SafeHome System User Manual

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1. Overview

1.1 What is SafeHome?

SafeHome is a comprehensive home security and surveillance system designed to protect your property and provide peace of mind. The system integrates security management and surveillance capabilities into a single, easy-to-use platform that can be accessed both locally through a control panel and remotely through a web browser.

SafeHome provides homeowners with:

- Complete security management - Arm/disarm your home security system, configure safety zones, and respond to security events
- Advanced surveillance - Monitor your property through multiple cameras with real-time viewing, pan/zoom controls, and thumbnail overview
- Dual interface access - Control your system through a desktop control panel or web browser from anywhere
- Intelligent alarm system - Automated intrusion detection with configurable delay times and monitoring service integration
- Flexible configuration - Customize security modes, safety zones, system settings, and camera access controls

1.2 Key Features

Security Management

- Multiple Security Modes
    - Away Mode: Full protection when the house is unoccupied
    - Stay Mode: Perimeter protection while occupants are inside
    - Disarm Mode: System deactivated for normal access

- Safety Zone Management
    - Create and manage multiple safety zones
    - Assign sensors to specific zones
    - Selective zone arming/disarming
- Intrusion Detection
    - Real-time monitoring of door/window sensors
    - Motion detection alerts
    - Configurable entry delay before alarm activation
    - Automatic monitoring service notification
    - Panic button for emergency situations

Surveillance Management

- Camera Control
    - View individual cameras or thumbnail overview
    - Pan and zoom controls for each camera
    - Enable/disable cameras as needed
    - Password protection for camera access
- Multiple Viewing Options
    - Floor plan-based camera selection
    - Thumbnail view of all cameras
    - Real-time video feed (1 frame per second)

System Configuration

- User Management
    - Multi-user support with access levels
    - Two-step authentication for web access
    - Master password management
    - Account lockout protection (5 failed attempts)
- System Settings
    - Monitoring service phone number
    - Homeowner phone number
    - System lock time configuration

    - Alarm delay time configuration

Dual Interface Access

- Control Panel (Desktop Application)
    - Native Tkinter-based GUI
    - Full system control from your computer
    - Real-time status updates and alerts
    - Visual floor plan with sensor/camera locations
- Web Interface (Browser-Based)
    - Access from any device with a web browser
    - Mobile-friendly responsive design
    - Two-step password authentication
    - Full system control remotely

1.3 System Architecture

SafeHome consists of several integrated components:

- Authentication System: User login and access control (Control Panel and Web Browser)
- Security System: Core security logic, alarm management, and zone control
- Surveillance System: Camera management and video feed handling
- Configuration Manager: System settings and safety zone management
- Storage Manager: Database persistence for users, settings, and logs
- Event Logging: Comprehensive audit trail of all system events

1.4 Use Cases

SafeHome is designed for homeowners who need:

- Reliable home security monitoring
- Remote access to security controls
- Flexible security zone management
- Comprehensive surveillance capabilities
- Easy-to-use interface for daily operations

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2. System Requirements

2.1 Hardware Requirements

Minimum Requirements

- Processor: Intel Core i3 or equivalent (1.6 GHz or higher)
- Memory: 4 GB RAM
- Storage: 500 MB available disk space
- Display: 1024 x 768 resolution or higher
- Network: Internet connection for web interface (optional, local network also supported)

Recommended Requirements

- Processor: Intel Core i5 or equivalent (2.4 GHz or higher)
- Memory: 8 GB RAM or higher
- Storage: 1 GB available disk space
- Display: 1920 x 1080 resolution or higher
- Network: Stable broadband connection for remote access

Optional Hardware

- Sensors: Window/Door sensors, Motion detectors (simulated in current version)
- Cameras: IP cameras or compatible camera devices (simulated in current version)
- Siren: External alarm siren device (simulated in current version)

2.2 Software Requirements

Operating System

- Windows: Windows 10 or later (64-bit recommended)
- macOS: macOS 10.14 (Mojave) or later
- Linux: Ubuntu 20.04 LTS or later, or equivalent Linux distribution

Required Software

- Python: Version 3.10 or higher (3.11 recommended)
    - Python 3.11 is used in CI/CD and tested environments
    - Python can be downloaded from python.org
- Web Browser (for web interface):
    - Google Chrome 90+ (recommended)

    - Mozilla Firefox 88+
    - Microsoft Edge 90+
    - Safari 14+ (macOS)

Python Dependencies

The following Python packages are automatically installed when you install SafeHome:

- Flask (≥2.3.0): Web framework for the web interface
- Pillow (≥10.0.0): Image processing for camera feeds
- pytest (≥7.4.0): Testing framework (for development)
- requests (≥2.31.0): HTTP library (for API testing)

All dependencies are listed in `requirements.txt` and will be installed automatically during setup.

2.3 Network Requirements

For Local Control Panel

- No network connection required for basic operation
- System runs entirely on local machine

For Web Interface

- Local Access: Works on localhost (127.0.0.1) - no external network needed
- Remote Access: Requires network configuration:
    - Port 5000 must be available (default Flask port)
    - Firewall rules may need to be configured
    - Router port forwarding may be required for external access

Network Ports

- Port 5000: Web interface HTTP (default)
- Database: SQLite (local file, no network port needed)

2.4 Database Requirements

SafeHome uses SQLite database, which requires:

- No additional database server installation needed
- Database file (`safehome.db`) created automatically
- Sufficient disk space for log storage (grows with system usage)

2.5 Security Considerations

Before installing and using SafeHome:

- Account Security
    - Use strong passwords (minimum requirements enforced by system)
    - Change default passwords immediately after installation
    - Do not share login credentials
    - Enable account lockout protection (enabled by default)
- Network Security (if using web interface remotely)
    - Use HTTPS in production environments (not included in default setup)
    - Configure firewall rules appropriately
    - Regularly update system and dependencies
    - Monitor access logs for suspicious activity
- Physical Security
    - Secure access to the control panel computer
    - Limit physical access to system hardware
    - Regular backup of system database

2.6 Browser Compatibility

The web interface has been tested and verified to work with:

Browser	Minimum Version	Status
Google Chrome	90+	✅ Fully Supported
Mozilla Firefox	88+	✅ Fully Supported
Microsoft Edge	90+	✅ Fully Supported
Safari	14+	✅ Fully Supported
Opera	76+	⚠️ May have minor display issues
Internet Explorer	-	❌ Not Supported

2.7 System Limitations

Current Version Limitations

- Simulated Devices: Current version uses simulated sensors and cameras for demonstration
- Single User Session: One active session per user account at a time

- Local Network Only: Web interface defaults to localhost (external access requires configuration)
- No HTTPS: Default web interface uses HTTP (not suitable for production without additional configuration)
- Single Database: SQLite database supports single concurrent write operation

Performance Considerations

- System performance depends on number of active cameras and sensors
- Large log files may slow down system queries
- Web interface updates every 15 seconds (configurable in code)

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3. Installation

3.1 Prerequisites

Before installing SafeHome, ensure you have:

1. Python 3.10 or higher installed on your system
    - Check Python version: `python --version` or `python3 --version`
    - If not installed, download from python.org
    - Important: During Python installation on Windows, check "Add Python to PATH"
2. pip (Python package installer)
    - Usually comes with Python installation
    - Verify: `pip --version` or `pip3 --version`
3. Git (optional, for cloning the repository)
    - Download from git-scm.com

3.2 Installation Steps

Step 1: Obtain SafeHome Source Code

Option A: Clone from Repository

```
git clone [repository-url]
cd SafeHome_team9
```

Option B: Extract from ZIP File

- Extract the ZIP file to your desired location
- Navigate to the extracted folder in terminal/command prompt

Step 2: Create Virtual Environment (Recommended)

Creating a virtual environment isolates SafeHome dependencies:

```
# Windows
python -m venv venv
venv\Scripts\activate

# macOS/Linux
python3 -m venv venv
source venv/bin/activate
```

Step 3: Install Dependencies

Install required Python packages:

```
# Windows
pip install -r requirements.txt

# macOS/Linux
pip3 install -r requirements.txt
```

This will install:

- Flask (≥2.3.0)
- Pillow (≥10.0.0)
- pytest (≥7.4.0)
- requests (≥2.31.0)
- pytest-cov

Step 4: Database Setup

The database will be created automatically on first run. However, if you need to migrate an existing database:

```
python common/migrate_database.py
```

Step 5: Create Web User Account (Optional)

To use the web interface, create a web user account:

```
python common/create_web_user.py
```

This creates a default web user:

- Username: `homeowner`
- First Password: `first123`
- Second Password: `second456`

⚠️ Important: Change these default passwords immediately after first login!

3.3 Verify Installation

To verify the installation:

1. Check Python packages:

```
pip list
```

   Ensure Flask, Pillow are installed.

2. Run a test (optional):

```
python -m pytest tests/ --version
```

3.4 Installation Troubleshooting

Problem: "Python not found"

Solution:

- Ensure Python is installed and added to PATH
- On Windows, reinstall Python with "Add Python to PATH" checked
- Try using `python3` instead of `python` on macOS/Linux

Problem: "pip is not recognized"

Solution:

- Update pip: `python -m ensurepip --upgrade`
- Or use: `python -m pip install -r requirements.txt`

Problem: Permission denied during installation

Solution:

- On Windows: Run Command Prompt as Administrator
- On macOS/Linux: Use `sudo` (not recommended) or use virtual environment

Problem: ModuleNotFoundError after installation

Solution:

- Verify virtual environment is activated
- Reinstall dependencies: `pip install -r requirements.txt --force-reinstall`

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4. Getting Started

4.1 First Launch

Starting the System

1. Open Terminal/Command Prompt
    - Windows: Press `Win + R`, type `cmd`, press Enter
    - macOS: Open Terminal from Applications
    - Linux: Open Terminal
2. Navigate to SafeHome Directory

```
cd path/to/SafeHome_team9
```

3. Activate Virtual Environment (if you created one)

```
# Windows
venv\Scripts\activate

# macOS/Linux
source venv/bin/activate
```

4. Start SafeHome

```
python main.py
```

You should see:

```
================================================
SafeHome Control Panel Started
System Status: OFF (Press 'Turn On' to start)
Web Interface: http://localhost:5000
================================================
```

Two windows will appear:

- Control Panel Window (Tkinter GUI) - Main interface
- Web Server running in background (accessible via browser)

4.2 Initial Setup

Step 1: Turn On the System (Control Panel)

1. The Control Panel window shows "System is OFF"
2. Click the "Turn On" button
3. Wait for system initialization (progress bar will show status)
4. When complete, you'll see the Login screen

Step 2: Login to Control Panel

1. Enter your credentials:
    - Default Username: `admin`
    - Default Password: `1234`
2. Click "Login"
3. You'll be taken to the Main Menu

Step 3: Change Default Password (Recommended)

1. From Main Menu, navigate to "CONFIGURE" → "System Control" tab
2. Click "Change Password"
3. Enter old password: `1234`
4. Enter new password (follow password requirements)
5. Confirm new password
6. Click "Change Password"

Step 4: Access Web Interface (Optional)

1. Open your web browser
2. Navigate to: `http://localhost:5000`
3. You'll be redirected to the login page
4. Enter web credentials:
    - Username: `homeowner`
    - First Password: `first123`
    - Second Password: `second456`

⚠️ Change these default passwords immediately!

4.3 System Overview

After successful login, you have access to:

Control Panel Features:

- SECURITY: Manage safety zones
- SURVEILLANCE: Configure security modes (Arm Away, Arm Stay, Disarm)
- CONFIGURE: System settings, change password, intrusion logs

Web Interface Features:

- Dashboard: Quick status overview and control buttons

- Arm Away/Stay: Set security modes
- Disarm: Deactivate security
- Panic Alarm: Emergency alarm trigger
- Configure Settings: System configuration
- Surveillance: Camera viewing
- Zone Management: Safety zone configuration

4.4 Quick Start Checklist

- [ ] Python 3.10+ installed
- [ ] Dependencies installed (`pip install -r requirements.txt`)
- [ ] System started (`python main.py`)
- [ ] System turned on (Control Panel)
- [ ] Logged into Control Panel
- [ ] Changed default passwords
- [ ] Web interface accessed (optional)
- [ ] Reviewed system settings

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5. User Guide

5.1 Control Panel Interface

The Control Panel provides the primary interface for system management. It includes several pages accessed through navigation.

5.1.1 Power Off Screen

Purpose: Initial screen when system is off

Features:

- System status indicator (OFF)
- "Turn On" button to start the system
- Progress bar during initialization

How to Use:

1. Click "Turn On" button
2. Wait for initialization (progress bar shows steps)
3. System automatically transitions to Login screen when ready

Status Messages:

- "System is OFF" - Ready to start
- "Starting system..." - Initialization in progress
- "Ready" - System initialized and ready for login

5.1.2 Login Screen

Purpose: Authenticate to access system controls

Features:

- Username and password input fields
- Login button
- Status messages for login attempts

How to Login:

1. Enter username (default: `admin`)
2. Enter password (default: `1234`)
3. Click "Login" button

Login Behavior:

- Successful login → Main Menu
- Failed login → Error message displayed
- Account lockout after 5 failed attempts (requires reset)

5.1.3 Main Menu

Purpose: Central hub for accessing all system functions

Menu Options:

- SECURITY: Safety zone management
- SURVEILLANCE: Security mode configuration
- CONFIGURE: System settings and logs
- LOGOUT: Exit to login screen
- Turn Off System: Shutdown system

How to Navigate:

- Click any menu button to access that section
- Use "Back" buttons within each section to return to Main Menu

5.1.4 Security (Zones View)

Purpose: Create and manage safety zones, assign sensors

Features:

- Visual floor plan with sensor locations
- Zone creation and management
- Sensor-to-zone assignment
- Zone status indicators

Creating a Zone:

1. Navigate to SECURITY from Main Menu
2. Click "Create Zone" or use zone creation interface
3. Enter zone name (e.g., "Front Door Zone")
4. Confirm creation

Assigning Sensors to Zones:

1. View sensors listed on the screen
2. Select a sensor
3. Choose target zone from dropdown
4. Confirm assignment

Zone Indicators:

- Green: Zone is armed and secure
- Yellow: Zone is armed but sensor open
- Red: Alarm condition in zone
- Gray: Zone is not armed

5.1.5 Surveillance (Modes View)

Purpose: Configure security modes (Arm Away, Arm Stay, Disarm)

Features:

- Security mode buttons
- Current mode display
- Armed zones indicator
- Floor plan visualization

Security Modes:

Arm Away:

- Full protection mode for when house is unoccupied
- All sensors (doors, windows, motion) trigger alarms
- Use when leaving home for extended period

Arm Stay:

- Perimeter protection while occupants are inside
- Only door/window sensors trigger alarms
- Motion sensors inside are ignored
- Use when staying home but want perimeter protection

Disarm:

- System deactivated
- No alarms triggered
- Use during normal activity when security not needed

How to Set Mode:

1. Navigate to SURVEILLANCE from Main Menu
2. Click desired mode button:
    - "Arm Away" - Full protection
    - "Arm Stay" - Perimeter protection
    - "Disarm" - Deactivate
3. Confirm mode change
4. Current mode displays at top of screen

Mode Restrictions:

- Cannot arm if doors/windows are open
- System checks all sensors before arming
- Error messages guide you to close sensors before arming

5.1.6 Configure (Monitoring View)

Purpose: System configuration, password management, and log viewing

Three Tabs Available:

System Settings Tab

Purpose: Configure system parameters

Settings Available:

- Monitoring Service Phone: Phone number for alarm monitoring
- Homeowner Phone: Your contact number
- System Lock Time: Auto-lock timeout (minutes)
- Alarm Delay Time: Entry delay before alarm (seconds)

How to Configure:

1. Navigate to CONFIGURE from Main Menu
2. Select "System Settings" tab
3. Enter or modify values in input fields
4. Click "Save Settings"
5. Confirmation message appears

Change Password Tab

Purpose: Update control panel password

How to Change Password:

1. Navigate to CONFIGURE from Main Menu
2. Select "Change Password" tab
3. Enter current password
4. Enter new password (follow requirements)
5. Confirm new password
6. Click "Change Password"
7. Success message appears

Password Requirements:

- Minimum length enforced by system
- Cannot be same as current password
- Must meet complexity requirements

System Control Tab

Purpose: Reset system or control panel lock

Features:

- Reset System: Clear all configurations (use with caution)
- Unlock Control Panel: Release control panel if locked

How to Reset System:

1. Select "System Control" tab
2. Click "Reset System" button
3. Confirm reset action
4. System clears all settings and returns to default state

How to Unlock Control Panel:

1. If control panel is locked
2. Select "System Control" tab
3. Click "Unlock Control Panel" button
4. Control panel is unlocked

Intrusion Log Section

Purpose: View historical security events

Features:

- Chronological list of intrusion events
- Event details (sensor, zone, time, action)
- Automatic updates when new events occur

Log Entry Format:

```
[HH:MM:SS] ACTION at SENSOR_NAME (ZONE_NAME)
```

Example:

```
[14:23:15] Intrusion detected at Front Door (Zone 1)
[14:25:30] Alarm activated at Living Room Motion (Zone 2)
```

5.2 Web Interface

The web interface provides remote access to SafeHome through any web browser. It uses a two-step authentication process for enhanced security.

5.2.1 Accessing the Web Interface

URL: `http://localhost:5000`

For Remote Access:

- Replace `localhost` with your computer's IP address
- Example: `http://192.168.1.100:5000`
- Ensure firewall allows port 5000

5.2.2 Login Process

Two-Step Authentication:

Step 1: First Password

1. Navigate to login page
2. Enter username (default: `homeowner`)
3. Enter first password (default: `first123`)
4. Click "Login" button

Step 2: Second Password

1. If first password is correct, second password screen appears
2. Enter second password (default: `second456`)
3. Click "Submit" button
4. Redirected to Dashboard upon success

Security Features:

- 5 failed attempts lock the account
- Remaining attempts shown on error
- Account lockout requires administrator unlock
- All login attempts are logged

5.2.3 Dashboard

Purpose: Central control panel with quick access to all functions

Features:

Status Display:

- Current Security Mode (Disarmed, Armed Away, Armed Stay)
- Alarm Status (IDLE, DELAY, ACTIVE)
- Real-time updates every 15 seconds

Main Control Buttons:

- Arm Away: Set full protection mode
- Arm Stay: Set perimeter protection mode
- Disarm: Deactivate security system
- Panic Alarm: Emergency alarm trigger

Secondary Control Buttons:

- Configure Settings: System configuration page
- Surveillance: Camera viewing interface
- Zone Management: Safety zone configuration

Navigation:

- Logout button (top right)
- Welcome message with username

5.2.4 Security Controls

Arm Away Mode

Purpose: Full protection when house is unoccupied

How to Arm Away:

1. On Dashboard, click "Arm Away" button
2. Confirm action if prompted
3. System checks all sensors
4. If sensors are closed, system arms successfully
5. Status updates to "Armed Away"

Behavior:

- All sensors trigger alarms (doors, windows, motion, cameras)
- Entry delay before alarm activation (if configured)
- Immediate monitoring service notification on alarm

Arm Stay Mode

Purpose: Perimeter protection while inside

How to Arm Stay:

1. On Dashboard, click "Arm Stay" button
2. Confirm action if prompted
3. System checks perimeter sensors
4. If doors/windows are closed, system arms successfully
5. Status updates to "Armed Stay"

Behavior:

- Only door/window sensors trigger alarms
- Motion sensors inside are ignored

- Camera snapshots trigger alarms
- Entry delay applies

Disarm Mode

Purpose: Deactivate security system

How to Disarm:

1. On Dashboard, click "Disarm" button
2. System immediately disarms
3. Status updates to "Disarmed"
4. Any active alarms are cleared

Behavior:

- All sensors ignored
- No alarms triggered
- System remains in Ready state

Panic Alarm

Purpose: Emergency alarm trigger

How to Trigger:

1. Click "Panic Alarm" button on Dashboard
2. Alarm activates immediately (no delay)
3. Siren sounds
4. Monitoring service notified immediately

Use Cases:

- Medical emergency
- Intruder present
- Immediate danger requiring response

To Clear Panic Alarm:

- Disarm the system
- Or wait for authorized user to clear

5.2.5 Configure Settings

Purpose: System configuration and settings management

Access: Click "Configure Settings" button on Dashboard

Available Settings:

Monitoring Service Phone:

- Phone number for alarm monitoring service
- Used when alarm is triggered
- Format: Enter as string (e.g., "555-1234")

Homeowner Phone:

- Your contact phone number
- Used for notifications
- Format: Enter as string

System Lock Time:

- Auto-lock timeout in minutes
- Account locks after inactivity
- Default: 30 minutes
- Range: 1-1440 minutes

Alarm Delay Time:

- Entry delay before alarm activation (seconds)
- Allows time to disarm after entry
- Default: 30 seconds
- Range: 0-300 seconds

How to Update Settings:

1. Navigate to Configure Settings page
2. Modify values in input fields
3. Click "Save Settings" button
4. Success message appears
5. Settings applied immediately

5.2.6 Surveillance Interface

Purpose: View and control cameras

Access: Click "Surveillance" button on Dashboard

Features:

Camera Selection:

- Floor Plan View: Click camera icons on floor plan
- Thumbnail View: Grid of all camera thumbnails
- Camera List: Dropdown selection

Camera Controls:

- Enable/Disable: Toggle camera on/off
- Pan: Horizontal camera movement (left/right buttons)
- Zoom: Camera zoom in/out (zoom in/out buttons)
- Snapshot: Capture current frame

Viewing Options:

- Single Camera View: Full-screen single camera
- Multi-Camera View: Grid of multiple cameras
- Live Feed: Real-time updates (1 frame per second)

How to View Camera:

1. Navigate to Surveillance page
2. Select camera from floor plan, thumbnail, or dropdown
3. Camera feed displays in main area
4. Use control buttons to pan/zoom
5. Click "Enable" or "Disable" to control camera

Camera Status Indicators:

- Green: Camera enabled and active
- Red: Camera disabled
- Yellow: Camera error or connection issue

5.2.7 Zone Management

Purpose: Create and manage safety zones, assign sensors

Access: Click "Zone Management" button on Dashboard

Features:

Zone Management:

- Create Zone: Add new safety zone
- Rename Zone: Change zone name
- Delete Zone: Remove zone (sensors reassigned)

Sensor Assignment:

- View all sensors and their current zone assignments
- Assign to Zone: Move sensor to different zone
- Clear Assignment: Remove sensor from zone

How to Create Zone:

1. Navigate to Zone Management page
2. Enter zone name in "Create New Zone" section
3. Click "Create Zone" button
4. Zone appears in zones table

How to Assign Sensor:

1. Find sensor in "Sensors & Assignments" table
2. Select target zone from dropdown
3. Click "Assign" button
4. Assignment updates immediately

How to Delete Zone:

1. Find zone in zones table
2. Click "Delete" button for that zone
3. Confirm deletion
4. Zone removed, sensors become unassigned

5.3 System States

Understanding system states helps you know what the system is doing:

OFF: System is powered off, no functions available

INITIALIZING: System is starting up, components loading

READY: System is on and ready, awaiting login or commands

ACTIVE: System is armed and monitoring sensors

LOCKED: Control panel locked due to failed login attempts

SHUTDOWN: System is shutting down gracefully

5.4 Best Practices

Daily Operations:

- Arm system when leaving home (Arm Away)

- Use Arm Stay when staying home but want perimeter protection
- Disarm when returning home
- Check intrusion logs regularly

Security:

- Change default passwords immediately
- Use strong, unique passwords
- Don't share login credentials
- Review intrusion logs weekly

Maintenance:

- Test system monthly (arm/disarm cycle)
- Verify sensor status regularly
- Check camera feeds periodically
- Review and clean up old logs

Emergency Procedures:

- Use Panic Alarm for immediate threats
- Keep monitoring service phone number accessible
- Know how to quickly disarm system
- Test emergency procedures quarterly

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6. Troubleshooting

6.1 Common Issues

System Won't Start

Symptoms:

- Control Panel window doesn't appear
- Error messages in terminal
- "System not initialized" error

Solutions:

1. Check Python Installation:

   ```
   python --version
   ```

   Should show Python 3.10 or higher

2. Verify Dependencies:

```
pip list | grep Flask
pip list | grep Pillow
```

   Both should be installed

3. Check Database:
   - Ensure `safehome.db` file exists or can be created
   - Check file permissions in project directory
4. Review Error Messages:
   - Read terminal output for specific errors
   - Common issues: Missing modules, port conflicts, permission errors
5. Reinstall Dependencies:

```
pip install -r requirements.txt --force-reinstall
```

Login Issues

Problem: "Incorrect password" but password is correct

Solutions:

- Ensure you're using correct username (case-sensitive)
- Check if account is locked (5 failed attempts)
- Try resetting password from Control Panel
- Verify you're using correct interface (Control Panel vs Web)

Problem: "Account is locked"

Solutions:

For Control Panel:

1. Use unlock script: `python common/unlock_admin_cp.py`
2. Or unlock from CONFIGURE → System Control tab

For Web Interface:

1. Use unlock script: `python common/unlock_account.py homeowner web_browser`
2. Or manually update database (advanced users only)

Problem: "System not available" (Web Interface)

Solutions:

1. Ensure Control Panel application is running
2. Verify web server started (check terminal for "Web Interface: http://localhost:5000")

3. Check if port 5000 is available:

```
# Windows
netstat -ano | findstr :5000

# macOS/Linux
lsof -i :5000
```

4. Try restarting the system

Web Interface Not Accessible

Problem: Can't connect to http://localhost:5000

Solutions:

1. Check if Server is Running:
    - Look for "Web Interface: http://localhost:5000" in terminal
    - If not visible, restart `main.py`
2. Try Different Port:
    - If port 5000 is in use, modify `main.py`:

      ```
      app.run(port=5001, debug=False, use_reloader=False)
      ```

    - Access via `http://localhost:5001`
3. Check Firewall:
    - Windows: Allow Python through Windows Firewall
    - macOS/Linux: Check firewall rules
4. Browser Issues:
    - Clear browser cache
    - Try different browser
    - Check for browser extensions blocking localhost

Cannot Arm System

Problem: "Cannot arm: door/window sensors are open"

Solutions:

5. Check sensor status on Zones view
6. Close all doors and windows
7. Wait for sensors to update (may take a few seconds)
8. Try arming again
9. If sensors show closed but still can't arm, check sensor assignments

Problem: "System not ready"

Solutions:

1. Ensure system is turned on (not OFF state)
2. Login to Control Panel first
3. Check system status in terminal
4. Try turning system off and on again

Camera Issues

Problem: Camera feed not showing

Solutions:

1. Ensure camera is enabled (green status)
2. Check camera assignment in Zone Management
3. Verify virtual device directory exists
4. Try disabling and re-enabling camera
5. Check if camera image files exist in `virtual_device_v4/` directory

Problem: Camera controls not working

Solutions:

1. Ensure camera is enabled before using controls
2. Try refreshing the surveillance page
3. Check browser console for JavaScript errors
4. Ensure camera supports pan/zoom (some cameras may not)

Sensor Status Not Updating

Problem: Sensor shows incorrect status

Solutions:

1. Refresh the page or view
2. Check sensor assignment to zone
3. Verify sensor is activated in system
4. Try manually updating sensor status (if using virtual devices)
5. Check system logs for sensor errors

Database Errors

Problem: "Database connection failed" or "Table not found"

Solutions:

1. Check Database File:
    - Verify `safehome.db` exists in project root
    - Check file permissions
2. Run Migration Script:

```
python common/migrate_database.py
```

3. Recreate Database (⚠️ This deletes all data):
    - Delete `safehome.db` file
    - Restart system (database will be recreated)
    - Recreate users and settings
4. Check Disk Space:
    - Ensure sufficient disk space for database

6.2 Error Messages

"System not initialized"

Meaning: System hasn't been turned on yet

Solution:

5. Open Control Panel
6. Click "Turn On" button
7. Wait for initialization to complete

"Login required"

Meaning: You're not logged in or session expired

Solution:

1. Login to Control Panel or Web Interface
2. If session expired, login again

"Port 5000 already in use"

Meaning: Another application is using port 5000

Solution:

1. Close other applications using port 5000
2. Or change port in `main.py`:

```
app.run(port=5001, debug=False, use_reloader=False)
```

"ModuleNotFoundError: No module named 'X'"

Meaning: Missing Python package

Solution:

```
pip install -r requirements.txt
```

"Permission denied"

Meaning: Insufficient file permissions

Solution:

- Check file/directory permissions
- Run as administrator (Windows) or with sudo (Linux) if needed
- Or fix permissions on project directory

6.3 Performance Issues

System Running Slowly

Solutions:

1. Reduce Log Size:
    - Clear old intrusion logs
    - Archive or delete old event logs
2. Check Active Processes:
    - Ensure only one SafeHome instance is running
    - Close unnecessary applications
3. Database Optimization:
    - Database grows over time, consider archiving old data
    - Recreate database if it becomes too large
4. Reduce Camera Count:
    - Disable unused cameras
    - Limit concurrent camera views

Web Interface Slow to Load

Solutions:

5. Check network connection
6. Reduce number of active cameras
7. Clear browser cache

8. Check browser console for errors
9. Try different browser

6.4 Getting Help

If you encounter issues not covered here:

1. Check Logs:
    - Control Panel terminal output
    - Browser console (F12 → Console tab)
    - System event logs
2. Review Documentation:
    - This User Manual
    - Technical documentation in `docs/` folder
    - README files in project
3. Common Scripts:
    - `common/check_account_status.py` - Check user account status
    - `common/unlock_account.py` - Unlock locked accounts
    - `common/reset_all_accounts.py` - Reset all accounts (use with caution)
4. Support Resources:
    - Project repository issue tracker
    - Documentation in `docs/` folder
    - Contact development team

Appendices

Appendix A: Default Accounts

After initial setup, the following default accounts are available:

Control Panel:

- Username: `admin`
- Password: `1234` (must be changed on first login)

Web Interface:

- Username: `homeowner`
- First Password: `first123`

- Second Password: `second456`

⚠️ Security Note: Change these default passwords immediately after installation!

Appendix B: Contact Information

For technical support or questions about SafeHome:

- Project Repository: [GitHub Repository URL]
- Documentation: See `docs/` folder in project directory
- Issue Reporting: Use project issue tracker

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