

# Jazmin Security - Technical Documentation

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## 1. Introduction

Jazmin Security is an innovative IOT-based home security system designed to provide real-time threat detection and alerting through a mobile application. It integrates a variety of sensors and technologies including face recognition, motion detection, gas and fire sensors, and a GSM communication module to ensure safety in residential or office environments.

At the core of the system is a Raspberry Pi 4B, which acts as the central controller, interfacing with multiple hardware components. The system is designed to detect potential intrusions, hazardous gas leaks, or fire incidents and immediately notify pre-configured emergency contacts via automated phone calls and SMS alerts using a SIM800A GSM module.

The project includes a custom-built mobile app, which allows the user to:

- Enable or disable the system remotely,

- View the status of each sensor,

- Trigger a buzzer or siren manually,

- Add or edit emergency contact numbers for notification.

This project demonstrates a practical implementation of embedded systems, circuit design, wireless communication, and application development to solve real-world problems related to home and small business security.

## 2. System Architecture

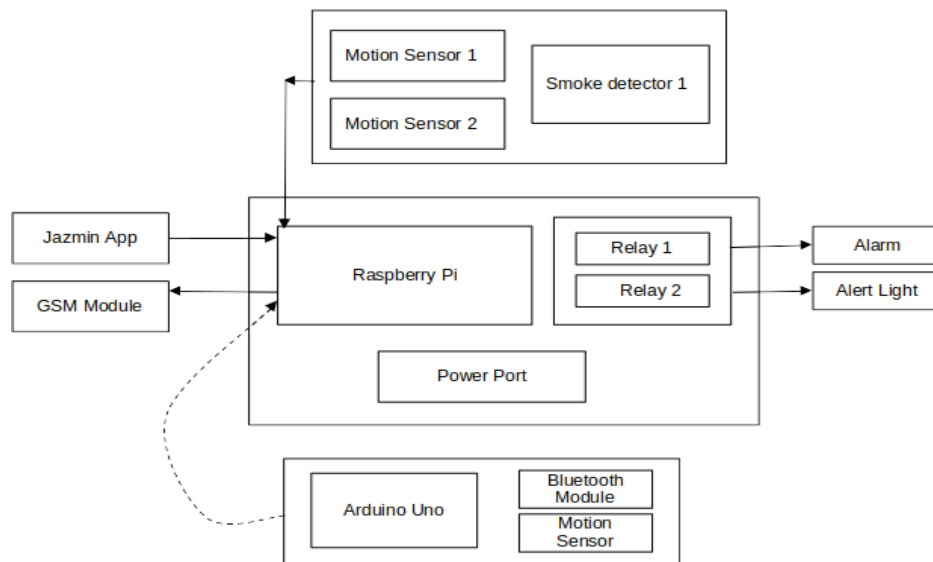


Fig. Jazmin Security Architecture

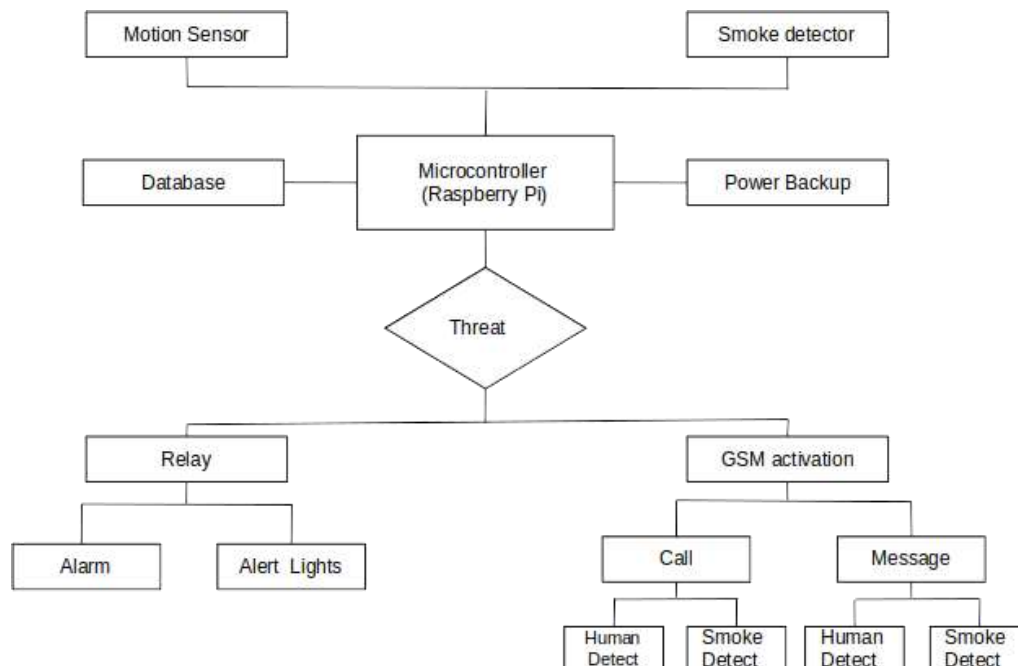


Fig. Jazmin Security Flowchart

### **3. Addressing Security Challenges**

Traditional security systems often rely on passive measures such as alarms and locks, which may not provide adequate protection against modern security threats. Intruders can bypass these systems, and incidents such as gas leakages may go undetected until it's too late. The Security System addresses these challenges by incorporating advanced sensors, communication modules, and smart features to proactively monitor, detect, and respond to security breaches and safety hazards.

### **4. Introducing the Security System**

At the heart of the Security System lies the Raspberry Pi 4B microcontroller, a versatile and powerful platform capable of running sophisticated security software. Connected to this microcontroller is the GSM module (SIM800A), enabling communication with mobile networks for sending SMS alerts and making calls in case of emergencies. Additionally, the system features a PIR motion sensor and MQ2 gas detector to detect unauthorized intrusions and gas leakages, respectively.

### **5. Mobile Application Integration**

A key feature of the Security System is its integration with a dedicated mobile application, providing users with a convenient interface to monitor, schedule, and control security operations remotely. Through the application, users can schedule monitoring times, set up contact numbers for receiving alerts, and customize alert settings based on their preferences. This mobile integration ensures that users remain informed and empowered to take action anytime, anywhere.

### **6. Proactive Monitoring and Response**

During scheduled monitoring times, the system continuously scans the environment for motion using the PIR motion sensor and monitors gas levels with the MQ2 gas detector. If an unauthorized intrusion or gas leakage is detected, the system triggers the GSM module to send SMS alerts or make calls to predefined contact numbers. This proactive approach enables swift response and intervention, minimizing the risk of property damage, theft, or harm to individuals.

### **6. Enhanced Emergency Response**

In addition to SMS alerts and calls, the Security System can be integrated with an IVRS (Interactive Voice Response System) to provide additional information to authorities in case of emergencies. When a call is received, the IVRS system can play a pre-recorded message containing the address or location of the security breach, enabling prompt response from law enforcement or emergency services.

Alert Generation: Sends signals to the Raspberry Pi upon detecting gas leakages, triggering alerts and notifications to users for immediate action.

## 7. Mobile Application Interface

Description: The mobile application serves as the user interface for interacting with the security system, providing functionalities for scheduling monitoring times, setting alert preferences, and receiving notifications.

### Functionality:

**Remote Control:** Enables users to remotely monitor and control the security system from their smartphones, offering flexibility and convenience.

**Alert Management:** Allows users to customize alert settings, including contact numbers for receiving SMS alerts or making emergency calls.

## 8. Operation

### 1. Monitoring Schedule Setup

Users configure monitoring schedules through the mobile application, specifying the days and times when the security system should be active.

Scheduled monitoring times are synchronized with the Raspberry Pi, ensuring that the system is activated and ready to detect intrusions or gas leakages during specified periods.

### 2. Intrusion Detection

During scheduled monitoring times, the PIR motion sensor continuously scans the environment for any movement.

If motion is detected within the monitored area, the sensor sends a signal to the Raspberry Pi, triggering an alert.

The Raspberry Pi then activates the GSM module, which sends SMS messages or makes calls to predefined contact numbers, notifying users of the intrusion.

### 3. Gas Leakage Detection

Similarly, the MQ2 gas detector continuously monitors the air for the presence of hazardous gas.

If a gas leakage is detected, the sensor sends a signal to the Raspberry Pi, prompting the activation of the GSM module.

The GSM module sends SMS messages or makes calls to notify users of the gas leakage, allowing them to take immediate action to ensure safety.

#### **4. Integration with IVRS System**

In addition to SMS alerts and calls, the security system can be integrated with an IVRS (Interactive Voice Response System) to provide additional information to authorities in case of emergencies.

When a call is received, the IVRS system can play a pre-recorded message containing the address or location of the security breach, enabling prompt response from law enforcement or emergency services.

#### **5. Integration with CCTV (Optional)**

For enhanced security and accuracy, the security system can be integrated with CCTV cameras.

Instead of relying solely on the PIR motion sensor, the system can analyze live video feeds from CCTV cameras to detect intrusions more accurately.

Integration with CCTV also provides visual evidence of security breaches, aiding in investigations and law enforcement efforts.

## **9. Features**

### **1. Real-Time Monitoring**

The security system offers real-time monitoring of motion and gas levels, providing users with instant alerts in case of security breaches or safety hazards.

### **2. Customizable Alerts**

Users can customize alert settings through the mobile application, specifying the types of alerts (SMS, call) and the contact numbers to receive notifications.

### **3. Scheduling**

The system allows users to schedule monitoring times based on their specific requirements, ensuring that security measures are active when needed.

### **4. Remote Control**

Users can remotely monitor and control the security system through the mobile application, enabling flexibility and convenience.

### **5. Integration with IVRS**

Integration with an IVRS system enhances emergency response capabilities by providing additional information to authorities during security incidents.

### **6. Optional CCTV Integration**

Integration with CCTV cameras enhances security by providing visual verification of security breaches and enabling more accurate detection of intrusions.

## 10. Hardware circuit in Jazmin:

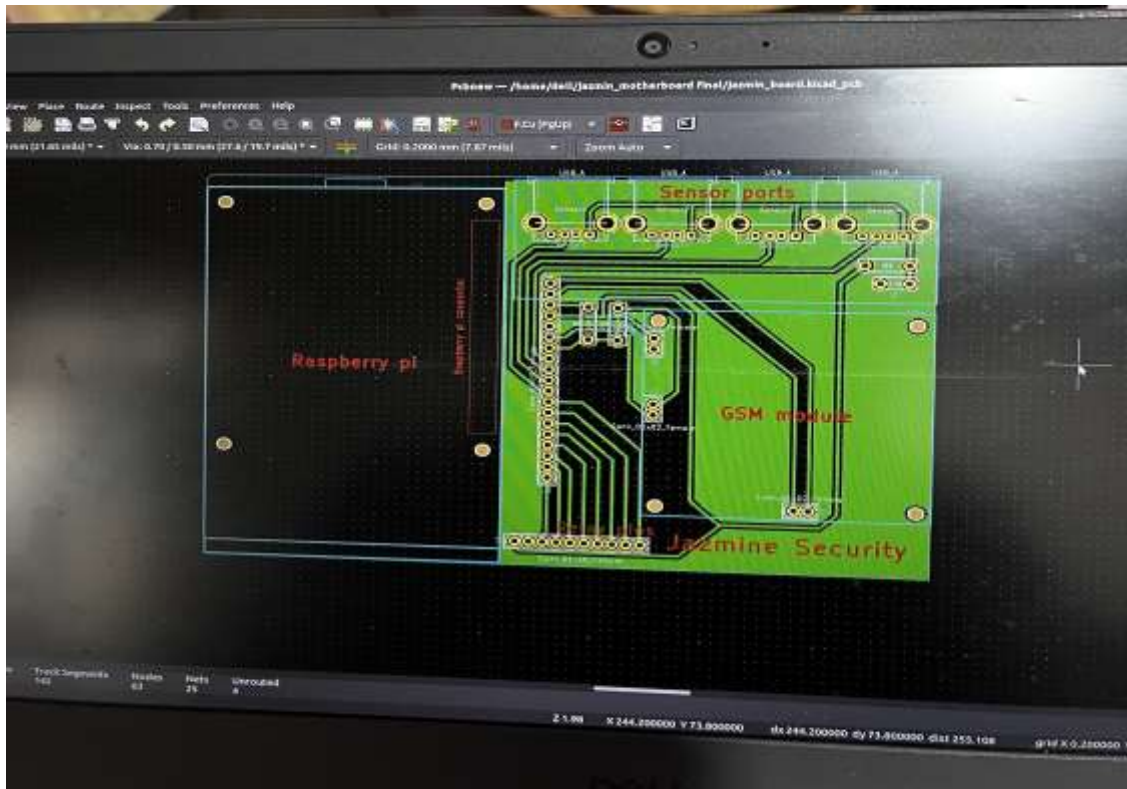


Fig. PCB design of Jazmin Security

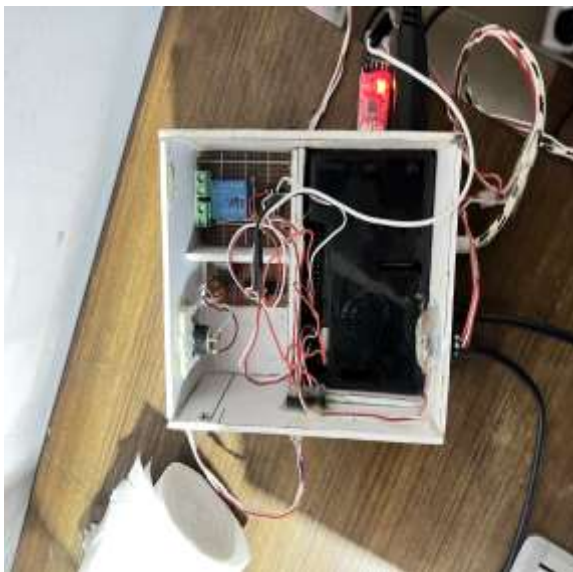


Fig. Initial testing phase POC model



Fig. Final Jazmin Security System



Fig. Jazmin Security after testing

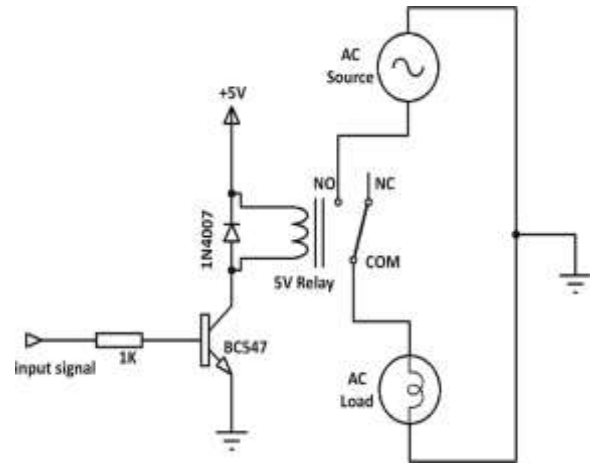


Fig. Relay Circuit

## 11. Key Features

- Face recognition using USB camera and OpenCV.
- Motion detection using PIR sensor.
- Gas and fire detection using MQ-2 and flame sensors.
- SMS and call alerts through SIM800A GSM module.
- Manual buzzer trigger and status monitoring via mobile app.
- Emergency siren triggered during hazard detection.
- Contact number configuration through the Android application.

## 12. Conclusion

The Security System represents a comprehensive solution for enhancing security measures and ensuring safety in commercial and industrial environments. By leveraging advanced technology such as Raspberry Pi, GSM communication, motion sensors, and gas detectors, the system offers real-time monitoring, customizable alerts, and remote control capabilities. Its integration with a mobile application enables users to schedule monitoring times, receive alerts, and take immediate action in case of security breaches or gas leakages. With optional integration with an IVRS system and CCTV cameras, the security system provides enhanced emergency response capabilities and visual evidence of security incidents. Overall, the Security System offers peace of mind and enhanced security for offices, banks, departmental stores, and other facilities, ensuring the safety of employees, customers, and assets.