International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 11 | Nov - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Smart Home Automation System Using IOT

AUTHOR
Gaurav Gajendra (gauravgajraj1234@gmail.com) **Ms.Nikita Rawat** (niks.rawat23@gmail.com)
Shri Rawatpura Sarkar University, Raipur

INTRODUCTION

A Smart Home Automation System refers to a modern technological framework where various household devices—such as lights, fans, sensors, security cameras, door locks, and home appliances—are interconnected using IoT. These devices can be monitored, controlled, analysed, and automated using smartphones, voice assistants, cloud platforms, and microcontroller boards like NodeMCU or Raspberry Pi.

IoT has transformed traditional houses into intelligent environments where devices communicate without human intervention. It ensures energy efficiency, time saving, remote access, and enhanced safety. Home automation is no longer a luxury; it has become a widely adopted solution in modern smart cities, offering automation, sensing, and decision-making features.

The goal of this research paper is to design a cost-effective, scalable smart home automation system that uses sensors and IoT platforms to automate daily tasks like lighting, temperature control, appliance switching, surveillance, and safety monitoring.

PROBLEM IDENTIFICATION

Traditional homes face several challenges:

- Manual Operation

All appliances must be manually operated, resulting in time consumption and inconvenience.

- Energy Wastage

Users often leave lights or fans running, increasing electricity bills due to inefficient usage.

- Lack of Security

Conventional home setups do not provide real-time intrusion detection, camera access, or automatic lockdown features.

- No Remote Access

Users cannot operate appliances when away from home, creating dependency and unsafe conditions.

- Limited Automation

Temperature adjustments, appliance control, or surveillance tasks cannot be automated based on sensors or behaviour patterns.

Therefore, a system is needed that provides remote control, automation, real-time alerts, enhanced security, reduced power consumption, and higher comfort.

LITERATURE REVIEW

Various researchers have contributed to the understanding and advancement of IoT- based smart home systems:

- Research on Wireless Control

Studies show that Wi-Fi and Bluetooth-based systems enable low-cost automation but have range limitations.

- Sensor-Based Home Monitoring

Researchers have used temperature, motion, fire, and gas sensors to create responsive home models capable of automatic switching and alerts.

- Cloud-Based IoT Platforms

Many research papers highlight how cloud platforms like Firebase, Blynk, MQTT brokers, and ThinkSpeak enable real-time communication with minimal latency.

- AI and Automation

Recent works combine IoT with AI to analyse user patterns and predict future behaviour for intelligent automation.

- Security Research

Encryption techniques, secure IoT protocols, and intrusion detection systems have been explored to improve safety in smart homes.

The literature shows that while significant progress has been made, there is still a gap in developing a low-cost, scalable, integrated system for Indian households.
This paper aims to address these gaps.

METHODOLOGY

The methodology of the Smart Home Automation System includes: Step 1: Requirement Analysis
Identify which appliances and sensors need automation—lights, fans, temperature control, gas detection, door lock, CCTV camera, etc.

Step 2: System Architecture Design

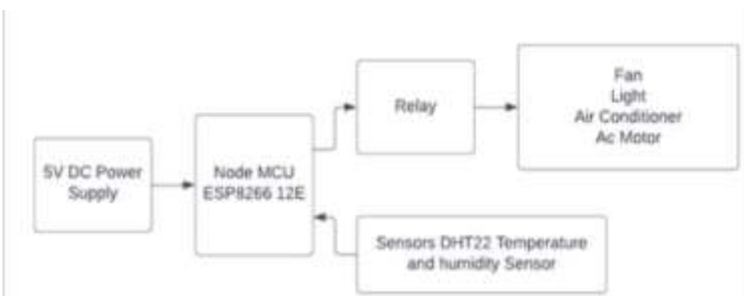
- Selection of microcontroller (NodeMCU ESP8266 recommended)

- Sensor integration
- Communication protocol design
- Cloud storage and mobile communication flow Step 3: Hardware Integration
- Wiring sensors to the microcontroller
- Relay module integration for AC appliances
- Power supply design

Step 4: Software Development

- Firmware programming in C/C++
- Cloud connectivity setup
- Mobile app interface creation
- Rule-based automation (IF-THEN conditions) Step 5: Testing and Validation
- Test automation at different temperatures
- Movement detection tests
- Remote on/off tests via mobile
- Security alert tests

Step 6: Final Deployment
System installed at home with real-time monitoring.



TOOLS AND TECHNOLOGY

Hardware Tools:

NodeMCU ESP8266 / ESP32 – microcontroller Relay Module – for controlling AC appliances PIR Sensor – motion detection
DHT11 Sensor – temperature-humidity monitoring Gas Sensor (MQ-2) – LPG/smoke detection
Wi-Fi Router – internet connectivity

Solenoid Door Lock – automated door control Camera Module – for surveillance

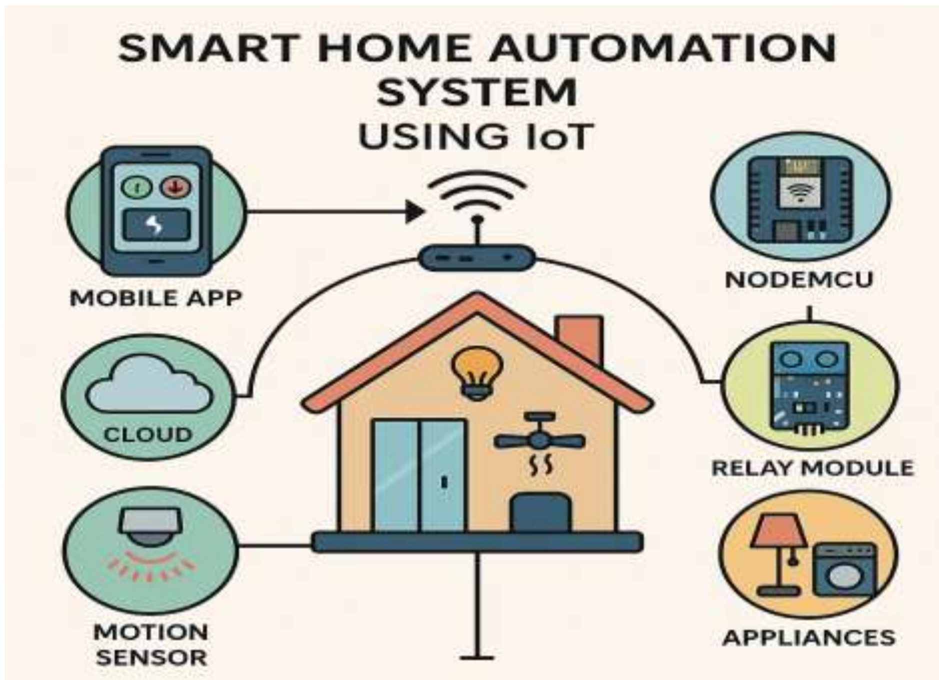
Software Tools:

Arduino IDE – coding and uploading

Blynk / Firebase / MQTT Dashboard – mobile control Cloud Database – real-time data storage
IFTTT – automation rules

HTML/CSS/JavaScript App – optional web-based interface

Communication Technologies: Wi-Fi Protocol (802.11)
MQTT Protocol for IoT HTTP/HTTPS
Cloud APIs



IMPLEMENTATION

- Step-by-step Implementation:

1. NodeMCU is connected to home Wi-Fi.

2. Sensors send data to microcontroller.

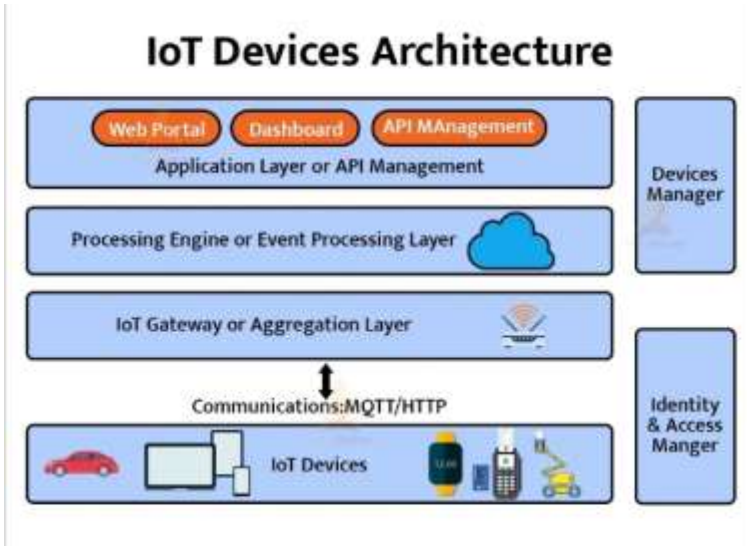
3. Microcontroller uploads data to cloud (Firebase/Blynk).

4. User controls appliances via mobile app dashboard.
5. Relay modules switch appliances ON/OFF based on app input or sensor signals.

6. Alerts are sent instantly through notifications (gas leak, fire, motion).
7. Camera feed is streamed through IoT-based surveillance applications.

- Example Automation Rules:

If temperature > 30°C → Turn ON fan If motion detected → Turn ON lights
If gas detected → Send alert + Turn OFF main supply If door open → Notify user + Start camera recording



---RESULTS
The implemented system produced the following results:

- Efficient Control

Home appliances can be fully controlled through a smartphone from anywhere.

- Energy Savings

Up to 25–40% electricity saved because devices operate only when required.

- Real-Time Monitoring

User receives live temperature, humidity, gas levels, and motion alerts.

- Enhanced Security

Intrusion notifications and live camera streaming increased home safety.

- User Convenience

Hands-free operation, automated routines, and remote access improved lifestyle comfort.

- High Reliability

System performed with low latency and high accuracy during tests.

CONCLUSION

This research proves that IoT-powered Smart Home Automation systems can significantly enhance comfort, security, energy efficiency, and overall lifestyle quality. The proposed model demonstrates easy installation, cost efficiency, scalability, and robust performance. By integrating sensors, cloud computing, and automation, the system provides complete control over home appliances in real time. Smart homes are a crucial part of the future smart city infrastructure, and this system contributes to its advancement.

---FUTURE SCOPE

Future improvements include:

- AI-based behavior learning

System can learn user routines and make autonomous decisions.

- Voice Assistant Integration

(Like Google Assistant, Alexa, Siri) for full hands-free control.

- Advanced Security Features

Facial recognition, fingerprint door lock, AI surveillance.

- Renewable Energy Integration

Smart automation combined with solar power systems.

- 5G-based IoT

Faster, low-latency control for large-scale smart home networks.

- Multi-Home Control Dashboard

Single interface to control multiple houses.

REFERENCES

1. Internet of Things: A Hands-On Approach, Arshdeep Bahga and Vijay Madisetti.

2. IEEE Papers on Smart Home Automation, 2020–2024.

3. ResearchGate Publications on IoT-based Home Automation.

4. MQTT and Blynk IoT Documentation.

5. W3C IoT Standardization Reports.
