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# Literature Review on Home Automation System

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**Abstract: One of the topics which are gaining popularity is Home Automation System because of its numerous advantages. Home automation refers to the monitoring and controlling of home appliances remotely. Due to never ending growth of the Internet and its applications, there is much potential and scope for remote access, control and monitoring of such network enabled appliances. A home automation system means to grant the end-users to manage and handle the electric appliances. If we look at different home automation systems over time, they have always tried to provide efficient, convenient, and safe ways for home inhabitants to access their homes. This paper deals with discussion of different intelligent home automation systems and technologies from a various features standpoint. The effort targeted on the home automation concept of where the controlling and monitoring operations are expediting through smart devices. Wide-ranging home automation systems and technologies are considered in review with central controller, cloud-based, Bluetooth-based, SMS based, ZigBee based, mobile-based, RF Module based, web based and the Internet with performance.**

**Keywords: Home Automation, Intelligence, Microcontroller, Raspberry pi, Sensor System, User-friendly Interface.**

## INTRODUCTION

Automation performs a vital role in daily experience and global economy. Engineers strive to combine automated devices with mathematical and organizational tools to create complex systems for a rapidly expanding range of applications and human activities. The concept of home automation has been around since the late 1970s but with the enhancement of technology and smart services, people's expectations have changed a lot during the course of time to perfectly turn the traditional house into smart home and also think that what a home should do or how the services should be provided and accessed at home to became a smart home and so has the idea of home automation systems. Many existing, well-established home automation systems are based on wired communication such as Arduino based and raspberry pi based home automation systems. This does not pose a problem until the system is planned well in advance and installed during the physical construction of the building. But for already existing buildings the implementation cost goes very high. In contrast, Wireless systems can be of great help for automation systems like Bluetooth, WI-Fi and IOT based home automation [1] systems. With the advancement of wireless technologies such as Wi-Fi, cloud networks in the recent past, wireless systems are used every day and everywhere.

Home automation systems suffer four main challenges; these are poor manageability, inflexibility, difficulty in achieving security and high cost of ownership. The main objectives of this research is to design and implement a home automation system using IoT that is capable of controlling and automating most of the house appliances through an easy manageable web interface. The proposed system has a great flexibility

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by using Wi-Fi technology to interconnect its distributed sensors to home automation server. This will decrease the deployment cost and will increase the ability of upgrading and system reconfiguration.

## DIFFERENT TECHNOLOGIES OF HOME AUTOMATION

### 1. Bluetooth based home automation system using cell phones:

In Bluetooth based home automation system [2] the home appliances are connected to the Arduino BT board at input output ports using relay. The program of Arduino BT board is based on high level interactive C language of microcontrollers; the connection is made via Bluetooth. The password protection is provided so only authorized user is allowed to access the appliances. The Bluetooth connection is established between Arduino BT board and phone for wireless communication. In this system, the python script is used and it can install on any of the Symbian OS environment, it is portable. One circuit is designed and implemented for receiving the feedback from the phone, which indicate the status of the device.

### 2. Zigbee based home automation system using cell phones:

To monitor and control the home appliances the system is designed and implemented using Zigbee. The device performance is recorded and stored by network coordinators for this the Wi-Fi network is used, which uses the four switch port standard wireless ADSL modern router. The network SSID and security Wi-Fi parameter are preconfigured. The message for security purpose first process by the virtual home algorithm and when it is declared safe it is re-encrypted and forwarded to the real network device of the home. Over Zigbee network [3], Zigbee controller sent messaged to the end. To reduce the expense of the system and the intrusiveness of respective installation of the system Zigbee communication is helpful.

### 3. GSM based home automation system using cell phones:

Due to the mobile phone and GSM technology, the GSM based [4] home automation is lure to research. The SMS based home automation, GPRS based home automation and dual tone multi frequency (DTMF) based home automation, these options we considered mainly for communication in GSM. The system use transducer which convert machine function into electrical signals which goes into microcontroller. The sensors of system convert the physical qualities like sound, temperature and humidity into some other quantity like voltage. The microcontroller analyzes all signals and converts them into command to understand by GSM module. Select appropriate communication method among SMS, GPRS and DTFC based on the command which is received by GSM module. The server application software can be accessed from internal network or from internet if the server has real IP on the internet using any internet navigator supports asp.net technology. Server application software is capable of maintaining the whole home automation system, setup and configuration. Server use database to keep log of home automation system components, we choose to use XML files to save system log.

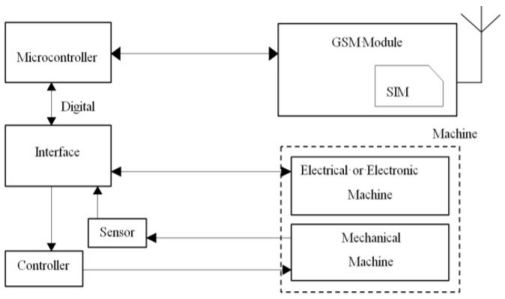


**Figure 1: Mobile-based Home Automation**

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**4. Wi-Fi based home automation system using cell phones:**

Wi-Fi based home automation system [5] mainly consist three modules, the server, the hardware interface module and the software package. The same technology uses to login to the server web based application. The server is connected to the internet, so remote users can access server web based application through the internet using compatible web browser. Software of the latest home automation system is split to server application software and Microcontroller firmware. The server application software package for the proposed home automation system is a web based application built using asp.net.

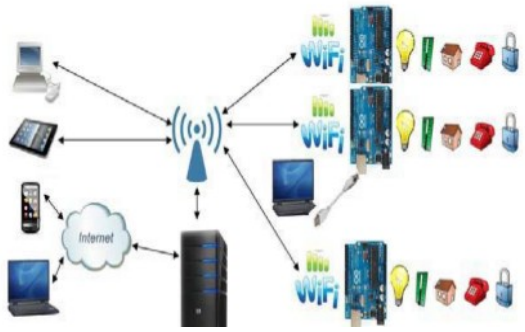


**Figure 2: The Home Automation System Layout**

**5. Home automation using RF module:**

The important goal of Home Automation System is to build a home automation system using a RF controlled [6] remote. Now technology is accelerating so homes are also getting smarter. Today traditional wall switches situated in various parts of the home makes it laborious for the end user to go near them to control and operate. Even further, it turns into more problematic for the old persons or physically handicapped people to do so. Home Automation using remote implements an easier solution with RF technology. In order to accomplish this, a RF remote is combined to the microcontroller on transmitter side that sends ON/OFF signals to the receiver where devices are connected. By operating the stated remote switch on the transmitter, the loads can be turned ON/OFF globally using wireless technology.

**6. Cloud Based home automation system:**

Home Automation using cloud based system focuses on design and implementation of home gateway to collect data from home appliances and then send to the cloud-based [7] data server to get store on Distributed File System, it is processed using Map and used to implement a monitoring tasks to Remote user. Presently home Automation System is persistently developing its resilience by assimilating the current characteristics which gratify the rising interest of the people. The current system consists of three important units: the first part is cloud server, handle and controls the data and information of client and users and the status of devices. The hardware interface module is the second part which implements the relevant connection to the actuators and sensing devices which give the physical service. Last part is Home Server, which construct the hardware device and gives the user interface. The current system is cost efficient, reliable and comfortable which also gives a secured home automation system for entire family.

**7. Raspberry pie based home automation with wireless sensor:**

Home Automation System has been developed with Raspberry Pi [8] by reading the algorithm and subject of Email. Raspberry Pi guarantees to be an efficient platform for implementation of powerful and economic smart home automation. Home automation using Raspberry pi is better than any other home automation methods in several ways. For example, DTMF (dual tone multi-frequency) using home automation, the call tariff is a big demerit, which is not the problem in their proposed method. In Home Automation using web server, the design of web server and the memory space required is dismiss by this method because it just uses the already

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established web server service given by G-mail. LEDs were used to identify the switching action. This System is efficient and flexible.

**8. Wireless Home Automation system using IoT:**

This system uses mobiles or computers to control basic home control and function automatically through internet from anywhere around the world globally, an automated home is sometimes called a smart home. It is meant to save the electric power and human energy. The proposed system is a distributed home automation system, consists of server i.e. Wi-Fi module, sensors. Server controls [9] and monitors the various sensors and can be easily configured to handle more hardware interface module. The Arduino board, with built in Wi-Fi module acts as web server. Automation System [10] can be accessed from the web browser of any local PC using server IP or remotely from any PC or mobile handheld device connected to the internet with appropriate web browser through server real IP. Wi-Fi technology is selected to be the network infrastructure that connects server and the sensors. Wi-Fi is chosen to improve system security and to increase system mobility and scalability.

**COMPARISON**

| Sl. | System | Communication on Interface | Controller | User Interface | Applications | Merits |
|---|---|---|---|---|---|---|
| 1. | Wi-Fi based using Arduino microcontroller through IOT | Wi-Fi | Arduino | Web Application and android App | Temperature and motion detection, monitoring and controlling appliances | Secure, Remotely controlled |
| 2 | Wireless Sensors based with mobile technology | cloud-based data server | PCB circuits | Mobile Application | Monitor the home conditions and power consumption of appliance | Low power consumption and cost efficiency |
| 3 | Bluetooth Based using Arduino | Bluetooth | Arduino | Python supported mobile | Controlling | Secured and Low cost |
| 4 | GSM Based Using Arduino | SMS | Arduino | Smartphone App | Control appliances | Simplicity |
| 5 | Cloud Based Using Zig Bee Microcontroller | Zig bee wireless Network | Smart Socket | PC or Android Phone | Entrance control management, monitoring the power consumption and temperature | Safety and Power saving |
| 6. | Web service and android | Web server and interfac | Raspberry pi | Android applicatio | Controlling shutter of | Autonomous |

| | | | | | | |
|---|---|---|---|---|---|---|
| | app Based using Raspberry pi | e card | | n | windo w | |

## CONCLUSION

Survey of different home automation system shows that there are several types of technologies used to implement this type of system. All the proposed systems have been presented and compared in this paper which presents some merits and demerits of the systems. This review explains different home automation system such as web based, Bluetooth-based, mobile-based, SMS based, ZigBee based, Arduino microcontroller based, Android app based, IOT based and cloud-based. Due to its performance, simplicity, low cost and reliability, home automation system is making its position in global market, that day is not so far when every home will be the smart home. This system is suitable for real-time home safety monitoring and for remotely controlling the home appliances and protecting from fire accidents with immediate solutions. The system may be employed in many places like banks, hospitals, and laboratories etc that dramatically reduce the hazard of unauthorized entry. Proof may be given to the safety department if any theft issue happens.

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