

Embedded Security System for Home Automation

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Abstract:-- The aim of the home automation is to control home devices from a central control point with security, comfort and convenience systems. In this paper, we present implementation of low cost, flexible and secure internet base home automation system. The communication between the devices is wireless, protocol between units is enhanced to be suitable for most of the appliances. Homeowners can orchestrate and monitor appliances for multiple locations within the house or even remotely, via telephone and internet. We develop a remote website that provides secure internet access and other services during installation to protect against security threats. We include features that uses local control home temperature and ability to integrate different home functions by Global Home Server Target Machine.

Keywords- application control, global home server, communication between products and connections, security.

I. INTRODUCTION

Safety and security of any living or working place is one of the most primary concern. The advancement of technology has increased the safety and security of the people along with their belongings. One of the reasons for the rise of smart home is the rising risk of burglary and robbery and busy life style. The busy life style of people is leading to necessity of controlling devices at home remotely and increasing the necessity of keeping surveillance over their homes. New communication technology opens home automation to many security threats along with numerous offers and benefits. Therefore to protect against this threat within the limited resources, a family of product based on Honeywell's Global Home Server, a remote website that provides capacity for supporting up to 100,000 homes by a small cluster of modest server machines, support for larger communities with additional configuration and network management.

II. SYSTEM CONTROL DESIGN

The system control design is divided into 2 portions for smart security systems. The first portion is Microcontroller with an Ethernet module for controlling unit and second is web control unit. The Ethernet module is connected to a Wi-Fi router which keeps a static IP address to it so that it can use TCP/IP based communication with other accessing devices connected to the same router. This module is connected to 4 appliances through relay devices to automatically turn on and off devices. As the relay devices are current controlled devices, current amplification is needed to support low current output of the microcontroller. Now that was a part that requires human control. To make this design more efficient and automatic system has been

designed as well. For this automated system, there is a temperature sensor which senses its immediate environment and indicates current temperature. Temperature is shown in the GUI output and microcontroller uses it to change the speed of fan connected to it. As temperature varies speed of the fan varies accordingly. The IR sensor is connected to a door of a room, that senses entry of a person and sensor changes its output stage and triggers the microcontroller to put on the light of that room only. When the person exist that room another IR sensor senses and directs the controller to put off the light, increasing consumption efficiency as well as making things more fast and advance.

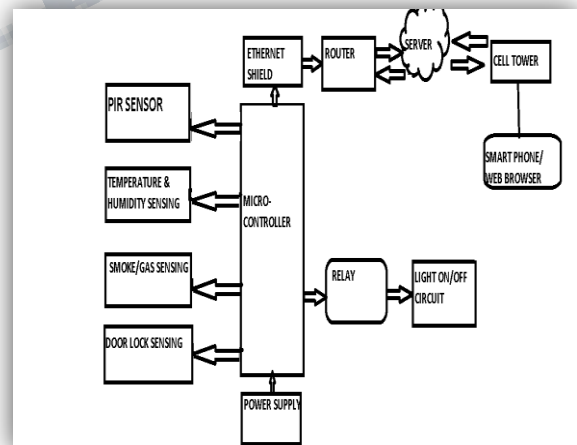


Fig.1. Block diagram of security system for home appliances

The block diagram of the smart security system shown in Fig. above is for overall design of security system for home. In this block diagram, temperature and humidity sensing circuit, smoke or gas sensing circuit, door lock

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sensing circuit, PIR sensing circuit, light on/off circuit, microcontroller, Ethernet shield, router, server, cell tower and smartphone are shown. When the corrected domain name enters, the Arduino Mega microcontroller reads smoke signal, magnetic signal, room temperature and moisture, and motion detector. It will send these data to the web server page via the internet. The relay state will be changed when the command and data is received. The microcontroller will read command and change relay state. And then, the data will be recorded and displayed on web server database. The real time status will display on web server page through the internet.

1. MCU (Microcontroller Unit) the Microcontroller unit is separated into two sections. First section is sensor section and the second one is driver section.

The smart security system for home appliances based on IOTs has the capabilities to control the light ON/Off and monitor the sensors shown in Fig.3. In the Fig.3, the alarm system1 is used for smoke or gas sensor and the alarm system2 for PIR sensor. And then, the alarm system3 is used for hall-effect sensor. ENC28J60 Ethernet module with RJ45 connector was used to connect each other Arduino Mega microcontroller and web server data. The Ethernet is interfaced to the Arduino Mega via the Arduino SIP pins. Arduino Mega microcontroller implemented with C language, using IDE comes with the microcontroller itself. Arduino software is responsible for collecting event from connected sensors, then apply action to actuators and pre-programmed in the server. Another work is to report and record the history in the server database.

2. Sensor Section- The sensor section is considered with the following detection of:

- ◆ Smoke or gas detection
- ◆ Motion detection
- ◆ Door lock detection
- ◆ Temperature and humidity detection

A. Smoke or Gas detection- The smoke or gas sensor is used to detect the gas leakage and smoke occurring in home. This is used to detect gases like LPG/I butane/ propane/ methane/ alcohol/ hydrogen/ smoke. There are different types of gas sensor which detects different gases according to different concentration parameter. Here we are using MQ-2 gas and smoke sensor. MQ2 is a semiconductor type sensor, which can appropriately sense the presence of smoke, LPG,

methane, butane, propane and other hydrocarbon combustible gases. Whenever the gas/smoke leakage is detected by the sensor, the circuit starts working with 5 volts supply.

B. Motion detection- Motion detectors are used to detect the unwanted movement of people around the restricted premises. Hence, the passive Infrared (PIR) sensors could be used as a motion detector if there is some movement around the restricted premises. The passive Infrared sensor is used as a motion detector in the system. The PIR (Passive Infra-Red) sensor is a pyro electric device that detects motion by measuring changes in the infrared level emitted by surrounding objects. This motion can be detected by checking for a high signal on a signal I/O pin. PIR sensor is electronic devices which is used in some security systems to detect an infrared emitting source. All living beings whose temperature is anything above absolute zero (-273.15°C or -459.67°F), emits infrared radiation. This radiation (energy) is invisible to the human eye but can be detected by electronic device designed for such a purpose.

C. Door Lock detection- The intrusion sensors are placed at the doors and windows to detect the intrusion of a burglar in the home. The intrusion detector is used to give extra security along with other detectors. The hall-effect proximity sensor is used for intrusion detector. A hall-effect proximity sensor is a magnetic sensor based on the hall effect of the magnet. Voltage perpendicular to both the current and the field is generated when a current carrying conductor is placed into a magnetic field and this principle is known as the Hall Effect. For the installation of the proximity sensor, a magnet is attached to the frame of the door or window, whereas the sensor is attached to the door or window itself. The magnet and the sensor should be installed such that they are close to each other whenever the door or window is closed.

D. Temperature and humidity detection- For temperature and humidity detection, DHT11 is used. The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). It is fairly simple to use, but requires careful timing to grab data. The overall circuit diagram of humidity and temperature detection circuit is shown in Fig.3. This is to design the monitoring system for smart security system.

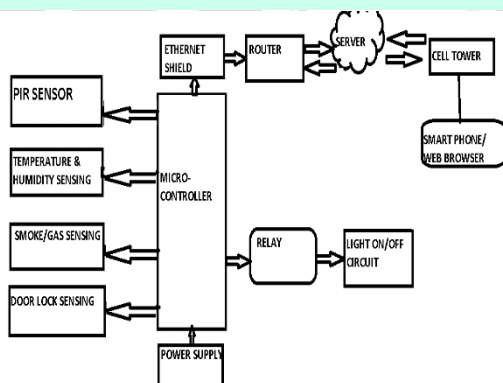
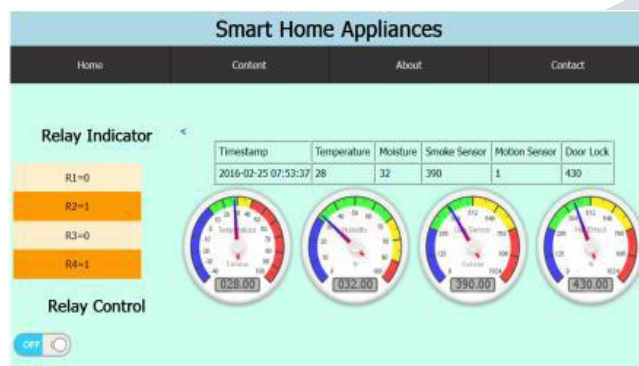
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E. Driver Section- The driver section includes the relay and buzzer for smart security system. The buzzer is used for alarm system and relay is used for light ON/OFF.

3. Web Control Design- The web control design is composed of two portions. The first portion is the database logging system and the second one is the user interface.

3.1 Database Logging System- The smart security system for home appliances control deals with information that has to be logged in database and monitored through web page on browser.

3.2 User Interface System- The user interface was implemented not only for monitoring system but also for control the light ON/OFF. The user can also easily watch the real time status and control light ON/OFF from relay control on the webpage through the web server via the internet.



III. CONCLUSION

In the proposed design, a Wireless automated home control with security features is presented. This design is very simple in nature. Arduino Uno microcontroller is the central part of the design where the server program for controlling is burned. Thus all the controlling is done by it. For the web application the Html part is provided inside the program thus it doesn't require any other application to be developed for different gadgets. The security mode is very invulnerable where nobody can access the system without deactivating the security system from the activating device. The automated mode makes life easier for users by complete automation of necessary appliances without any human effort. The application of the system could be:

1. In case of lighting control, it is possible to conserve energy in both residential and commercial applications by automatically controlling intensity of light depending on the presence of anyone inside the room.

2. It could be useful for old aged/especially able people as appliances can be controlled by merely a touch. It is also possible to control the system using voice commands using Android. It is safe because there is no chance of getting electric shock.

3. Security system has motion sensors that will detect any kind of unapproved movement and alert the user through the alarm and via web page.

4. Security cameras can be installed which will monitor the premises, allowing the user to observe activity around the house. Here wires are used to connect to the switching devices for appliances but use of small Wi-Fi modules can make the system fully wireless.

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