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A Review on Various Motion Detection and Home Automation using Cayenne

Mukesh Pimpalkar[1], Saurav Tiwari[2], Sakshi Rahangdale[3], Kashifa Sheikh[4], Punam Rajput[5], Suraj Mahajan[6]

[2]Computer Science and Engineering, TGPCET, Nagpur, India
[1]Computer Science and Engineering, TGPCET, Nagpur, India
[3]Computer Science and Engineering, TGPCET, Nagpur, India
[4]Computer Science and Engineering, TGPCET, Nagpur, India
[5]Computer Science and Engineering, TGPCET, Nagpur, India

Abstract - Home monitoring and automation are used to assist maintain cozy living conditions inside a home. There are various forms of comfort requirements for people in their houses. The most important of these categories is thermal comfort, which has to do with temperature and humidity. This is followed by visual comfort, which has to do with colors and light, and hygienic comfort, which has to do with air quality. These parameters can be monitored by a system to assist keep them within a reasonable range. Making the house smarter also entails enabling the intelligent automatic execution of a number of orders after analyzing the data gathered. The Internet of Things can be used for automation (IoT). As a result, the resident has access to specific home data and can remotely manage a few settings. The entire design of an Internet of Things-based sensing and monitoring system for automated smart homes is presented in this study. The CAYENNE platform is utilized in the proposed architecture for data collection, data visualization, and remote control of household appliances and devices. The chosen platform is incredibly adaptable and simple to use. The NodeMCU-ESP8266 microcontroller board, which enables real-time data sensing, processing, and uploading/downloading to/from the server, is used to sense various variables inside the home.

***Key Words*:** Motion detection, CAYENNE, internet of things, automation, microcontrollers.

1.INTRODUCTION

The network of physical items, or "things," that are implanted with sensors, software, and other technologies for the purpose of communicating and exchanging data with other devices and systems through the internet is referred to as the Internet of Things (IoT). The rapidly expanding network of interconnected items with integrated sensors that can gather and transmit data in real time is known as the "Internet of Things." Appliances like refrigerators, vehicles, lights, and thermostats can all be connected to the Internet of Things.

There are four types of IoT network we have discussed below:

Cellular Network: IoT devices can interact using cellular networks, which are the same mobile networks that are used by smartphones. These networks weren't always thought to be the greatest option for IoT devices because they were initially created for power-hungry gadgets like smartphones.

PAN & LAN: Personal area networks (PAN) and local area networks are networks that only span relatively short distances (LAN). Although data transfer via PAN and LAN networks is often thought to be cost-effective, it is not always dependable.

LPWAN: IoT devices that use LPWANs transmit little data packets infrequently over great distances. In response to the early difficulties with cellular communication, this kind of wireless network was created.

Mesh Networks: The connection configuration of mesh networks—how the parts communicate with one another—is the most effective way to characterize them. In mesh networks, all sensor nodes work together to share data among themselves so that it can reach the gateway.

By enabling remote access to a variety of electronic gadgets, IoT has emerged as the rapidly expanding trend that is currently easing our way of life. One well-liked IoT platform is Cayenne, which makes it simple to create your own IoT configuration. With Cayenne's drag-and-drop IoT project builder, developers can easily design and host their connected device on the internet without investing a lot of time in the programming end. It was once restricted to the Raspberry Pi, but now Arduino and other controllers are supported as well.

2.FEATURES of CAYENNE

- You may drag and drop widgets from an app to remotely manage your IoT projects using the Cayenne App.
- Our IoT projects are set up and managed using the Cayenne Online Dashboard via a browser.
- The device data is processed and stored by Cayenne Cloud.
- The server, agent, and hardware can all communicate with Cayenne Agent to implement incoming and outgoing commands, actions, triggers, and alarms.

3. LITERATURE SURVEY

S Ramakrishnan et al [1], this paper discusses the creation of a smart wireless home security system that delivers intrusion alerts and is Internet of Things (IoT) based. Any movement of

a person within range of a PIR sensor is detected. Through WiFi, the system is connected to the internet using a NODE MCU ESP8266. The NODE MCU sends a message to a smartphone each time the PIR sensor picks up movement.
Ranjithkumar. R et al [2], in this study, a novel home automation system is presented, which may be made more effective and precise by incorporating the PIR motion sensor and Google voice assistant. It consists of the PIR sensor, electromagnetic relays, and Node MCU, a Wi-Fi module used to transfer data over the internet. This designed system may be managed using a mobile application and activates whenever there is movement within the specified sensor range. The Blynk app has been set up in accordance with the system to function smoothly on both iOS and Android devices. The ultimate prototype also includes this system has been successfully constructed, and the functioning prototype has been put through a variety of test cases. The final prototype is additionally configured with Google Assistant so that the relays can be triggered with voice commands.

Aamir Nizam Ansari et al [3], in order to monitor and receive alarms when motion is detected and to send photographs and videos to a cloud server, this paper describes a security alarm system using low processing power processors and the Internet of Things. An application built on the Internet of Things can also be used remotely to watch activity and receive alerts when motion is detected. When the cloud is unavailable, the images and videos are kept locally on the Raspberry Pi and delivered when the connection is established. Otherwise, they are sent directly to a cloud server. As a result, benefits like these make this programme perfect for monitoring homes while you're away.

Vinay Sagar K N et al [4], an automated home is frequently referred to as a smart home. Wireless Home Automation System (WHAS) using IoT is a system that uses computers or mobile devices to operate basic home operations and features automatically through the internet from anywhere in the world. It is intended to conserve both human and electric energy. The feature that sets the home automation system apart from other systems is that it can be controlled online from any location in the world.

M. Al-Kuwari et al [5], the entire design of an Internet of Things-based sensing and monitoring system for automated smart homes is presented in this study. The EmonCMS platform is utilized in the proposed architecture for data collection, data visualization, and remote control of household appliances and devices. The chosen platform is incredibly adaptable and simple to use. The NodeMCU-ESP8266 microcontroller board, which enables real-time data sensing, processing, and uploading/downloading to/from the EmonCMS cloud server, is used to sense various variables inside the home.

Shweta Singh et al [6], the current study examines IoT principles through a thorough analysis of academic research publications, business white papers, expert interviews, and online databases. This paper's main goal is to give an overview of the Internet of Things, various architectures, and important technologies and how they are used in everyday life.

Sudha Kousalya et al [7], the project focuses on providing smart security by sending a captured image through an email to the owner utilizing the internet when an object is detected, which is referred to as home automation. We will carry out this project utilizing the "Node MCU" Module. For the elderly and the handicapped, this will be more beneficial.

4. EXISTING SYSTEM

A. *Home Automation based on bluetooth*

Systems for automating the home that use Bluetooth, an Arduino board, and a smartphone are safe and affordable. a planned Bluetooth-based home automation system. A computer or smartphone serves as the receiver device in the Bluetooth system. It can be used as a real-time system because of its fast transmission rate, excellent security, and inexpensive cost. The maximum range of a Bluetooth network is 10 meters. One of the biggest drawbacks of Bluetooth-based home automation systems is that if the smartphone is out of range, it won't be able to operate the appliances.

B. *Home Automation based on voice recognition*

Bluetooth technology is used for the wireless communication between the smartphone and the Arduino UNO. This will be more useful for elderly and disabled persons who want to use voice commands to operate appliances. This system's fundamental flaw is that it depends on the signal to noise ratio (SNR) for communication between the user and the voice recognition tool; if the voice signal is noisy, this can have a significant impact on communication and cause the system to perform inaccurately.

C. *Home Automation based on ZigBee*

The ZigBee technology is comparable to Bluetooth. With a modest data rate and power, it is one of the widely used transceiver standards. Its physical range is 10 to 20 meters, however using direct sequence spread spectrum, that range can be increased to 150 meters (DSSS). It is perfect for creating prototypes and other research-related tasks.

D. *Home Automation based on GSM*

Text messages are used in GSM-based home automation systems to communicate with the appliances. The primary flaw in GSM-based home automation systems is that there is no assurance that text messages will always be delivered to the system, making them unreliable.
These are the shortcomings of the current approaches, and we are adopting "IOT Based Smart Security and Smart Home Automation" to address them.

5. METHODOLOGY

A. *Requirements:*

- Node MCU:

An open source IOT platform is Node MCU. It consists of hardware based on the ESP-12 module and firmware that runs on Espressif Systems' ESP8266 Wi-Fi SOC. By default, "Node MCU" refers to the firmware rather than the

development kits. It is a single board microcontroller with 128kb of memory and 4Mbytes of storage. Power is provided by a USB port, and it has 16 GPIO pins.

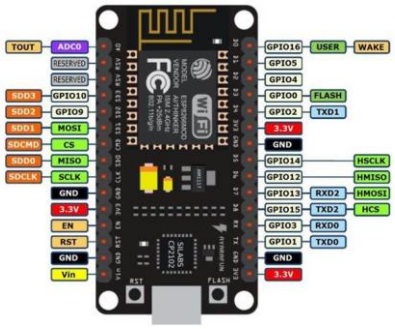

Fig. 4.1 Node MCU

- IR sensor:

An electrical device known as an infrared sensor uses infrared radiation to detect and/or emit specific features of its environment. Additionally, infrared sensors have the ability to measure heat emissions from objects and recognize motion. An explanation of what the electromagnetic spectrum is and how it relates. From the supposed red edge of the visible spectrum at 700 nanometers (nm) to one-millimeter, infrared energy is present. These wavelengths are equivalent to a frequency range of roughly 430 THz to 300GHz.

Fig. 4.2 IR Sensor

- Single Channel Relay:

Relays are electromagnetic switching devices made up of an armature that is moved to control one or more switch contacts by an electromagnet. Relays have several benefits, including the fact that they offer isolation and amplification and are simple to use. Each channel on the 5-channel relay interface board here requires a 15-20 mA driving current. With big current relays that operate under AC250V 10A or DC30V 10A, it may be used to manage a variety of appliances and equipment. It features a common interface that a microcontroller can use to control it directly.

Fig. 4.3 Single Channel Relay

- DHT11:

The widely used DHT11 temperature and humidity sensor has an exclusive NTC for temperature measurement and an 8-bit microprocessor to output the temperature and humidity measurements as serial data.

Fig. 4.4 DHT11 sensor

- MQ2 Sensor:

One of the most popular gas sensors for detecting LPG, propane, alcohol, CO, and even methane is the MQ-2.

Fig. 4.5 MQ2 Sensor

- DC Fan:

Temperature-Regulated DC A fan may be used to regulate the temperature of equipment, spaces, electronic parts, etc. Fan starts automatically, allowing for manual temperature control, making it simple to operate and reasonably priced.

Fig. 4.6 DC Fan

- LDR Sensor:

The most common uses for photoresistors, often referred to as light dependent resistors (LDR), are to detect the presence or absence of light or to gauge the strength of the light.

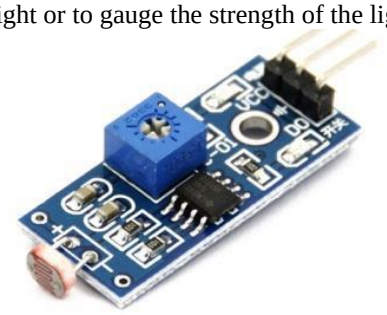

Fig. 4.7 LDR Sensor

B. *Proposed System:*

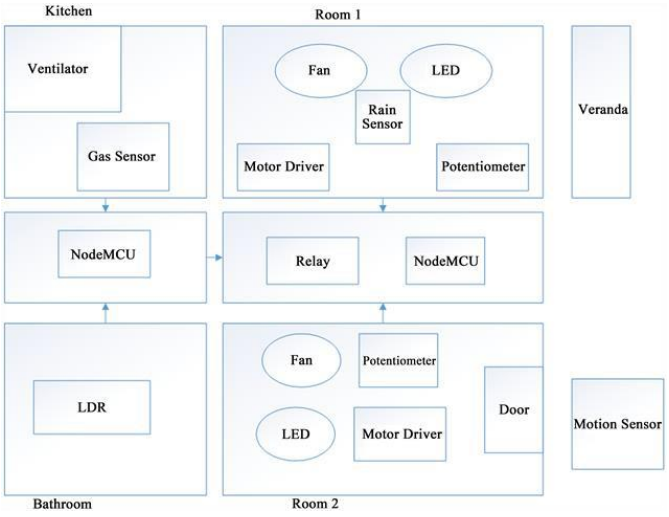

Fig. 4.8 Block Diagram

The goal of home automation with a motion detection and security system is to identify any motion in the house and respond appropriately. This device uses sensors like the DHT11 for controlling humidity and temperature, the MQ2 for detecting hazardous substances in the air, the LDR for controlling light, the IR and ultrasonic for detecting motion, and the node MCU to control all of the sensors at once.

The prototype can be used in following three ways:

a. As a smart security system

If an IR / ultrasonic sensor is positioned at a building's entryway. As was previously mentioned, these sensors pick up on impediment movements. The micro-input controller's trigger is the signal that recognizes their presence.

b. As a smart home automation system

We can use a cell phone to remotely operate all electrical appliances with home automation. In this project, we are using the internet to control lights and fans. This will enable us to remotely control our household appliances. This will make it easier for elderly and disabled individuals to operate their home equipment.

c. Environment monitoring

We are using DHT11 and MQ2 sensors for the environment monitoring. Also, we are installing these two sensors inside the house to get to know about atmospheric condition inside the house. Here, a DHT11 sensor displays the temperature and humidity data, while a MQ2 sensor examines the air purity to see whether any poisonous gases are present. The sensor's reading is updated every second. We can turn on fans to blow the air outside if the temperature or air impurity rises at that time.

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