A Smart and Secure Home Automation System Using IoT

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Abstract

This paper is based on the development of a model simulating a home automation system with different operation modes which can be controlled by android mobile application. In this work, a smart and secure home automation system is proposed to automatically achieve some activities performed frequently in daily life in order to acquire comfort, freedom and security. This system mainly focuses on three modules such as smart home system, fire security system and burglar security system. This system has three main operating parts. In automation part, it controls and operates the home appliances, regulating it according to the conditions to which it is exposed. The remote mode is achieved using the mobile application that allows the user to control the appliances. Finally, in alarm part it controls the parameters that assure the security of the house when the owner is away from home. The objective of this work is to develop a smart and secure home (SSH) using Internet of Things (IoT) devices which can be controlled and monitored using android smart phone.

Keywords: Home Automation System, Fire Security System, Burglar Security System, SSH, IoT, Android Smart Phone

1. Introduction

Generally, smart and secure home automation system [1-12] focuses on the combination of both hardware and software devices and provides service through network for maintaining a better living. It allows us an automated home with security and we can also control it by using android based smart phones. Everything will be automated gradually in day to day life for living a better and secure life at homes. This work presents the basic design of safe, secure and smart home automation system with a wireless system and it is cost effective. Its main objective is to support elder and disabled persons. This system can be operated by the android smart phone. For connecting sensor with the network, IoT technique is needed. This is the most suitable technology for smart home system. A simple function of the automation home is to enable the tasks such as turning on/off home appliances. All the tasks are automatically done or it can be reported for monitoring. This system is user friendly and can be designed with low cost.

The main contributions of this paper are stated as follows:

- Smart home system is mainly designed for elder and disabled people. It performs the tasks by touch and voice commands and the smart android mobile device acts as a controller.
• Fire security system is designed to provide warning of fire, so that people can be evacuated and immediate action can be taken as soon as possible.
• Burglar security system is designed for safety of the home, if any intruder tries to enter the home then laser beam buzzer rings so that the house owner can be alerted.

The rest of the paper is structured as follows. Section 2 presents the related works. Section 3 presents the methodology. Section 4 presents the results and discussion. At last, we conclude at Section 5.

2. Related Works

In this section, some works related to home automation systems are focused. Mahmud et al. [13] focuses on the design of IoT based smart and low cost home automation system. This system can control all the home appliances as well as electronic machines and it can be observed through a website. This system can supervise the metering method of a home. The dealers and consumers can observe the power distribution system anomalies by the help of metering system. This system also used for online billing system. Lohan et al. [14] focuses on the development of several sensors such as temperature sensors, luminance sensors and motion sensors in home. This paper also focuses on the algorithm in order to save the light energy as well as air conditioners of the entire home. Susheela et al. [15] presents an assistive system which is based on eye tracking to control and monitor a smart home using IoT. This system can help the severe disabled persons to control the everyday equipments such as radio, television, fan and lamps in his/her home. Popa et al. [16] proposed a modular platform for smart homes which utilizes the power of cloud services for collecting, aggregating as well as storing all the data gathered for the smart environment. Afterwards, the data is used for generating the advanced neural network models in order to create energy awareness by advising the occupants of smart environment how to improve the daily habits with less energy consumption and less cost. Kumar et al. [17] focuses on the development of a system which allows the visually challenged for interacting with the electronic systems in their vicinity. The main aim of this paper is to overcome the limitations identified in previous systems and to enhance the access for the visually challenged. This paper focuses on the integration of two sub modules which allows the visually challenged for interacting with the electronic devices around them.

3. Methodology

IOT is responsible for connecting each and every network with a common controller. The smart home appliances can be controlled by using this technology. The proposed system deals with three major modules which are mentioned as follows:
• Smart Home System
• Fire Security System
• Burglar Security System

3.1 Smart Home System

Smart home system [1-12] is commonly called as home automation. It is a major part as it supports the elders and also disables persons to live comfortably. The home appliances do their task by giving the commands of host user by some remote controlling devices. In this work, Android smart phone devices are used and the connection mechanism is
described in Fig. 1. The IoT sensors are configured with appliances and make a smart phone as a controller for giving the commands to the appliances.

![Arduino connecting the devices](image)

**Figure 1. Arduino connecting the devices [22]**

This work is performed in two different modes such as touch mode and voice command mode. In touch mode, the interface application is opened by the help of smart phone and click on/off of the corresponding home appliances. In voice command mode, the command is provided through the controller and then the controller will do the task in order to on/off the appliances.

### 3.2 Fire Security System

Fire security system [18,19] is designed to work in wireless mode and it is cost effective. The sensor detects the presence of fire or flame based on the IR wavelength emitted by the flame. It gives logic 1 as output if flame is detected, otherwise it gives logic 0 as output. The Arduino board checks the logic level on the output pin of sensor and performs the task such as activation of buzzer and LED. The fire security system design is represented in Fig. 2.
3.3 Burglar Security System

Burglar security system [20, 21] is mainly called as laser security system. The laser door is based on the interruption of laser beam. The laser pointer is a light source. If an intruder tries to enter into the room then a bell is ringing with danger signal. This system architecture is described in Fig. 3.

![Figure 3. Burglar security system architecture](image-url)
The working of the proposed system is described in Fig. 4.

Figure 4. Pictorial representation of working of proposed system

4. Results and Discussion

The proposed system has two modes such as touch mode and voice command mode. In touch mode, the appliances are turning on/off by clicking the required options as mentioned in Fig. 5.
Figure 5. Touch command for operating the appliances

In voice command mode, the appliances are performing their tasks by saying some commands (voice commands) to the system as mentioned in Fig. 6.

Figure 6. Voice command for operating the appliances
In fire security system, when the sensor senses flame, it blows the buzzer with danger light signal and writes the message to the host user for calling 101 for help as mentioned in Fig. 7.

![Figure 7. Fire security system](image)

Home automation system makes the operation of various home appliances more convenient and saves energy with some security system like fire and burglar security system. It involves automatic controlling of all electrical or electronic devices in homes through an android smart phone.

5. Conclusion

This work focuses on the design of a smart and secure home automation system using IoT devices. This system can help the elder and disabled persons for maintaining a comfortable and secure life. This is operated in touch mode and voice command mode. This system is controlled and monitored using android mobile phone. In this system, fire alarm security and burglar alarm security are also provided. This system is designed to inform the users as soon as possible in emergency conditions. This system can be a better solution for the design of smart and secure home.

References


[22] https://www.circuito.io