Project Title : Intelligent Home Automation System with Automatic Inverter Switching, Battery Power Management, and Gas Flame Detection

Aim:

To design an intelligent home automation system that automatically switches to inverter during power failure, manages battery usage efficiently, and detects gas flame or leakage to enhance safety and reliability at home.

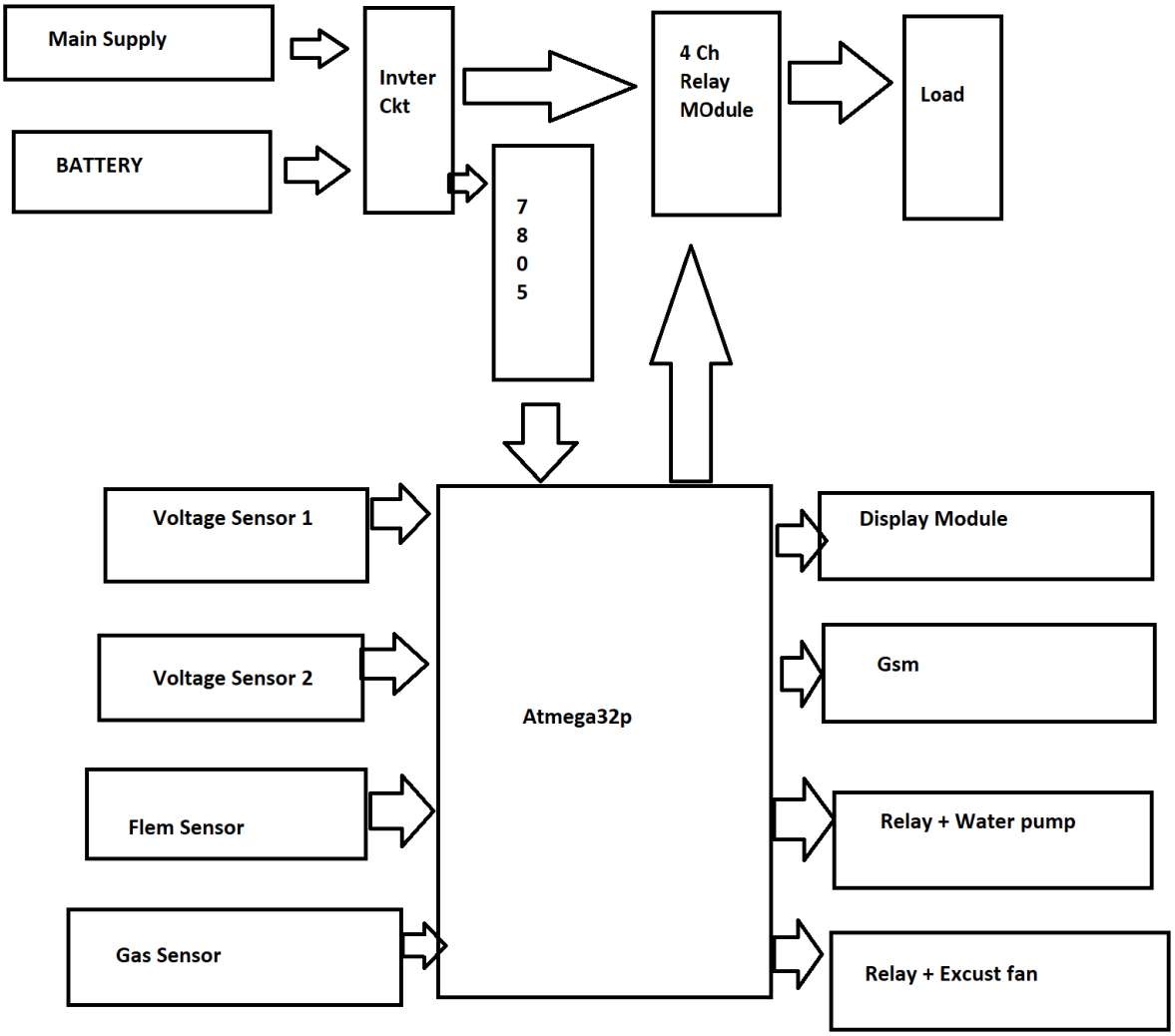
Objectives:

- To detect power failure and switch to inverter automatically.
- To monitor and manage battery voltage levels to prevent over-discharge.
- To detect gas flame or leakage for fire and gas safety.
- To ensure continuous power supply and improve home safety through automation.
- To notify the user about battery status and gas/fire alerts.

Working Principle:

The system monitors the main power line. When power goes off, the microcontroller triggers a relay to switch to the inverter supply. A battery monitoring circuit checks voltage levels and prevents the battery from draining completely. A gas sensor detects LPG or gas leakage, while a flame sensor detects open fire near the stove. If gas or flame is detected, a buzzer alerts the user, and optionally, an SMS alert can be sent using a GSM module.

Block Diagram



Hardware Components:

- ATmega328P
- Relay Module
- Battery Monitoring Circuit
- Gas Sensor
- Flame Sensor
- Buzzer / LED Indicators
- GSM Module (SIM800L - Optional)
- Battery and Inverter ckt

- Power Supply

Software Used:

- Arduino IDE
- Embedded C/C++
- GSM AT Commands *(optional)*

Advantages:

- Automatically handles power failures—no manual switch needed
- Protects battery from over-discharge and damage
- Detects fire and gas leak early, preventing accidents
- Low-cost and reliable solution for smart home safety
- Easily expandable for other automation features

Disadvantages:

- Needs proper insulation and safe relay wiring
- Gas sensor may require periodic cleaning or calibration
- GSM module depends on SIM and network availability
- Does not include internet-based (IoT) controls by default

Applications:

- Smart homes and apartments
- Kitchen safety automation
- Battery-powered homes or off-grid houses
- Elderly or physically challenged person's home
- Rentable PGs, hotels, and rural areas with unstable electricity

Future Scope:

- Add IoT dashboard for remote control and monitoring

- Use Wi-Fi or Bluetooth for mobile alerts
- Add temperature and smoke detection for full fire monitoring
- Auto-charging logic for solar or hybrid setups
- Connect with voice assistants like Alexa or Google Home

Conclusion:

This project provides a smart solution for home power management and safety. It ensures uninterrupted power during outages, protects the battery system, and prevents fire or gas-related accidents. This automation system is practical, affordable, and adaptable for real-world use.