

International Journal Research Publication Analysis

Page: 01-05

DESIGN AND IMPLEMENTATION OF AN IOT-ENABLED GSM-BASED SMART HOME SECURITY SYSTEM WITH REAL-TIME INTRUSION ALERTS

***Mayur Londhe**

Electronics and Telecommunication Engineering (ENTC) B.Tech Third Year
Pradnya Niketan Education Society's Nagesh Karajagi Orchid College of Engineering &
Technology, Solapur.

Article Received: 11 June 2026

Article Revised: 01 July 2026

Published on: 21 July 2026

***Corresponding Author: Mayur Londhe**

Electronics and Telecommunication Engineering (ENTC) B.Tech Third Year Pradnya
Niketan Education Society's Nagesh Karajagi Orchid College of Engineering &
Technology, Solapur.

DOI: <https://doi-doi.org/101555/ijrpa.3572>

ABSTRACT

Home security has become increasingly important due to the rise in thefts and unauthorized access to residential properties. Conventional security systems generally provide only local alarms and require the owner's physical presence for monitoring. This paper presents the design and implementation of an IoT-enabled GSM-based smart home security system capable of detecting unauthorized entry and sending instant alerts to homeowners through SMS and IoT-based remote monitoring. The proposed system integrates an Arduino Uno microcontroller, GSM module, PIR motion sensor, magnetic door sensor, ESP8266 Wi-Fi module, relay module, and buzzer to provide reliable real-time security. When an intrusion is detected, the system activates an alarm, sends an SMS notification, and updates the user's mobile dashboard through the Internet. The proposed solution is economical, easy to install, energy efficient, and suitable for residential as well as small commercial applications. Experimental observations indicate that the system successfully detects intrusion events with high accuracy while maintaining low operational cost.

KEYWORDS: GSM, IoT, Home Security, Arduino Uno, ESP8266, PIR Sensor, Smart Home, Intrusion Detection.

1. INTRODUCTION

In today's digital world, home security has become increasingly important due to the rising number of burglary and unauthorized access cases. Traditional security systems mainly rely on local alarms, which are not effective when homeowners are away. Therefore, there is a need for a smart security system that provides real-time alerts and remote monitoring.

The proposed IoT-enabled GSM-based Smart Home Security System uses sensors to detect intrusion and an Arduino microcontroller to process the data. When unauthorized activity is detected, the system activates a buzzer, sends an SMS alert through the GSM module, and updates the IoT dashboard using the ESP8266 module. The system is affordable, easy to install, energy-efficient, and suitable for homes, offices, and small businesses.

2.LITERATURE REVIEW

Previous home security systems used GSM to send SMS alerts after detecting intrusion but lacked remote monitoring. Modern IoT-based systems provide real-time monitoring through the Internet but depend on Wi-Fi connectivity.

The proposed system combines GSM and IoT technologies to provide both SMS alerts and remote monitoring. It also integrates PIR motion detection, magnetic door sensing, local alarm generation, and relay control, making it a reliable, low-cost, and efficient home security solution.

3.Problem Statement

Traditional home security systems mainly depend on local alarms, making them ineffective when homeowners are away. Internet-only solutions fail during network outages. Therefore, there is a need for an affordable smart security system capable of providing both GSM-based SMS alerts and IoT-based remote monitoring.

4. OBJECTIVES

- Design a low-cost smart home security system.
- Detect unauthorized movement using PIR sensors.
- Detect unauthorized door opening using magnetic sensors.
- Send SMS alerts using the GSM module.
- Enable remote monitoring using IoT.
- Activate an alarm during intrusion.
- Reduce response time during security incidents.

5. Proposed System

The proposed system consists of Arduino Uno as the central controller. PIR and magnetic sensors continuously monitor movement and door status. Whenever intrusion is detected, Arduino processes the sensor inputs and activates the buzzer.

Simultaneously, the GSM module transmits an SMS notification to the registered mobile number, while the ESP8266 updates the IoT dashboard with the latest security status. The relay module can optionally switch on external devices such as lights or sirens.

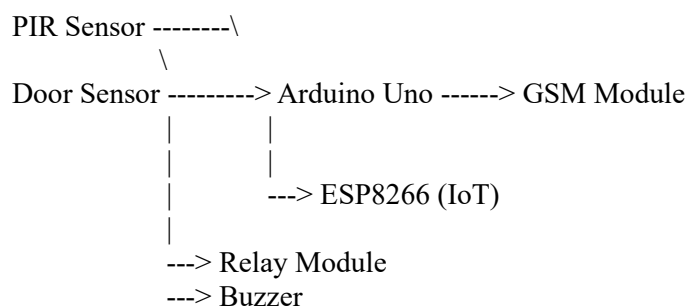
6. Hardware Components

Component	Purpose
Arduino Uno	Main controller
GSM SIM800L/SIM900A	SMS notification
ESP8266 NodeMCU	IoT communication
PIR Sensor	Motion detection
Magnetic Door Sensor	Door status detection
Relay Module	External device control
Buzzer	Audible alarm
Power Supply	System operation

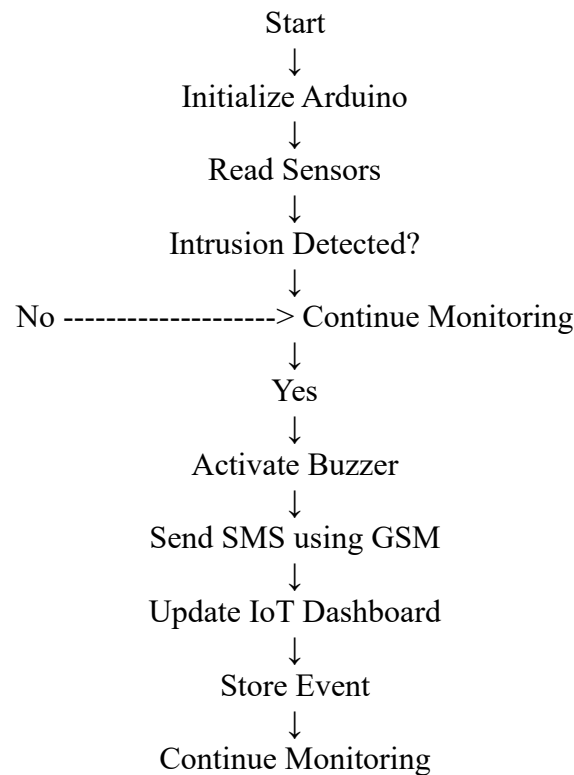
7. Working Methodology

1. System initializes all sensors.
2. Arduino continuously monitors PIR and door sensor.
3. Motion or door opening triggers an interrupt.
4. Arduino activates the buzzer.
5. GSM sends an SMS alert.
6. ESP8266 uploads the event to the IoT dashboard.
7. User receives real-time notification.
8. System returns to monitoring mode after reset.

8. Block Diagram



9. Flowchart



10. RESULTS AND DISCUSSION

The developed system was tested under different intrusion scenarios. The PIR sensor successfully detected human movement within its operating range, while the magnetic sensor accurately identified door-opening events. SMS alerts were delivered promptly through the GSM module, and the IoT dashboard reflected the intrusion status in real time when network connectivity was available. The combination of GSM and IoT improved system reliability because SMS alerts remained functional even when Internet service was unavailable. The prototype demonstrated low power consumption and stable operation, making it suitable for residential and small-office security applications.

11. Advantages

- Low implementation cost
- Real-time intrusion alerts
- GSM backup when Internet fails
- Easy installation
- Remote monitoring
- Low power consumption
- Expandable architecture

12. Limitations

- GSM network coverage is required for SMS alerts.
- Wi-Fi connectivity is required for IoT monitoring.
- PIR sensors may occasionally trigger false alarms due to environmental factors.
- Camera-based verification is not included in the basic prototype.

13. Future Scope

Future enhancements may include AI-based face recognition, cloud-based event storage, mobile application control, biometric authentication, CCTV integration, voice assistant compatibility, and solar-powered operation to improve system intelligence, reliability, and sustainability.

14. CONCLUSION

This paper presented the design and implementation of an IoT-enabled GSM-based smart home security system for real-time intrusion detection and remote monitoring. By integrating Arduino Uno, PIR sensors, magnetic door sensors, GSM communication, ESP8266-based IoT connectivity, relay control, and an audible alarm, the proposed system provides an economical and reliable security solution. The dual communication approach ensures that homeowners receive timely notifications even in the event of Internet connectivity issues. The prototype demonstrates the practicality of combining GSM and IoT technologies to improve residential security and offers a scalable foundation for future smart-home applications.

15. REFERENCES

1. For an IJPRA paper, use 15–25 genuine references from IEEE Xplore, Springer, Elsevier, or other scholarly sources that are directly relevant to your work. Do not invent citations or cite papers you have not actually used.