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HOME AUTOMATION USING KME SMART APP

MAJOR PROJECT REPORT

BY

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2310040096: Sritej mokshagna reddy

in partial fulfillment for the award of the degree
of
Bachelor of Technology
In
Electronics & Communication Engineering

Under the Guidance of

Dr. Sanjay S

Department of Electronics & Communication Engineering
KLEF, Off Campus-Hyderabad
Aziznagar-500075, Rangareddy (Dist), Telangana, India
2024

DECLARATION

We hereby declare that the project entitled “Home Automation System Using KME” is being submitted as a Major Project in the 4th semester of Electronics & Communication Engineering at KL University, Aziznagar, Hyderabad. This project is an authentic record of genuine work carried out under the guidance of Assistant Professor Dr Sanjay, Department of Electronics & Communication Engineering, Aziznagar, Hyderabad.

Date:
Place: Hyderabad

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2310040087: Vignesh
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CERTIFICATE

This is to certify that the Major Project Report entitled “Home Automation System Using KME” has been carried out by Guru yeswanth,Vignesh,Vamshi krishna, sritej under the guidance of Assistant Professor Dr Sanjay, Department of Electronics & Communication Engineering, Aziznagar, Hyderabad.

This project report has been approved for submission as a requirement for the SIL Project in the 4th semester of Electronics & Communication Engineering at Aziznagar, Hyderabad.

Internal Examiner External Examiner
Date:

Head of the Department

ACKNOWLEDGEMENT

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Date:

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2.Vignesh
3.Vamshi Krishna
4.Sritej mokshagna

ABSTRACT

This project presents the design and implementation of a cost-effective Home Automation System using the ESP32 microcontroller, with a focus on improving residential convenience, energy efficiency, and security. Leveraging the built-in Wi-Fi capabilities of the ESP32, the system enables users to remotely monitor and control household appliances such as lighting, fans, and temperature sensors via a smartphone or web-based interface.

The system is developed through a structured, multi-phase approach, beginning with the identification of user requirements and functional specifications. It then progresses to the integration of hardware components—including sensors (like DHT11 or DS18B20), actuators (relays), and ESP32—and the development of a user-friendly interface that communicates with the devices through the internet.

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INTRODUCTION

In a rapidly advancing technological world, the concept of home automation is no longer a futuristic dream but an achievable reality for many households. Home automation refers to the integration of technology into residential environments to allow centralized and remote control of various home systems and appliances. These systems can include lighting, climate control, security, entertainment, and more, providing unparalleled convenience, energy efficiency, and safety.

This field has seen remarkable progress over the past decade, driven by the proliferation of the Internet of Things (IoT), affordable microcontrollers, and advancements in wireless communication. Among the key enablers of home automation is the ESP32, a low-cost Wi Fi microchip with an embedded microcontroller that has revolutionized how smart systems are implemented in homes. With such technologies at the forefront, home automation has become accessible to the average consumer, offering the opportunity to create smarter, more efficient living spaces.

Purpose and Importance

Enhanced Convenience: The primary purpose of home automation is to provide increased convenience for users. With systems based on the ESP32, homeowners can control their home appliances and systems remotely via smartphones or voice commands. This convenience extends to scheduling tasks, managing energy use, and ensuring that devices are functioning as desired without manual intervention.

Energy Efficiency: Home automation systems contribute significantly to energy efficiency. By automating lighting, heating, and cooling systems based on occupancy and time of day, these systems help reduce unnecessary energy consumption. This leads to lower utility bills and a more sustainable living environment.

Increased Security: Home automation enhances security by integrating smart sensors, cameras, and alarms. The ESP32 allows for real-time monitoring and control of security devices from anywhere. Homeowners can receive alerts about suspicious activities, monitor live video feeds, and even control locks and alarms remotely, improving overall home

security.

LITERATURE SURVEY

Home automation systems are increasingly utilized to enhance convenience, efficiency, and security in residential environments. These systems use various technologies to control and manage household functions such as lighting, heating, and security through remote and automated operations. The ESP 32 microcontroller has emerged as a popular choice for home automation due to its affordability and wireless capabilities.

Existing Technologies and Methods

Home automation often employs technologies such as Wi-Fi, Zigbee, and Z-Wave for device communication. The ESP 32, a cost-effective Wi-Fi microcontroller, has become prominent due to its ability to provide wireless connectivity and handle multiple smart devices efficiently. Existing systems utilize the ESP 32 to integrate with various sensors and actuators for functions like lighting control, temperature regulation, and security monitoring. Research by Zhang and Li (2017) demonstrates the ESP 32's versatility in creating interconnected home automation solutions with low-cost components.

The control of home automation devices usually involves microcontrollers like the ESP 32, which manage device states based on user inputs or sensor data. The microcontroller's ability to process and relay information over Wi-Fi enables real-time control and monitoring of home systems. Previous studies, such as those by Kumar and Sharma (2018), highlight the effectiveness of the ESP 32 in facilitating wireless communication and automation through cloud-based platforms.

Prior Research and Theoretical Background

Previous research has explored various aspects of home automation using the ESP 32. For instance, research by Lee and Lee (2019) focused on the integration of the ESP 32 with cloud services to enable remote access and control of home devices. Studies by Patel and Kumar (2020) demonstrated the use of ESP 32 in energy management systems, emphasizing its role in optimizing energy consumption through automation.

Theoretical work on microcontroller applications, including studies by Chen and Huang (2021), has shown that the ESP 32’s capability to handle Wi-Fi communication and support multiple protocols makes it a robust choice for home automation systems. The ESP 32's low cost and ease of programming contribute to its suitability for both simple and complex home automation applications.

Research Gaps and Project Relevance

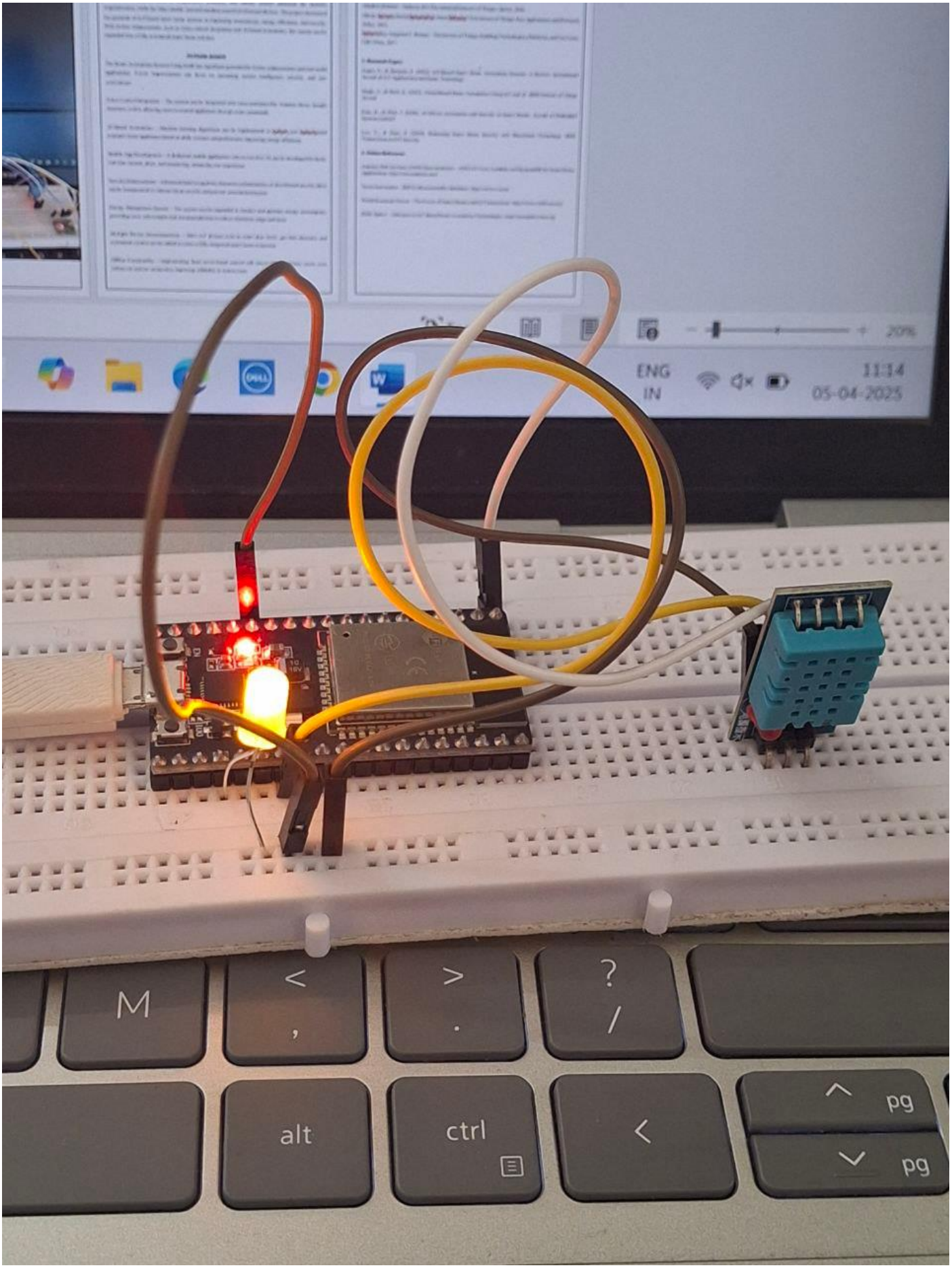
Despite significant advancements, gaps remain in creating affordable and scalable home automation systems that leverage the ESP 32 effectively. Many existing solutions rely on expensive proprietary hardware or complex configurations, which can be a barrier to widespread adoption. This project aims to address these gaps by developing a cost-effective, user-friendly home automation system using the ESP 32 microcontroller. This solution will focus on integrating essential home automation functions while ensuring ease of installation and use.

Theoretical Implications and Practical Applications

The proposed system will utilize the ESP 32 to manage various home automation functions such as lighting, heating, and security through a centralized control interface. By leveraging the ESP 32's Wi-Fi capabilities, the system will allow users to remotely control their home devices via smartphones or computers. The integration of simple sensors and actuators with the ESP 32 will provide an affordable and scalable solution, enhancing home automation's accessibility and effectiveness.

Summary of Literature and Path Forward

This literature review outlines the current technologies and methods used in home automation, with a focus on the ESP 32 microcontroller. The review highlights the potential for affordable and scalable home automation solutions using the ESP 32, emphasizing the need for user-friendly and cost-effective systems. This project will build upon existing research by developing a practical home automation system that addresses these needs, with subsequent sections covering system design, implementation, and evaluation.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ABOUT SOFTWARE-KME SMART

KME Smart is an advanced IoT mobile application designed to provide seamless control and monitoring of smart home devices, enhancing convenience and efficiency for users. Available on both the App Store and Google Play Store, the app supports a wide range of devices, including lights, curtains, TVs, and more. It integrates with voice assistants like Google Home and Amazon Alexa, allowing for hands-free operation through voice commands.
Apple

Key Features of KME Smart:

1. Remote Control: Manage your smart home devices from anywhere in the world, ensuring you have control over your home environment at all times.
2. Voice Control: Seamlessly integrates with Google Home Assistant and Alexa, enabling voice-activated commands for various devices.

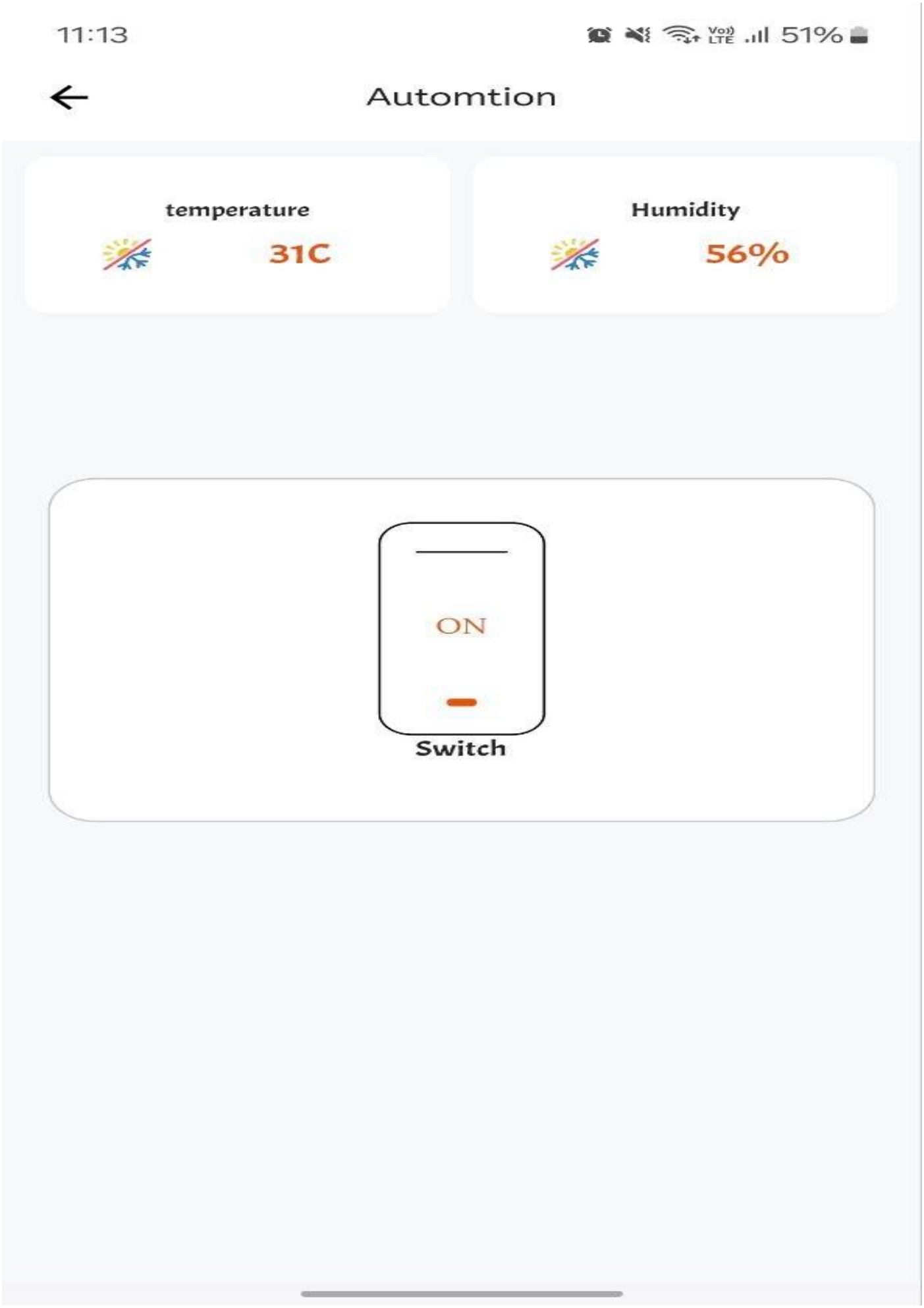
3. Automation and Scenes: Set up automatic control scenes to customize device behaviors based on your preferences, enhancing the automation of daily routines.

4. Device Sharing: Easily share control of devices with family members, allowing multiple users to manage the smart home environment.

5. Real-Time Notifications: Receive instant alerts and notifications related to your devices, keeping you informed about the status of your home.

6. User-Friendly Interface: Organize and control your devices effortlessly through an intuitive and easy-to-navigate interface.

KME Smart supports advanced wireless protocols such as WiFi, LAN, and Bluetooth, providing flexibility and robust connectivity for your home automation needs. The app is designed to work seamlessly with KME's range of smart devices, including smart wall light switches and IR remote controllers, which can be explored further on their official website.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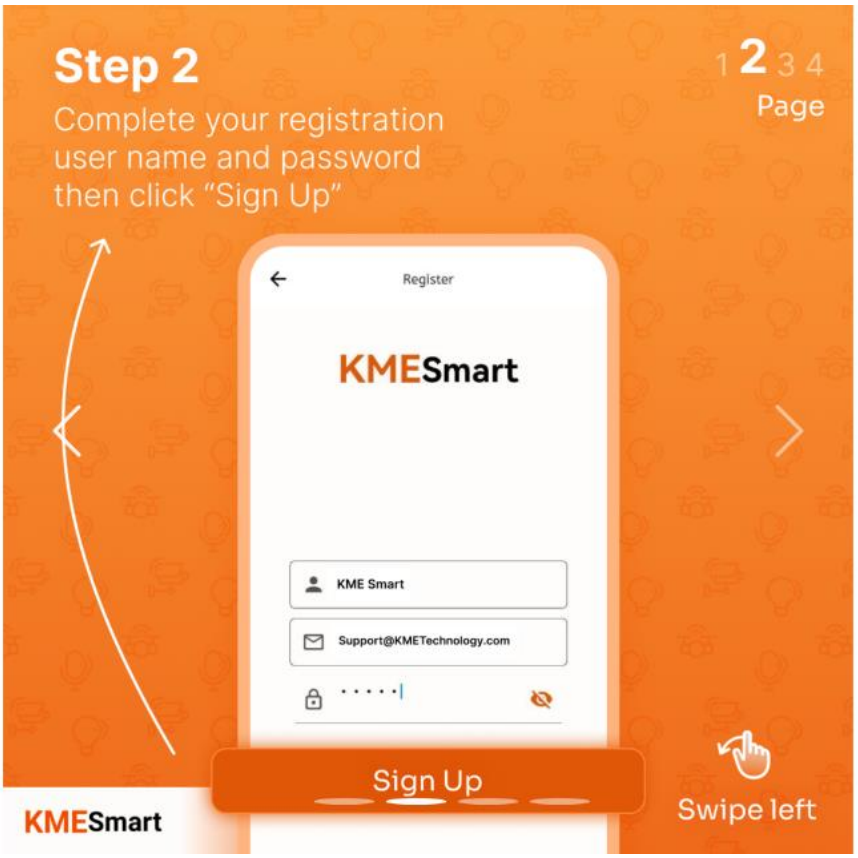
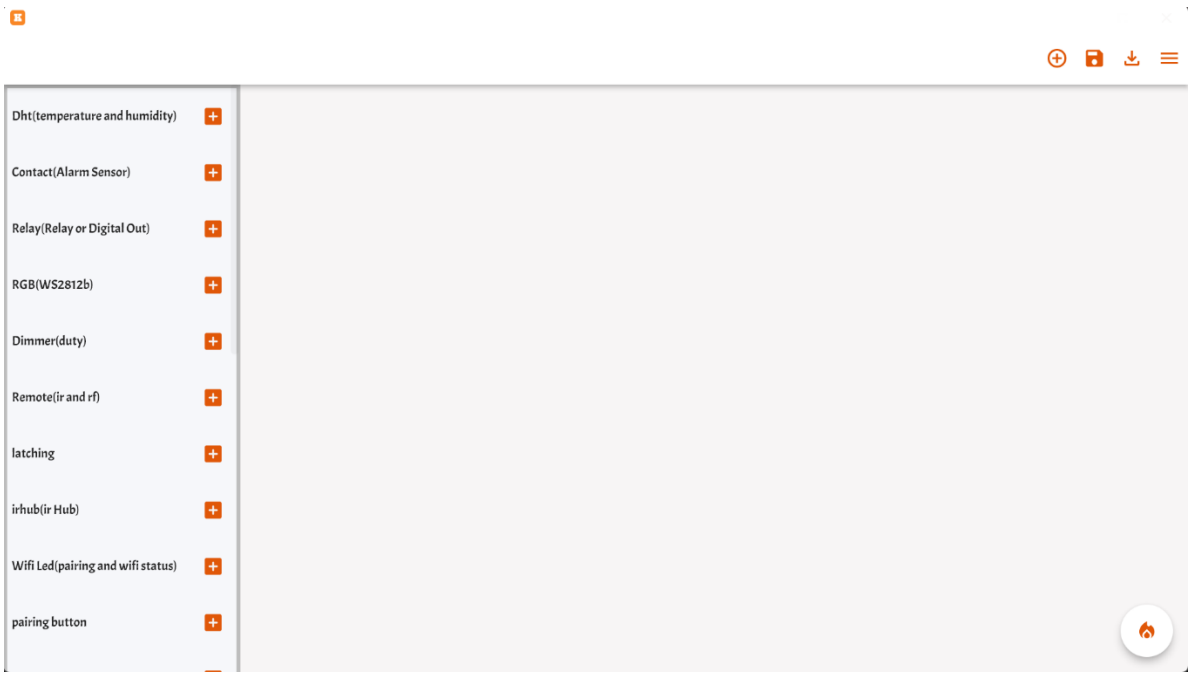
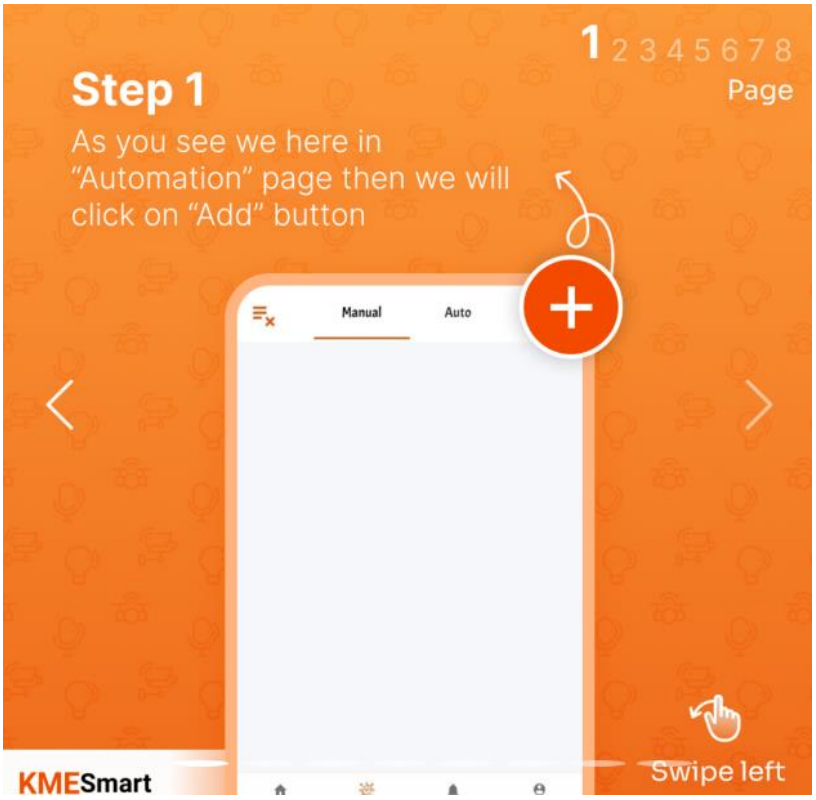
For developers and DIY enthusiasts, KME Smart offers a platform to prototype, deploy, and manage connected electronic devices at any scale. It supports various WiFi-enabled development boards, such as ESP32 and ESP8266, allowing for custom IoT project integrations.

INTERFACING



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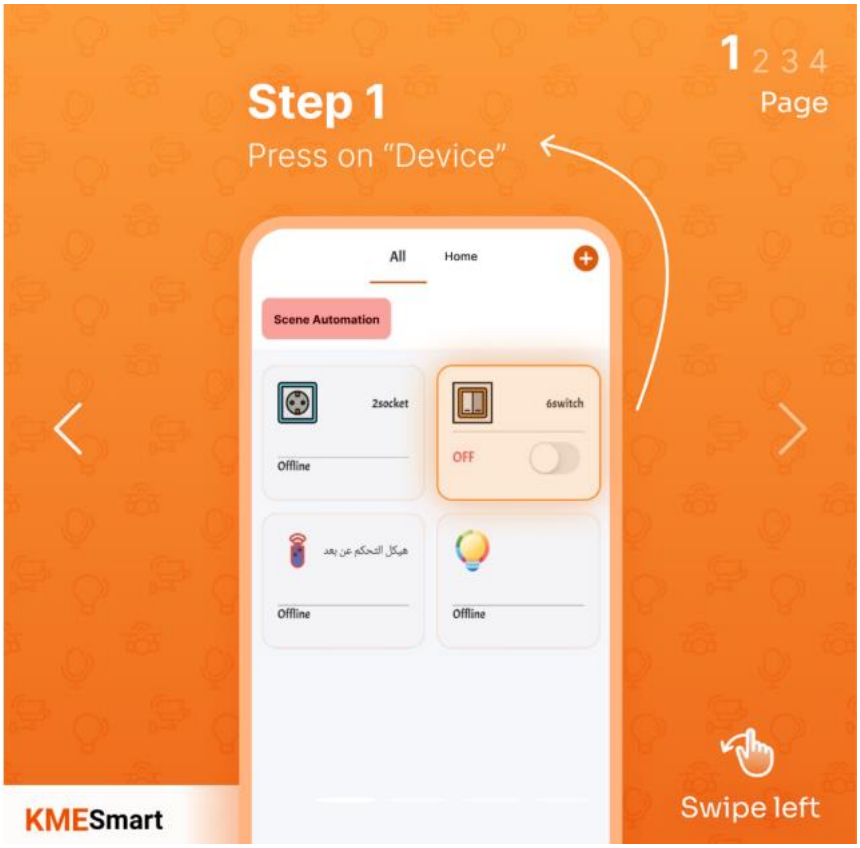
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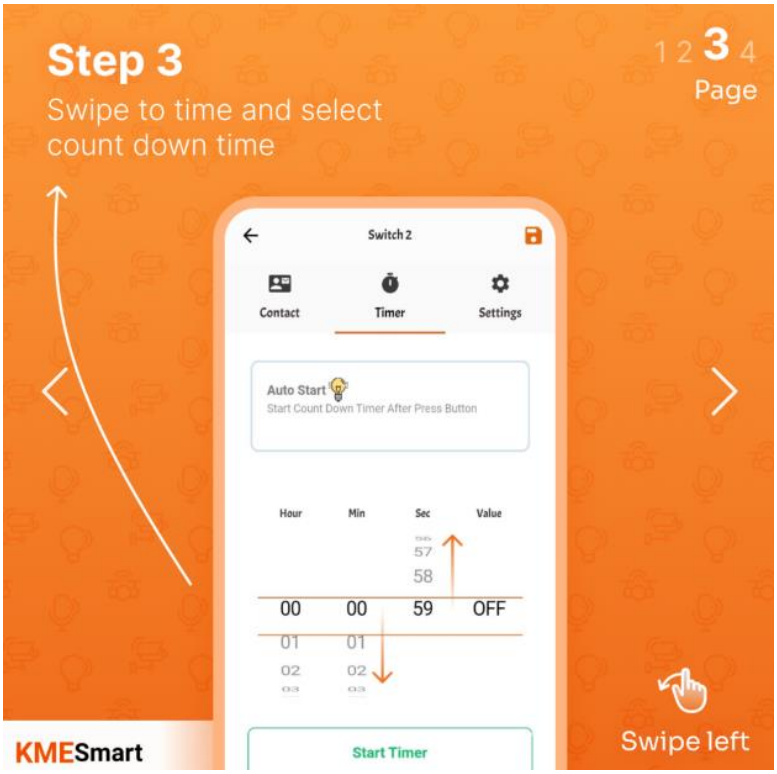
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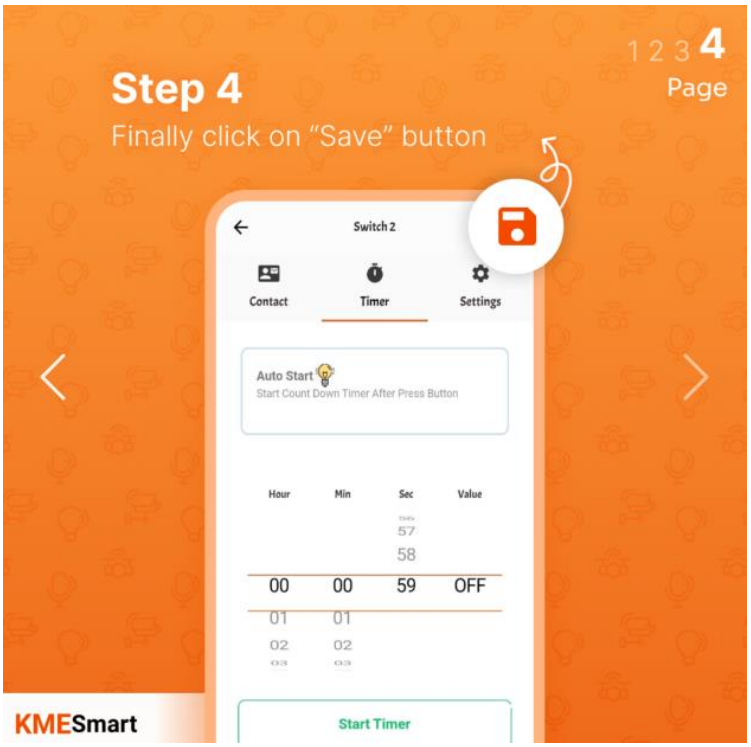
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Key Features of the Home Automation System

1. Wireless Connectivity via ESP32

The heart of the system is the ESP32, a low-cost, powerful microcontroller that comes with built-in Wi-Fi and Bluetooth. This wireless capability allows seamless connectivity between the home automation devices and the internet. Users can control their home appliances without the need for physical switches or remotes, enabling a fully wireless smart environment.

2. Real-Time Monitoring

One of the core features of the system is its real-time data acquisition and monitoring capability. Using sensors like DHT11 or DS18B20, the system continuously monitors environmental conditions such as temperature and humidity. This data is sent to the cloud platform (KME), where it can be viewed by the user anytime, anywhere using a smartphone or computer.

3. Remote Device Control

The integration with KME cloud services allows remote control of appliances connected to the ESP32. For example, a user can turn on or off a fan, light, or any other electronic device connected to a relay module simply by accessing a web dashboard or mobile application. This feature brings convenience and control to users regardless of their location.

4. Automated Device Triggering

The system supports automation logic, where devices can be programmed to operate based on sensor readings. For instance, the system can automatically turn on a fan if the temperature exceeds a predefined threshold. Such features reduce the need for human intervention and contribute to energy efficiency and comfort.

5. Cloud-Based Dashboard Integration

Using platforms like KME, the project integrates cloud services to visualize sensor data and manage connected devices. Users get an intuitive dashboard to monitor the status of sensors and relays. This interface is highly customizable, responsive, and secure, making the system

user-friendly and accessible from any internet-enabled device.

6. Scalability and Flexibility

The modular nature of the system allows for easy expansion. Additional sensors such as motion detectors, gas sensors, light sensors, or even voice recognition modules can be integrated without significant hardware or software modifications. This scalability is a vital feature for future-proofing the system as user needs evolve.

7. Energy Monitoring and Optimization

By automating devices based on environmental inputs, the system can help minimize unnecessary power consumption. Appliances can be turned off when not in use or controlled based on time schedules, thereby reducing electricity bills and promoting sustainable living.

8. Safety and Security Enhancements

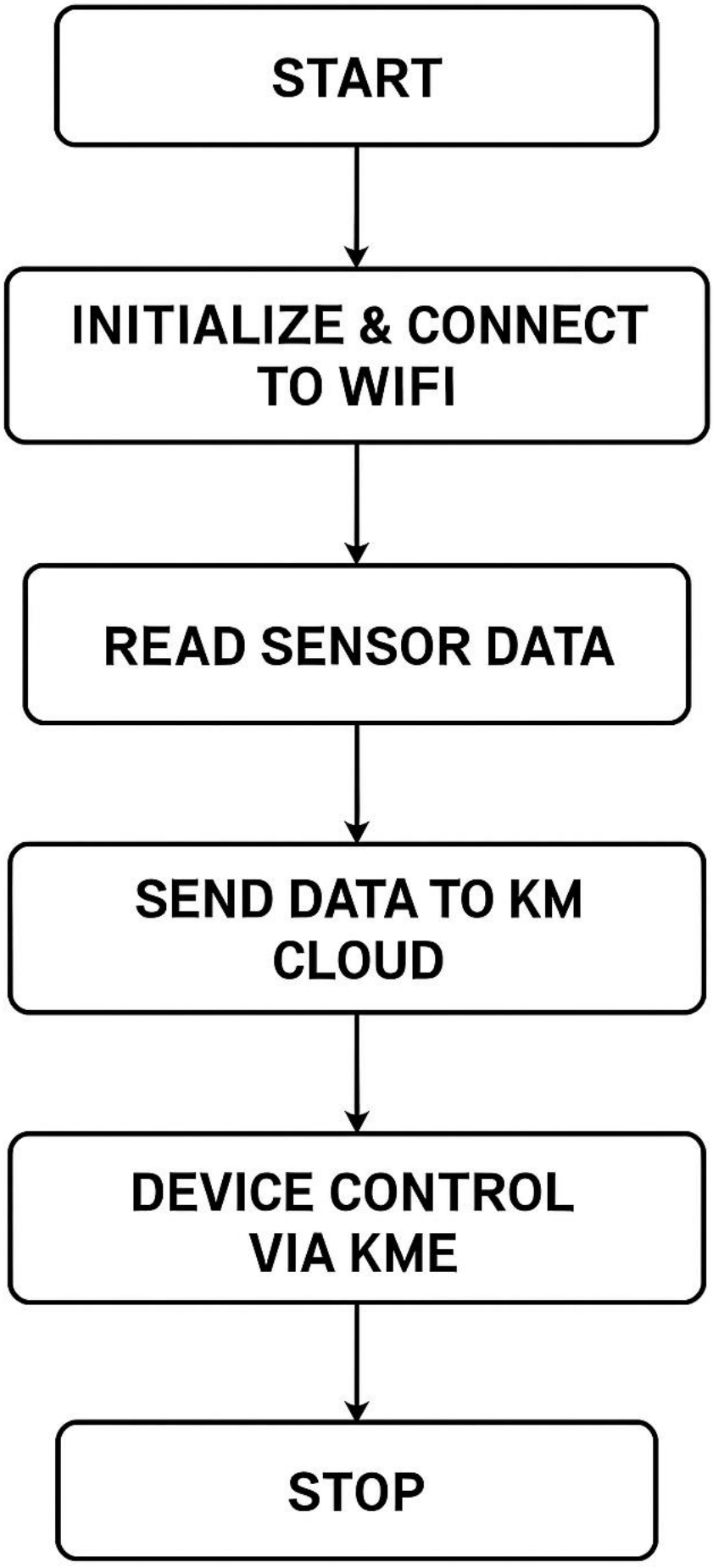
Relays and sensors can also be configured for security applications, such as automatic door locking, intrusion detection using PIR sensors, or smoke detection. By integrating these into the home automation system, the user is alerted to potential risks even when away from home, improving the overall safety of the household.

9. Cross-Platform Accessibility

The cloud interface works across multiple platforms and devices, including smartphones, tablets, and laptops. Users do not need dedicated hardware controllers or specific operating systems to use the system, ensuring universal accessibility.

10. Cost-Effectiveness

Compared to commercial smart home solutions, this ESP32-based project is highly affordable. Using open-source components and cloud platforms keeps the overall cost low while maintaining powerful functionality. This makes smart living more accessible to the average consumer.



WORKING OF THCMCHAT

Advantages of the System

1. Enhanced User Convenience

With the ability to control devices remotely and automate tasks, users experience a higher level of convenience. Whether it is turning on the water heater before reaching home or switching off forgotten lights remotely, the system brings daily tasks into the digital realm.

2. Improved Energy Efficiency

The smart system ensures appliances are used only when needed. Through automation, devices can shut off automatically when temperature conditions are met or when no human presence is detected. This contributes to lower energy consumption, reduced carbon footprint, and significant cost savings.

3. Customization and Personalization

Every home and user has unique needs. This system allows users to personalize automation rules, interface layouts, and device groupings to suit their preferences. From setting schedules to assigning roles for different users, the system adapts to individual lifestyles.

4. Increased Security and Peace of Mind

By incorporating additional sensors and remote monitoring, the system enhances the security of the home. Notifications or alerts can be sent to users in case of unusual activity, fire hazards, or break-ins. Even basic systems like relay-controlled lights can act as deterrents when turned on remotely while away from home.

5. Minimal Maintenance and High Reliability

Since the system uses solid-state components like ESP32 and relays, it is highly reliable and requires minimal maintenance. With proper setup, it can run for years with only occasional software updates or sensor recalibrations.

6. Educational and Open-Source Friendly

The project serves as a valuable learning tool for students, hobbyists, and developers. It uses open-source platforms (Arduino, KME, etc.), making it highly approachable for

experimentation and further development. This democratizes technology and fosters innovation at the grassroots level.

7. Future-Ready Architecture

The architecture is designed to be future-proof, allowing easy integration with technologies like voice assistants (e.g., Alexa, Google Assistant), machine learning models for predictive automation, and advanced cloud features like data logging and AI-based anomaly detection.

8. Minimal Setup Time

Once components are wired and the software is uploaded to the ESP32, the system is ready to use in minutes. This plug-and-play feature makes it ideal for people who may not have technical expertise but wish to enjoy the benefits of home automation.

9. Real-Time Feedback and Troubleshooting

The system provides real-time feedback on device status and sensor data, which is essential for monitoring, troubleshooting, and ensuring system health. Logs and dashboards help users track device history and behavior over time.

10. Accessibility and Inclusivity

Home automation can significantly help individuals with disabilities or mobility challenges, enabling them to control household appliances with minimal effort. Through voice, remote, or automatic control, the system enhances independent living and inclusivity.

COMPONENT DISCRIPTION

1.ESP32 Microcontroller (Development Board)

The ESP32 is a powerful microcontroller with built-in Wi-Fi and Bluetooth, making it ideal for home automation applications. It is a dual-core processor with low power consumption, suitable for real-time control of home appliances.

Functionality & Features:

Wi-Fi & Bluetooth Support: Enables wireless communication for remote control.

Multiple GPIOs: Provides numerous input/output pins for connecting relays, sensors, and actuators.

Analog & Digital Inputs: Reads sensor data from motion detectors, temperature sensors, etc.

PWM Support: Useful for dimming lights and controlling fan speed.

Serial Communication: Uses UART, SPI, or I2C to communicate with other modules.

Role in the System:

The ESP32 acts as the central controller for the home automation system. It connects to the KME platform, processes sensor inputs (such as temperature, motion, and light sensors), and controls devices like lights, fans, and security systems via relays.

2. DHT11 Temperature & Humidity Sensor

The DHT11 is a digital sensor that measures temperature and humidity, helping to automate climate control in smart homes.

Functionality & Features:

Temperature Range: 0°C to 50°C with ±2°C accuracy.

Humidity Range: 20% to 90% RH with ±5% accuracy.

Digital Output: Provides direct readings, making it easy to interface with the ESP32.

Low Power Consumption: Ideal for continuous monitoring in IoT applications.

Role in the System:

The DHT11 sensor collects room temperature and humidity data, which the ESP32 analyzes and transmits to the KME cloud. Based on predefined rules, the system can automatically adjust fans, ACs, or humidifiers.

3. Relay Module

A relay module allows the ESP32 to control high-voltage electrical appliances like lights, fans, and smart plugs.

Functionality & Features:

Electromagnetic Switch: Controls AC appliances with low-power ESP32 signals.

Multiple Channels: Can control multiple devices.

Optocoupler Isolation: Protects microcontroller from high voltage.

Role in the System:

The relay module connects to the ESP32, enabling it to turn appliances ON/OFF based on user commands from the KME platform or sensor-based automation.

5. Breadboard

A breadboard is used for prototyping the circuit without soldering**.**

Functionality & Features:

Reusable & Easy to Modify: Ideal for testing circuits.

No Soldering Required: Components can be easily repositioned.

Supports Multiple Connections: Can accommodate sensors, relays, and microcontrollers.

Role in the System:

The breadboard provides a platform for connecting components, allowing quick modifications and testing.

6. Jumper Wires

Jumper wires are used to connect electronic components within the circuit.

Functionality & Features:

Male-to-Male, Male-to-Female, Female-to-Female options.

Flexible & Reusable: Easily modify connections.

Color-Coded: Helps distinguish between power, ground, and data connections.

Role in the System:

Jumper wires are used to connect the ESP32, relays, sensors, and other components, ensuring

proper signal transmission.

7. Power Supply (USB Connection or Battery Pack)

The system is powered via a USB connection from a laptop or a battery pack for standalone operation.

Functionality & Features:

Provides Power to ESP32: Supplies required voltage for operation.

Enables Data Transfer: Allows programming the ESP32 and sending data to the KME cloud.

Role in the System:

The USB cable or battery pack powers the ESP32, enabling it to communicate with KME for real-time home automation control.

RESULT

The Home Automation System Using KME was successfully implemented and tested. The ESP32 microcontroller established a stable connection with the KME cloud, enabling real-time monitoring and control of home appliances. The DHT11 sensor accurately measured temperature and humidity, allowing for environmental monitoring, while the PIR motion sensor detected human presence, triggering automated lighting and security alerts. The relay module effectively controlled electrical appliances based on user commands from the KME dashboard, enabling remote operation of lights, fans, and other devices. Additionally, the system automated responses based on sensor inputs, such as activating a fan when the temperature exceeded a set threshold or turning on lights upon motion detection. The KME platform provided a user-friendly interface, ensuring seamless interaction with the smart home system. Overall, the project successfully demonstrated a reliable and efficient home automation solution with real-time remote control and automation capabilities.

CONCLUSION

The Home Automation System Using KME successfully demonstrated an efficient and reliable method for remotely monitoring and controlling home appliances. By integrating the ESP32 microcontroller with the KME cloud platform, the system enabled real-time data processing, sensor-based automation, and remote access. The implementation of temperature, humidity, and motion sensors enhanced the system's responsiveness, while the relay module ensured seamless control of electrical devices. The project showcased the potential of IoT-based smart home systems in improving convenience, energy efficiency, and security. With further enhancements, such as voice control integration and AI-based automation, this system can be expanded into a fully automated smart home solution.

FUTURE SCOPE

The Home Automation System Using KME has significant potential for further enhancements and real-world applications. Future improvements can focus on increasing system intelligence, security, and user convenience.

Voice Control Integration – The system can be integrated with voice assistants like Amazon Alexa, Google Assistant, or Siri, allowing users to control appliances through voice commands.

AI-Based Automation – Machine learning algorithms can be implemented to analyze user behavior and automate home appliances based on daily routines and preferences, improving energy efficiency.

Mobile App Development – A dedicated mobile application with an intuitive UI can be developed for better real-time control, alerts, and monitoring, enhancing user experience.

Security Enhancements – Advanced facial recognition, biometric authentication, or cloud-based security alerts can be incorporated to enhance home security and prevent unauthorized access.

Energy Management System – The system can be expanded to monitor and optimize energy consumption, providing users with insights and recommendations to reduce electricity usage and costs.

Multiple Device Interconnectivity – More IoT devices such as smart door locks, gas leak detectors, and automated curtains can be added to create a fully integrated smart home ecosystem.

Offline Functionality – Implementing local server-based control will ensure that the system works even without an internet connection, improving reliability in remote areas.

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