Home Automation Using Image Processing

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Abstract:- Today, many of the automation systems deployed are mostly controlled by humans. This control by humans restricts the automation of home appliances to an extent. Also, most of the deployed home automation systems use the Internet of Things technology to control the appliances. In this we propose a system developed using action recognition to fully automate the home appliances. We recognize the three actions of a person (sitting, standing and lying) along with the recognition of an empty room. With this system, we remove the human intervention in home automation systems for controlling the home appliances and at the same time we ensure the data privacy and reduce the energy consumption by efficiently and optimally using home appliances and also it has a security mode. In the security mode if any human is detected it captures the image of the person detected and shares the picture to responsible person, the picture shared will be refreshes with every one minute and also it uploads the captured image in local IP address provided to it. through the local IP no. of persons can see the image captured.

I. INTRODUCTION

A. Overview

The conventional system that we currently employ does not make use of any pi cameras and is entirely based on OS control. Voice assistants, like the ones we have now, such Alexa and Google assistants, simply use voice commands from mobile phones to turn on and off electronics. These systems now use PIR sensors to turn on lights and related equipment's. It only detects motion not only that of a human, but of any living thing which increases the power consumption of the devices.

B. Objectives and Goals

We have developed this project, which senses and detects only human motion in images, to address these problems. This technique lessens the delay of longer device ON and OFF times. Moreover, other objects' motion is not detected by this method. To solve these issues, we created this project that exclusively recognizes and interprets human motion in pictures. By using this method, the ON and OFF periods of the gadget are not delayed. Furthermore, this approach does not detect the motion of other objects

This system has 3 operating modes (M1, M2, M3). mode1 is fully automated mode which detects any human being it starts working according to the human being's position or the location he is standing inside the room. Mode 2 is a manually controlled mode in which we can ON&OFF the appliances according to the operators wish using chat bot installed in his mobile. Mode 3 acts as security mode and also as manual mode This mode captures the unauthorized persons detection and sends the image in the chat bot installed and also in the local IP address provided.

II. RELATED WORKS

HAUAR: HOME AUTOMATION USING ACTION RECOGNITION (Shashank Kotyan, Nishant Kumar, Pankaj KumarSahu, and Venkanna U.,2018) Existing home automation systems rely heavily on human control and the Internet of Things, which limits their potential and raises privacy concerns. This paper proposes a new system that uses action recognition to automate appliances completely, eliminating the need for human intervention and protecting data privacy. The system can recognize three actions (sitting, standing, and lying) and detect empty rooms with 90% accuracy in real-life tests. Its goals include increased automation, improved privacy, and reduced energy consumption through optimal appliance usage.

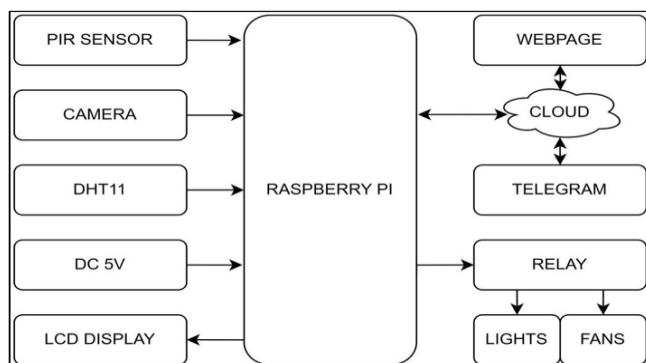## III. BLOCK DIAGRAM AND WORKING

Fig 1 Block Diagram

➢ *PIR Sensor*

A PIR sensor is a passive infrared sensor that detects the presence of people or animals by detecting changes in their infrared (IR) radiation. The PIR sensor is connected to the Raspberry Pi GPIO pins.

➢ *Webpage*

A web page is a document that is displayed on a web browser. The Raspberry Pi can be used to host a web page, which can be accessed by any device connected to the same network. A web page is a document that is stored on a web server and can be accessed by a web browser. Web pages are written in Hypertext Markup Language (HTML), which is a code language that tells the web browser how to display the page. Web-pages can contain text, images, videos, and other multimedia content.

➢ *PI Camera*

A camera is used to capture images or videos. The Raspberry Pi can be used to connect a camera, which can be used for surveillance, photography, or videography. A Pi Camera is a small, versatile camera module specifically designed for the Raspberry Pi single-board computer. It connects to the Raspberry Pi via a dedicated ribbon cable and can be used for various applications, including;

- Still photography: Capture photos with resolutions up to 8 megapixels (depending on the model).
- Video recording: Record videos in full HD resolution (1080p) at 30 frames per second (fps) or lower resolutions at higher frame rates.
- Time lapse photography: Capture a series of photos at set intervals to create a sped-up video.
- Security cameras: Monitor your home or office remotely using the Pi Camera and a software application
- Live streaming: Broadcast live video footage online.
- Machine vision projects: Use the Pi Camera and computer vision libraries to analyze images and videos for tasks like object detection and facial recognition.

- Educational projects: Learn about photography, video recording, and computer vision through hands-on projects with the Pi Camera.
- High Quality Camera: This is a high-end model with a 16-megapixel sensor and interchangeable lenses. It is ideal for professional applications.

The Pi Camera is a powerful and affordable tool that can be used for various creative and practical applications. It is relatively easy to set up and use, making it a great choice for beginners and experienced makers alike.

➢ *Cloud*

The cloud is a remote server that can be used to store data or run applications. The Raspberry Pi can be used to connect to the cloud, which can be used to store data, such as images or videos captured by the camera, or to run applications, such as a web server or a database.

➢ *DHT11*

A DHT11 sensor is a temperature and humidity sensor. The DHT11 sensor is connected to the Raspberry Pi GPIO pins The DHT11 sensor is a low-cost, digital humidity and temperature sensor commonly used in home automation systems, weather stations, and other applications that require accurate and reliable humidity and temperature readings. It utilizes a capacitive humidity sensor and a thermistor to measure the surrounding air and outputs both temperature and humidity values in a digital format.

➢ *Raspberry PI*

The Raspberry Pi is a small, open-source computer that is designed to work with a variety of software packages. The Raspberry Pi is the central component of the system and is responsible for controlling all of the other components. The Raspberry Pi 4 is powered by a Broadcom BCM2711 quad-core Cortex-A72 processor, which is clocked at 1.5GHz. It comes with 1GB, 2GB, 4GB, or 8GB of RAM, and it has a microSD card slot for storage. The Raspberry Pi 4 also has two micro-HDMI ports, two USB 3.0 ports, two USB 2.0 ports, a Gigabit Ethernet port, and a 3.5mm audio jack.

➢ *Telegram*

Telegram is a messaging app that can be used to send and receive messages, as well as make and receive voice calls. The Raspberry Pi can be used to connect to Telegram, which can be used to send and receive messages about the status of the system or to control the system remotely.

➢ *DC 5V*

The DC 5V power supply provides power to the Raspberry Pi and the other components

➢ *Relay*

A relay is an electrically operated switch that can be used to control high-voltage or high-current devices. The Raspberry Pi can be used to control the relay, which can be used to turn on and off lights, fans, or other devices.

➢ *LCD Display*

An LCD display is a liquid crystal display that is used to display text and images. The Raspberry Pi can be used to connect an LCD display, which can be used to display information about the system or to control the system. Liquid crystal displays (LCDs) are a ubiquitous technology found in various electronic devices, including smart phones, computers, televisions, and monitors. They are known for their thin, lightweight, and energy-efficient design, making

them a popular choice for portable devices. Unlike cathode-ray tube (CRT) displays, which use electron beams to excite phosphors, LCDs rely on liquid crystals to modulate light. Liquid crystals are fluid substances that exhibit properties of both solids and liquids. They can align their molecules in a specific direction, influencing the passage of light.

➢ *Lights Fans*

Lights and fans are devices that can be controlled by the Raspberry Pi. The Raspberry Pi can be used to turn on and off lights, fans, or other devices.

The Raspberry Pi is connected to the other components using a variety of cables, including GPIO cables, USB cables, and HDMI cables. The block diagram shows how the different components of the system work together. The PIR sensor detects the presence of people or animals and sends a signal to the Raspberry Pi. The Raspberry Pi then turns on the camera and starts recording video. The video is then uploaded to the cloud, where it can be accessed by any device connected to the same network. The Raspberry Pi can also be used to send a Telegram message or to turn on a light or fan. The system can be used for a variety of purposes, such as: Surveillance: The system can be used to monitor a home or office for intruders.
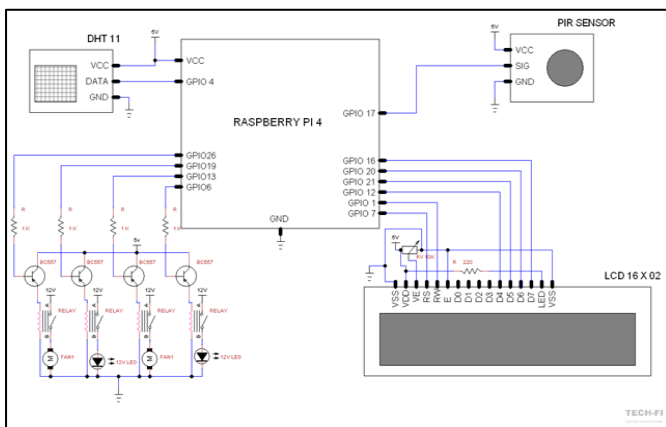
IV. CIRCUIT DIGRAM

Fig 2 Circuit Diagram

The circuit diagram shows various connections to the PIR Sensor, PI camera, DHT 11, Raspberry Pi, DC power supply, Relay, LCD display, Lights and fans. Turn on lights or appliances when motion is detected by the PIR sensor Display the current temperature and humidity on the LCD display Send data from the sensors to the internet. The specific functionality of the circuit would depend on the code that is loaded onto the Raspberry Pi. However, it is likely that the circuit is designed to monitor temperature, humidity, and motion, and to control devices based on the sensor readings. For example, the circuit could be used to turn on lights when motion is detected, or to display the temperature and humidity on the LCD screen. The DHT11 sensor is connected to GPIO pin 4 on the Raspberry Pi.

The PIR sensor is connected to GPIO pin 17 on the Raspberry Pi. The LCD display is connected to a number of

GPIO pins on the Raspberry Pi, including GPIO pins 18, 23, 24, 25, and 4.The relays are connected to GPIO pins 16, 19, 20, and 26 on the Raspberry Pi.

V. APPLICATIONS

➢ *Home Automation*

The system can be used to control lights, fans, and other devices in a home.

➢ *Environmental Monitoring*

The system can be used to monitor the temperature and humidity in a room or greenhouse.

➢ *Wildlife Observation*

The system can be used to observe wildlife in their natural habitat.

VI. CONCLUSION

Home automation using image recognition holds immense potential to revolutionize the way we interact with our living spaces. While the technology is still in its early stages of development, significant advancements are being made in image recognition accuracy and speed. Several research projects and commercial applications demonstrate its potential for diverse home automation applications. Overall, home automation using image recognition presents a transformative approach to creating intelligent and personalized living spaces. By addressing the existing challenges and ensuring responsible development, this technology holds the potential to significantly enhance our comfort, convenience, security, and energy efficiency.

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