

IOT Based Home Security System

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ABSTRACT

Home security has become an important requirement due to the increasing need to protect residential premises from intrusion, gas leakage, fire-related hazards, and other abnormal conditions. This paper presents an **IoT-based home security system** that integrates sensing, monitoring, communication, and appliance-control functions into a single platform. The proposed system employs an Arduino-based controller to acquire information from an LPG gas detector, temperature detector, intruder detector, power-failure detector, and level detector. According to the detected condition, the controller activates appropriate output devices through relay-driver circuits and provides system information through an LCD. A GSM modem enables communication of important security information to the user, while appliances such as lights, motors, valves, heaters, and exhaust fans can be controlled according to system requirements. In particular, automatic exhaust-fan operation during gas leakage can reduce the possibility of hazardous gas accumulation. The developed prototype demonstrates the feasibility of combining home security and automation functions to provide improved safety, remote awareness, convenience, and efficient utilization of electrical energy. The source report describes the system as a residential, industrial, domestic, and commercial security solution based on IoT technology.

Keywords— Internet of Things (IoT), Home Security, Arduino Mega, GSM, LPG Gas Sensor, Intruder Detection, Home Automation, Relay Control.

INTRODUCTION

Safety and security of residential and working environments are major concerns in modern society. Increasing incidents of burglary and robbery, together with busy lifestyles, have increased the demand for intelligent security systems capable of continuously monitoring homes even when occupants are away. Conventional security arrangements generally require considerable human involvement and may not provide immediate information regarding abnormal conditions.

The advancement of communication and embedded technologies has enabled security systems to incorporate sensors, controllers, communication modules, and actuators for automatic monitoring and control.

The Internet of Things (IoT) provides an effective platform for connecting sensors, actuators, smartphones, and other electronic devices through communication networks. IoT technology allows information obtained from physical devices to be processed and used for monitoring and control purposes. In a home-security application, parameters such as intrusion, temperature, gas leakage, power failure, and water level can be monitored continuously. Appropriate action can then be initiated automatically whenever an unsafe or abnormal condition is detected.

The proposed **IoT Based Home Security System** combines security monitoring with home automation. The system incorporates an Arduino Mega controller, LPG gas detector, temperature detector, intruder detector, power-failure

detector, level detector, GSM modem, LCD, relay-driver circuitry, and different controllable loads. The integration of these components provides a comprehensive approach to improving home safety while reducing the need for continuous manual supervision.

LITERATURE SURVEY

Several researchers have investigated IoT-enabled security and home-automation systems. Suhail [1] discussed an IoT-based home-security approach using the Raspberry Pi 2 platform, demonstrating the applicability of embedded computing for intelligent security applications. Howedi and Jawid [2] presented the design and implementation of a low-cost, multifunctional smart-house prototype. Kodali *et al.* [3] developed an IoT-based smart security and home-automation system intended to provide cost-effective wireless monitoring and control. Gupta and Chhabra [4] further investigated IoT-based smart-home design with emphasis on power and security management.

Tanwar *et al.* [5] proposed an advanced IoT-based security-alert system for smart homes, while Gunge and Yalagi [6] studied smart-home automation and its role in controlling domestic devices. Tiwari and Gedam [7] reviewed IoT-based home-automation systems, highlighting the increasing role of internet connectivity in residential control applications. Kulkarni *et al.* [8] presented IoT-based home automation using Raspberry Pi. The broader principles and applications of IoT in embedded and home systems are also discussed by Norris [9] and Giusto *et al.* [10]. These studies demonstrate the potential of IoT technology for integrating sensing, security monitoring, communication, and automated control within residential environments.

PROBLEM STATEMENT

Conventional home-security systems may not provide integrated monitoring of multiple hazards such as intrusion, LPG leakage, temperature variation, power failure, and other household conditions. Furthermore, occupants may be unable to continuously supervise their homes when they are away. Therefore, there is a requirement for an intelligent system capable of continuously detecting abnormal conditions, providing security information to the user, and automatically controlling appropriate appliances to improve safety and convenience.

OBJECTIVES

1. To develop an IoT-based home-security system capable of monitoring intrusion, LPG gas leakage, temperature, power failure, and other important household conditions and providing appropriate security indications or alerts.
2. To automate the operation of household appliances and safety devices through an Arduino-based control system in order to improve safety, reduce manual intervention, and minimize unnecessary consumption of electrical energy and time.

PROPOSED SYSTEM

The proposed system integrates home-security monitoring and automatic appliance control around an Arduino Mega controller. Various sensing units are connected to the controller, including the LPG gas detector, temperature detector, intruder detector, power-failure detector, and level detector. These sensors continuously monitor the corresponding environmental and security parameters and transmit their signals to the Arduino for processing.

The Arduino evaluates the received sensor information and initiates the appropriate response according to the programmed conditions. A 16×2 LCD is employed to display system information, while the GSM modem provides wireless communication for security-related information. An APR-based voice section and speaker are incorporated

for audible indication. The relay-driver and relay sections interface the low-power controller with external loads such as lights, motors, valves, heaters, and exhaust fans. For example, when LPG leakage is detected, the system can automatically operate the exhaust fan to remove accumulated gas and reduce the possibility of an accident. This integrated arrangement enables the system to perform both security monitoring and home-automation functions.

BLOCK DIAGRAM

Fig. 1 shows the functional block diagram of the IoT-based home security system, where the Arduino Mega processes inputs from LPG gas, temperature, intruder, power-failure, and level detectors. Based on the detected conditions, it controls the GSM modem, LCD, alarm, and various household appliances through the relay-driver circuit.

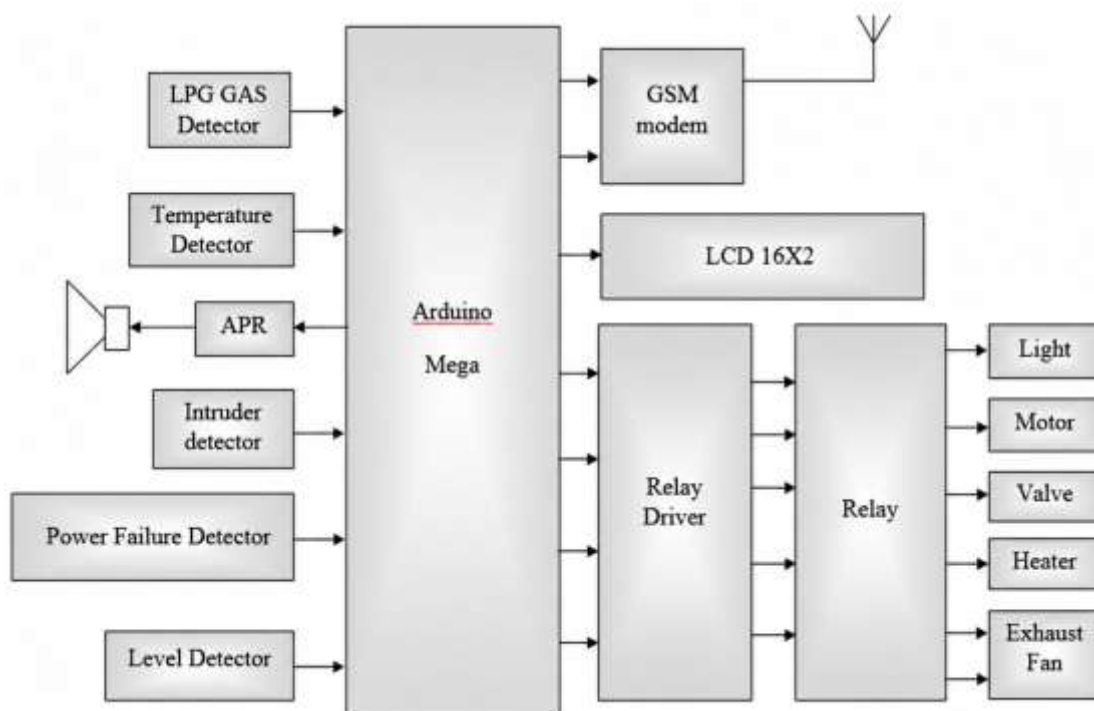


Fig 1 Block Diagram

CIRCUIT DIAGRAM

Fig. 2 shows the circuit diagram of the IoT-based home security system, with the ATmega2560 microcontroller interfaced with temperature, liquid-level, PIR, and gas sensing circuits. The controller is also connected to the LCD, GSM modem, APR voice module, and optocoupler-based relay drivers for monitoring, alert generation, and control of household appliances.

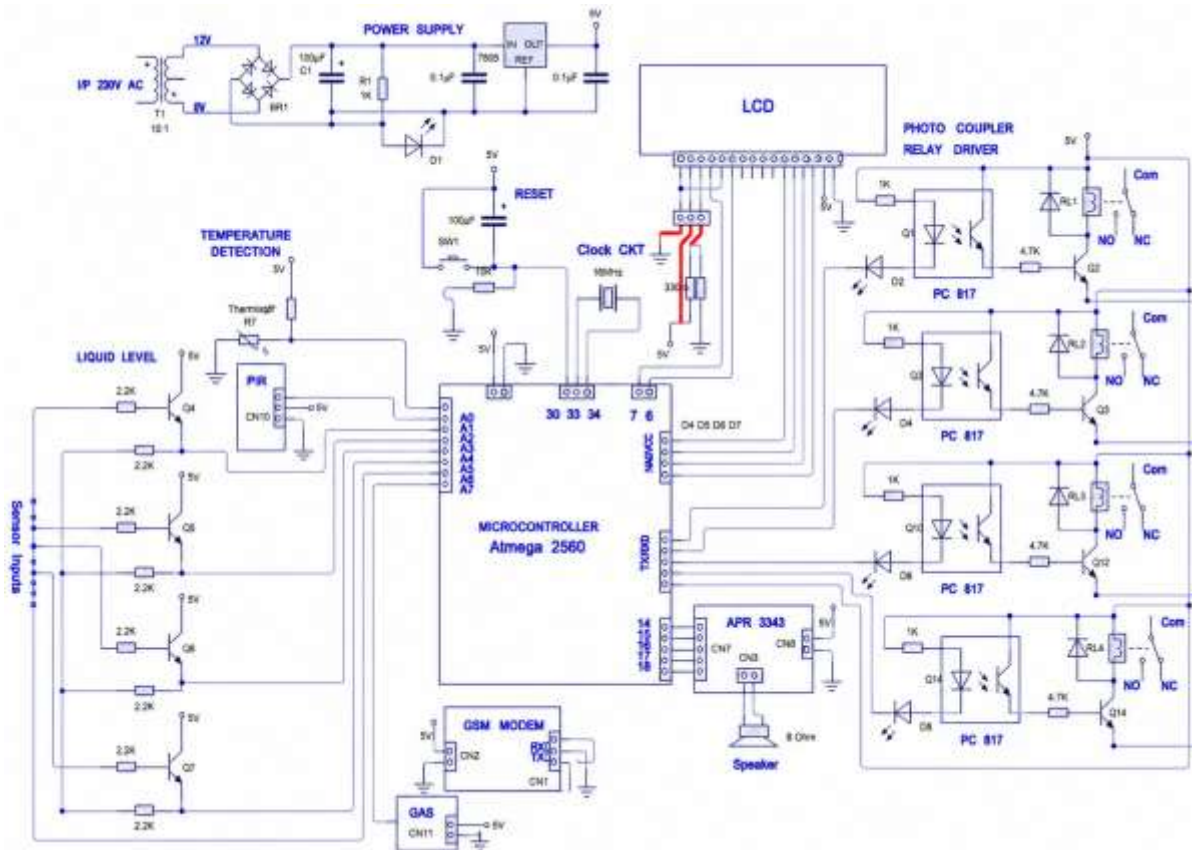


Fig 2 Circuit Diagram

METHODOLOGY

The operation of the proposed system begins by continuously acquiring information from the connected sensors. The Arduino Mega monitors the LPG gas detector, temperature detector, intruder detector, power-failure detector, and level detector. The measured or detected condition is compared with the corresponding programmed operating requirement. Under normal conditions, the controller continues monitoring and displays the appropriate system status through the LCD.

Whenever an abnormal condition is detected, the controller performs the corresponding security or control operation. Intrusion detection can initiate a security response, while LPG leakage causes the system to activate the required safety mechanism, particularly the exhaust fan. Similarly, temperature and level information can be utilized for controlling the associated appliances. Relay-driver circuitry receives the control signals generated by the Arduino and switches the required relay to operate the connected load.

The GSM communication section extends the functionality of the system by allowing security-related information to be communicated remotely. Thus, the complete methodology combines **sensing** → **data acquisition** → **Arduino processing** → **condition evaluation** → **alert/communication** → **relay switching** → **appliance control**. This arrangement minimizes continuous human intervention while improving the responsiveness of the home-security system.

RESULTS AND DISCUSSION

Fig. 3 shows the developed prototype integrating the controller board, sensing circuits, GSM communication module, LCD, relay modules, audible indication, and connected loads into a complete IoT-based home security system. The controller processes the sensor inputs, displays the corresponding system status on the LCD, and operates the relay modules to perform the required security and home-automation functions.

The experimental implementation demonstrates that multiple household-security functions can be incorporated into a single controller-based platform. Gas detection provides an important safety feature because the exhaust fan can be operated automatically when leakage is identified. Intruder detection improves residential security, while temperature, level, and power monitoring extend the system beyond conventional intrusion-only security. The GSM section further improves the usefulness of the system by providing a communication mechanism when important events are detected.

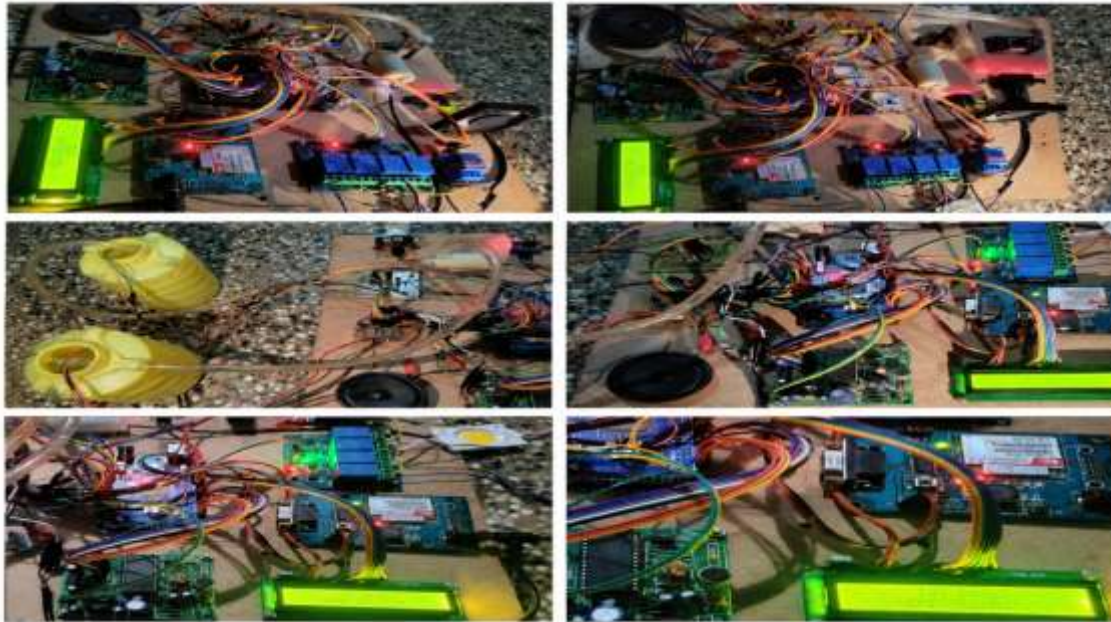


Fig 3 Hardware Setup

CONCLUSION

An IoT-based home-security and automation system has been developed by integrating multiple sensors, an Arduino Mega controller, GSM communication, LCD indication, relay-controlled appliances, and audible warning facilities. The proposed system monitors important parameters including LPG leakage, temperature, intrusion, power failure, and level conditions and performs appropriate control operations according to the detected situation. The developed prototype demonstrates that security monitoring and household-appliance automation can be effectively integrated into a single embedded platform. Automatic responses, such as operating the exhaust fan during gas leakage, can improve household safety, while remote communication and appliance control provide greater convenience to the user. The system therefore provides a practical foundation for a low-cost intelligent home-security solution with scope for further development.

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