

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 6, Issue 11, November 2017

Survey of Home Automation Systems

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ABSTRACT: Home automation is becoming recognized globally because of its various benefits. Controlling and monitoring of electrical appliances in home or office by local networking, android phones or by remote control is known as home automation. Real-time resolution and automation for IoT (Internet of Things) can be achieved with the help of framework provided by artificial intelligence. This paper deals with discussion about different smart home automation systems and technologies from a various features standpoint. The work focuses on concept of home automation where the monitoring and control operations are facilitating through smart devices installed in residential buildings and offices. Wide ranging home automation systems are considered in review.

KEYWORDS: Home Automation, Android, Electrical devices, GSM, ZigBee, Smart Home.

I. INTRODUCTION

The technique of reducing human involvement in any process like controlling or monitoring of a device to a minimum is known as automation. The central aim of introducing automation in home or office is to provide an ease of controlling devices and reducing human efforts along with saving energy and optimizing resources. Industrialist and researchers are working to build efficient and affordability automatic systems to monitor and control different machines like lights, fans, AC based on the requirement. Automation makes not only an efficient but also an economical use of the electricity and water and reduces much of the wastage. Automation also provides a compatible level of security as it allows only authenticated users send and receives commands. In addition, this application is very useful in future as it provides a powerful means for helping and supporting special needs of the elderly and people with disabilities.

II. LITERATURE SURVEY AND RELATED WORK

Ahmed ElShafee, Karim AlaaHamed [1] proposed a design and proposed implementation of a home automation system that uses Wi-Fi technology as a network infrastructure to communicate with its sub-parts. The suggested system is divided in three major parts. First is the web server, which represents the core system that manages and controls home, for example, Local area network (LAN) or internet. The other part of the system is hardware interface module that provide interfacing with various sensors and components of home automation. The third and major part is the software package. Secured Wi-Fi technology is being used for communication within the system by logging into the server web based application and accessing other application using internet. According to the system, the appliance such as Serine, turning on and off of lights, AC, window shutters and different appliances can be controlled. This system provides flexibility also through the commercial point of view by providing proper security and connectivity.

B. Murali Krishna, V. Narasimaha Nayak, K. Ravi Kishore Reddy, B. Rakesh, P. Manoj Kumar, N. Sandhya [2] produces a Home Automation system which is controlled by using Android smart phone. Bluetooth module (HC-05) is being used to control different home appliances which are connected to the input and output pins of FPGA board and a serial communication between Bluetooth module and FPGA board is carried out. Bluetooth provides a simple and efficient communication path between different peripherals. HC-05 is comparatively a better module as it can easily switch between its master and slave mode and also after disconnecting from the peripheral it will start searching for other Bluetooth devices without any prerequisite command. Provided home automation system is secured and flexible

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and is controlled using an android application in a mobile phone. FPGA board is used to control the electrical devices which are connected to FPGA board through relay. A wireless communication between Bluetooth module and android phone is established. That module is serially connected to the FPGA board through RS-232 for the controlling of home appliances. The whole system is controlled using either AT commands or using the switches provided in the android application.

Eleni Isa and Nicolas Sklavos [3] proposes and implements a secured home automation system using GSM (Global System for Mobile). The introduced system operation is supported by a GSM embedded mobile module, which enables the alert messages transmission to both mobile devices of end users, and central security offices. The proposed system is implemented on a microcontroller module, through an embedded platform. System's operation is also based on cameras and sensors inputs. The proposed system operates on different levels of user's access control, based on passwords policies. Each time, the involved end users and the security offices, can be informed for attacks, operation modes changes etc., through SMS communication, via the available GSM network device platform. The proposed system design is based on a microcontroller device, embedded in an Arduino system module. A modern security system, of this kind, is connected with a variety of different peripherals and other devices. The given system I secured as the user has only three attempts to enter the right password. If user fails to do in given attempts, the system will notify about non-authorized user by setting an alarm and going to standby mode for few minutes set by the authorized user.

Archana N. Shewale and Jyoti P. Bari[4], proposes a home automation system using renewable energy based on ZigBee. The system is divided mainly in two parts. First is observation of energy consumption of home appliances done by ZigBee and second is observation of energy generation done by power line consumption(PLC). Solar power system is installed for the energy of the system. It consists of plc modems, solar panel and REG (Renewable energy gateway) for monitoring energy generation from the panel. The home server incorporates that energy and power data from lights and other outlets through ZigBee access point(AP). s. Users can graze the energy and power information and figure out the energy consumption of home equipments and lights, with the help of home server. Communication between power system and electrical appliances is done through MCU (microcontroller unit) via ZigBee which consists of application programming. The Home Server connects user interface to hardware interface. Home server sends command to microcontroller through ZigBee transceiver. Microcontroller receive signal and run accordingly to carry out specific operations required for controlling devices

DhakadKunal,DhakeTushar,UndegaonkarPooja,ZopeVaibhav and Vinay Lodha [5], proposed a smart home automation using IoT. The system is mainly divided into three sub-parts: server, microcontroller and peripherals. Server consist of a web application framework used to handle statuses of appliances. User can access the devices by using the web site. Microcontroller is used to provide the interface between peripherals and the server. Sensors are attached to the controller which is used to communicate with server via Wi-Fi. This is used to improve security system and also to increase scalability and mobility of the system. Peripherals consists of the electrical devices, for example, tube lights, fans etc. which shows the result. These peripherals are controlled using MCU unit. This system provides security and saves energy as it can be accessed by user even when he is far away from home via website where Wi-Fi is available.

Faisal Baig, Saira Beg and Muhammad Fahad Khan [6] proposes a system of controlling home appliances remotely through voice command using GSM technology. Two methods of controlling home appliances are discussed. First is controlling via voice to text SMS and another is using Mobile phone as a remote control. Process starts from a user with an android phone giving voice commands which is converted to text through android intent API 2.01 via mobile application. The generated commands are appended in SMS is sent through GSM network in the form of SMS commands received and read by the microcontroller via Bluetooth module. After completion of operation, microcontroller save the status of the devices and sends a feedback of the successful or failure of the operation. The proposed system can control devices via voice when the user is in remote area, and also it controls the appliances through home mobile.

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Satish Palaniappan, Naveen Hariharan, Naren T Kesh, Vidhyalakshimi S and Angel Deborah. S [7] proposes various systems on home automation controlled by different units.

One of the system is phone based home automation system. It is used to provide a common framework that provide facilities such as a system controller, house wide wiring and a common interface. Telephones are used for the transmission of the commands. The logic system the controller that is entirely build of electrical components. Power supply of the system is controlled by using DTMF transceiver which is interfaced with a solid state relay. AC power line carrier technology and infra-red signals can also be used for implementation of these system. After the inter facing of software and hardware, user is allowed to use the keypad tones to control the devices as required

Second system uses ZigBee wireless communication technology for home automation. The system also works on PIC controller and use voice recognition. The voice commands are taken from the mic, compares with the previously stored commands and processed accordingly. The controller then transmits the voice commands to the receiver using relay to control the respective appliances.

The other system uses wireless control systems for home automation. Wireless communication systems can be made by coupling standalone appliances and assimilating to form a co=operating network. Open Service Gateway Interface(OSGi) technology is used to craft this system. Different technologies are used to connect appliances. Application layer consists of web browsers, PC application and a central console. Appliances can also be controlled by voice commands. The main advantage of this system is sharing of services.

Monika M Patel, Mehul A Jajal and Dixita B vataliya [8], proposes a home automation system using Raspberry Pi. The proposed system uses Wi-Fi, based web server running on a PC. The system is divided in three main parts: web server, raspberry pi board and relay controlled unit. Web server connected via Wi-Fi to PC used by user to send commands to the appliances. Raspberry Pi board, providing interface between web server and appliances processes signals accordingly and transfers it to relay controlled unit. Relay controlled unit on receiving signals, working as a switch turn on or off the respective electrical appliance.

Neha Malik and YogitaBodwade [9] proposes various systems for home automation.

1. First is home automation using RF module. In this system, transmitting module consists of RF controlled remote which is connected to the microcontroller that sends ON and OFF commands to the devices that are connected to reception module. By performing functions on the remote switch on the transmitter, loads can be turned ON and OFF globally using wireless technology.
2. Second is home automation using Android ADK. The electrical appliances are linked to the input and output ports of the board (EMBEDDED SYSTEM) and their current status will be passed to the ADK. The system uses USB host connection so that it can be connected by Android phones. Providing microcontroller board (Arduino ADK) as an interface, users controls electrical devices through android phones.

Marvin R. G. Garcia, Hannah R. B. Chan, Benilda E. V. Comendador , Grant B. Cornell, Christopher D. Celestial, and Arc E. P. Mercolesia [10] proposes a system of home automation using Cloud computing. The system consists of collecting of on-line data of power consumption and then manipulating the power supply of connected electrical devices. Along with controlling of electrical devices, this system can generate reports on daily, monthly or yearly basis of cost or usage of electricity of each appliance connected to the system.

III. CONCLUSION

Survey of various home automation systems shows that there are numerous kinds of such systems are available which uses different kind of technologies. All the proposed systems have been presented and compared in this paper which reveals some merits and demerits of the systems. This survey explains different home automation system such as Web based home automation, Bluetooth-based home automation, mobile-based home automation, SMS based home automation, ZigBee based home automation, Arduino microcontroller based home automation, Android app based

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home automation, IOT based home automation and cloud-based home automation. Owing to its performance, simplicity, low cost and reliability, home automation system is commercialized in global market. In near future, there will be a day, where every home will be a Smart Home.

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