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Smart Office Automation Using ESP32

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Abstract: *Leveraging Internet of Things (IoT) devices is crucial for enhancing office security and automation in today's connected world. Controlling multiple office appliances individually can be challenging for office owners. To address this, IoT technology can be utilized for office appliance automation, enabling control of appliances through the internet using a user-friendly application.*
A proposed smart office system uses ESP32 and ESP32-CAM modules, integrating motion detection, lighting, fan, window, and electrical component control via mobile and wireless communication. This creates an efficient and cost-effective solution. The Wi-Fi module receives user commands over the internet, which are processed by the ESP32 microcontroller, switching loads through relays. The system also updates the switch status on mobile devices when changed physically..

Keywords: ESP32, ESP32-CAM, IoT, Arduino IDE, SOAS

I. INTRODUCTION

In the contemporary workspace, efficiency and sustainability are paramount. The Smart Office Automation System (SOAS) leverages the compact yet powerful ESP-32 to orchestrate a symphony of interconnected devices aimed at enhancing security and energy conservation. Here we are using the ESP-32 for the automation and ESP-32 CAM for the security, ESP32 will do the automation by sensing the motion detection and temperature changes we can also control the devices manually. By using the Relays, we can control the devices/Electrical appliances in the office using our mobile. ESP-32 CAM utilize IR sensor to detect any motion presence. If a motion is detected, capture an image and save's it & Send notifications via the One Signal API when a person is detected.

Project Outline:

The project aims of "Smart Office Automation Using ESP32" is to design and implement a automation system that utilizes Iot technology and the ESP32 microcontroller platform to control the office application using the mobile from anywhere using the mobile. It offers the advantage of efficiency of using the power.

II. LITERATURE SURVEY

The early 1900s witnessed the industrial revolution, which paved the way for the introduction of the first home appliances. In 1901, the first vacuum cleaner was introduced, followed by clothes dryers, washing machines, refrigerators and electric dishwashers. These were not "smart" appliances, but their introduction was game changer for the people of the 20thcentury.

During the 1930s, inventors turned their attention to home automation technologies, but the idea didn't materialize until 1966, when the Echo IV, the first smart automation system, was developed. This device allowed consumers to create computing shopping lists, control the temperature of the home and turn appliances on and off. Created in 1969, the kitchen computer could create recipes, but the device never became a commercial success due to its price.

The development of the microcontroller in 1971 resulted in price reductions for electronics devices, making the technologies more accessible. In 1991, a concept called "geron technology" was introduced, which combined gerontology with technology aimed at making the lives of senior citizens easier. Several new technologies were introduced in this sector during the 1990s.

The early 2000s were marked by the rapid increase in the popularity of smart home technology. Different technologies emerged and were slowly integrated in the homes. Smart homes started to become affordable options and therefore

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viable technologies for many consumers. Home networking, domestic technologies and various other consumer gadgets became available.

Smart office automation is ubiquitous in the current market. Consumers are now able to control the heating, TVs, lights, doors and alarms via remote controllers and smartphones.

III. ESP 32

The ESP32 is a powerful and versatile microcontroller developed by Espressif Systems, equipped with integrated Wi-Fi and Bluetooth capabilities. It features a dual-core or single-core Xtensa LX6 processor that operates at up to 240 MHz, making it suitable for a wide range of applications, from DIY electronics to industrial IoT projects. With 520 KB of SRAM, 448 KB of ROM, and 16 KB of RTC SRAM, it provides ample memory for most embedded systems. The ESP32 includes a rich set of peripheral interfaces, such as 34 GPIO pins, 10 touch sensors, ADCs, DACs, PWM, UART, SPI, and I²C, allowing seamless integration with other components. It supports Wi-Fi 802.11 b/g/n standards, enabling it to connect to wireless networks effortlessly, while its Bluetooth v4.2 capabilities, including BLE, opens up opportunities for low-power communication.

Applications of the ESP32 span across various domains. In IoT, it powers smart home devices, industrial monitoring systems, and environmental sensors. For hobbyists, it finds use in robotics, wearables, and creative DIY projects.

IV. WORKING

The project aims of "Smart Office Automation Using ESP32" is to design and implement a automation system that utilizes IoT technology and the ESP32 microcontroller platform to control the office application using the mobile from anywhere using the mobile. It offers the advantage of efficiency of using the power.

V. EXISTING SYSTEM

This involves using physical switches, buttons, or dials, IR remotes and Bluetooth modules to adjust settings like lighting, temperature, and security. This method can be cumbersome, inefficient, and prone to human error. It also lacks the flexibility and responsiveness offered by automated solutions. Some offices use dedicated controllers for specific functions, like thermostats for temperature control or standalone security systems. While these controllers offer more automation than manual methods, they often lack integration and can be expensive to implement and maintain.

VI. PROPOSED METHOD

An ESP32-based smart office automation system offers numerous advantages over traditional methods. It enables the integration of various devices and functionalities into a single, centralized platform. This involves using physical switches, buttons, or dials, IR remotes and Bluetooth modules to adjust settings like lighting, temperature, and security.

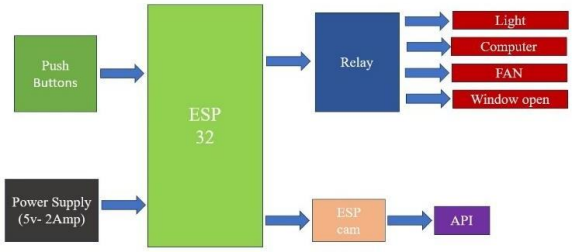

Figure 1: Block diagram of the proposed method

VII. RESULTS & DISCUSSION

Once the system is powered up, initialized & Connected to the Internet the system is ready for controlling the office appliances using the Blynk platform. Once the Device is connected then we can see the status of each appliance from our mobile itself and we can turn ON & OFF the appliance using mobile from anywhere.

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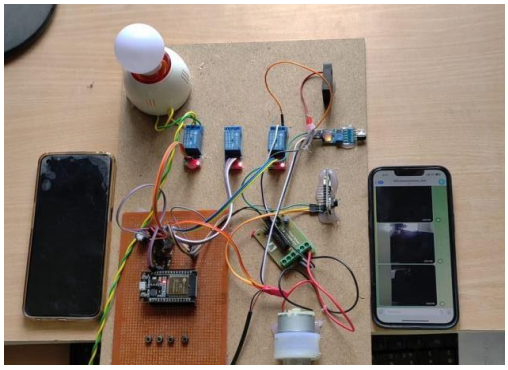
If the ESP 32 cam is connected we get the Notification to the Telegram if any motion is detected it takes the pictures and send them through telegram below showed some example photos took by the device. We can also get the photos manually by giving the command "/photo" to the Telegram bot.



VIII. CONCLUSION

In conclusion, smart office automation systems represent a transformative leap towards creating efficient, productive, and user-friendly work environments. By integrating advanced technologies such as IoT, AI, and data analytics, these systems optimize resource usage, streamline operations, and enhance employee well-being. From energy management and security to workflow automation and workspace utilization, the applications are diverse and impactful.

IX. FUTURE SCOPE

The future scope of smart office automation using ESP32 holds immense potential for enhancing workplace efficiency, comfort, and security. Here are some exciting possibilities:

- Energy Efficiency:
- Security and Access Control:
- Workspace Comfort:
- Occupancy Sensing and Analytics:
- Voice and Gesture Control:
- Health and Well-Being:
- Collaboration and Communication

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