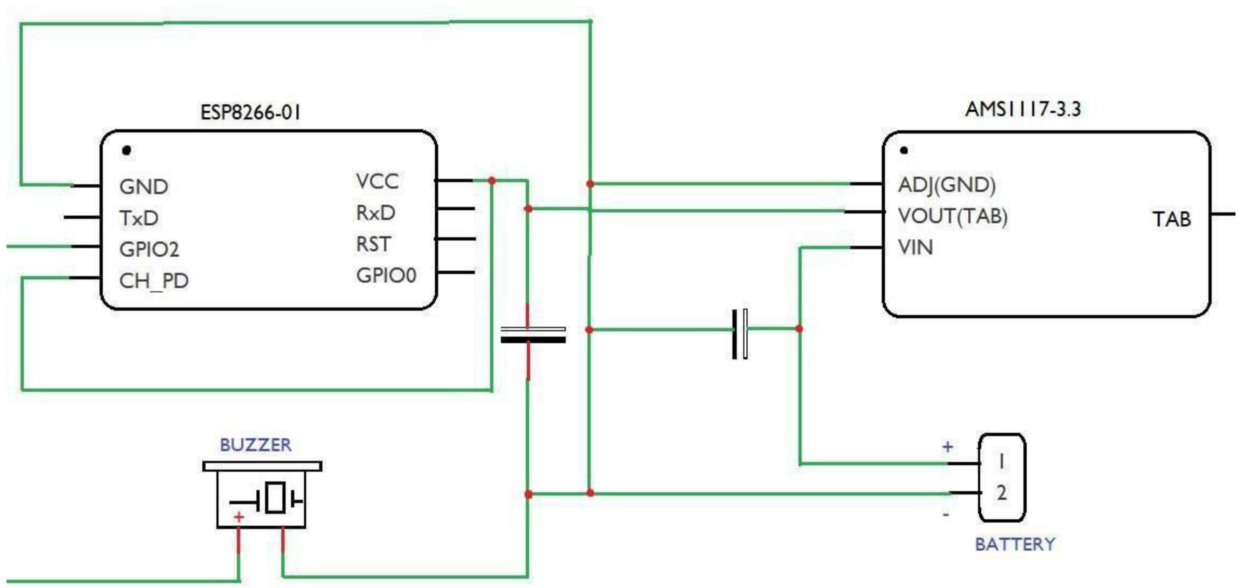

Fig 5 Circuit Diagram

The circuit diagram shown in the fig 5 provides a detailed representation of the physical connections between the components.

Key aspects of the circuit include:

Arduino-ESP8266 Interface: The Arduino and ESP8266 are connected via serial communication (UART), allowing them to exchange data.
Voltage Regulator: It takes an input voltage from a power source and provides a regulated output voltage to power the Arduino and ESP8266.

Flow Chart :

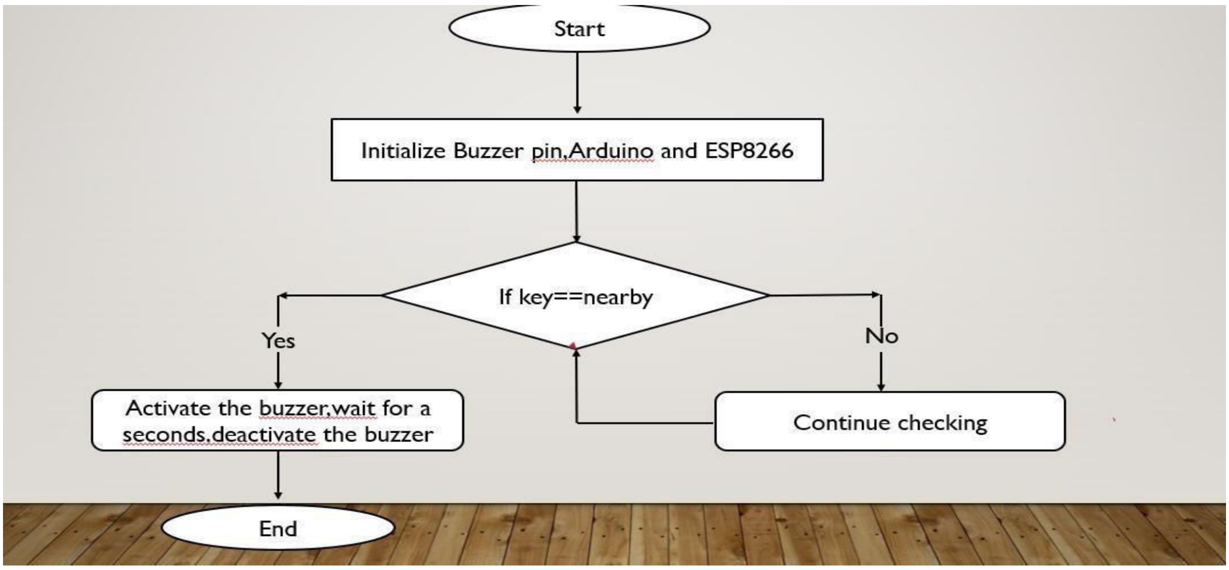

Fig 6 Flow Chart

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The flow chart shown in the fig 6 outlines the software logic that governs the Smart Key Finder's operation. It depicts the sequence of operations within the system:
Initialization: The system starts by initializing its components.
Key Detection: The Arduino constantly checks for the presence of the key.
Key Detected? : If a key is detected, the system proceeds to notify the user; otherwise, it continues monitoring.
Notification: The ESP8266 is activated to send a notification to the user's device.
Loop: The system continuously loops through these steps.

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