

SMART HOME USING WI-FI

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Abstract– The technology is a never ending process. The home automation technology is to provide an efficient automation based system to control everyday home appliances. The system offers users an easy & effective means of controlling their various home appliances from a remote location. This project presents the design and implementation of flexible and secure Wi-Fi based home automation system.

Recently, ZigBee and Bluetooth has become one of the most promising technologies for home automation, but it is complicated to form a network for ZigBee and Bluetooth provides short range. So we are using Wi-Fi technology which is simple to implement and which is more advanced.

The Wi-Fi based project includes controlling the appliances using wireless network. A Smartphone based application will be used to control the home appliances. This controlling will be performed with the help of AVR processor and the driver circuitry, which will drive the various appliances like, light, heat, humidity, ventilation etc.

This project offers a new approach to control home appliances from a remote terminal, with the help of Wi-Fi module, which can provide controlling over longer range.

The communication between the smart phone application and the processor will be using the Wi-Fi technology, which is the wireless technology. The Wi-Fi based on the standard IEEE 802.11n that is the wireless LAN (WLAN) protocol. The basic vision of the system is to provide a convenient & secure system to the user, which would aid the high degree of mobility.

Index terms- microcontroller AVR, Switching circuit, Wi-Fi module, Smartphone.

I. Introduction

Wireless technologies are becoming more popular around the world and the consumers appreciate this wireless lifestyle which gives them relive of the well-known cable connection that tends to grow under their desk. Now with the Wi-Fi technology, digital devices form a network in which the appliances and devices can communicate with each other. Today, home automation is one of the major applications of Wi-Fi technology. Operating over globally available frequency of 2.4/5 GHz, it can link digital devices within a range of 70 to 250 m at the speed of up to maximum net data rate from 54 Mbit/s to 600 Mbit/s depending on the device class. With this capability of Wi-Fi we propose a home automation system based on Wi-Fi technology [1].

There are few issues involved when designing a home automation system. The system should be scalable so that new devices can easily be integrated into it. It should provide a user- friendly interface on the host side, so that the devices can be easily setup, monitored and controlled. This interface should also provide some

diagnostic services so that if there is any problem with the system, it can be tracked down [4]. Moreover the overall system should be fast enough to realize the true power of wireless technology. Finally the system should be cost effective in order to justify its application in home automation [2].

The aim of this project is to develop the Wi-Fi based system to control the everyday home appliances. The system offers users an easy & effective means of controlling their various home appliances from a remote location i.e. without physically being present at home. The system makes use of the Wi-Fi to enable remote access to the various home appliances. In recent years, the people are getting aware about the importance of the electricity, water etc. and they try to minimize the wastage of such things at their maximum level. This project is a small attempt to reduce the human work for saving these energies [5].

II. Objective of System

- To form wireless network with the help of Wi-Fi module
- To establish communication between the Smartphone application and the system placed in the field of interest.
- To transfer the data between Smartphone application and Wi-Fi module.
- To test the system for the expected results.

III. Block Diagram

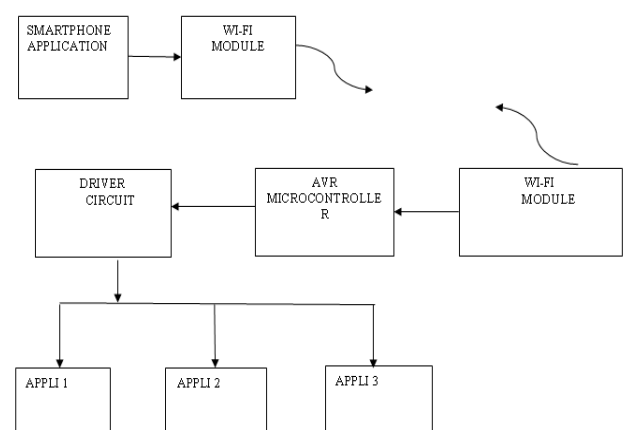


Fig: block diagram

The system works using the Smartphone application. The Smartphone application is nothing but an android application which is the main source for giving the instruction to the Wi-Fi module. The transmitter of Wi-Fi transmits the data given by the application using radio waves technology.

The Wi-Fi works on radio waves technology, as the data to be passed through Wi-Fi is converted into the electromagnetic signal which is then sent using the antenna. This signal is received and decoded by the router at the receiving end. This signal is passed to the controller which is nothing but AVR controller.

The AVR further operates the received information and performs operations on the appliances, which are driven by the driver circuitry.

IV. Design Components

The system contains both hardware & software components which are classified as follows

Hardware Components

Microcontroller:

The microcontroller used is the brain of the entire system. It will receive the commands executed on the remote server and compute the appropriate instructions to control the home appliances

Wi-Fi module:

This machine serves as a focal point in the system. It acts as a bridge between the user (remote machine) & the various home appliances. It also acts an interface to the microcontroller.

Specifications of module:

- Wi-Fi module : IEEE 802.11n
- Operating frequency 2.4GHz-5GHz
- Range 30m to 140m
- Data transfer rate of Wi-Fi 160Mbps
- Bandwidth of Wi-Fi 20MHz

Driver circuit (Triac):

Driver circuit is nothing but a switching circuit, which provides actual connection between our circuits to the appliances. We are using the Triac for switching purpose.

Home Appliance:

The home appliances must be connected to the main power supply at all times. This is a precondition for the system. The various aspects of the system which can be controlled are:

- a. The appliances status (ON/OFF)
- b. The output power of the appliance
- c. The time for which the appliance is running.

V. Dataflow diagram

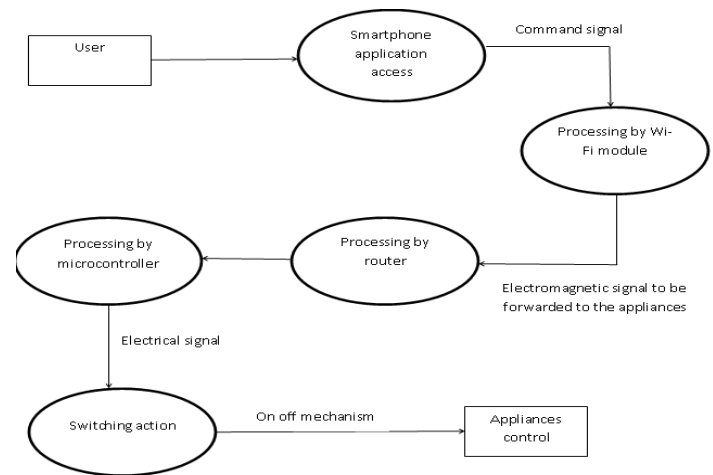


Fig: dataflow diagram

VI. Advantages

- *Convenience*- It provides the user with comfort & convenience since the user can control the connected home appliances from any remote machine having Wi-Fi connectivity.
- *Real-time Control*- User can monitor the real-time status of each of the connected appliances and make adjustment as & when he/she feels it necessary.
- *Addition of appliance*- Enables users to add an appliance with ease & simplicity. The overhead of adding an appliance is very low & is restricted to the hardware required.
- *Security*- The system can be employed as a very efficient security tool by connecting cameras, motion & light sensors etc to the system. The status of these sensors & monitors can be monitored from a remote location & can be used to gather security information about the home in general & take the required measures for the same.

VII. Limitations

- *Connectivity*- the Wi-Fi module and Smartphone may lose the connectivity sometime; this will make the circuit to stop responding to user's commands.

VIII. Conclusion

The system for the "Home Automation" has a vast scope & almost limitless application in today's technology driven market. The system can be made efficient by modularizing each and every component of the system hence ensuring that it can be integrated with a varied range of devices. The basic vision of the system is to provide a convenient & secure system to the user, which would aid the high degree of mobility

This Project presents a theoretical approach and a practical implementation of Wi-Fi based communication is low cost microcontroller based embedded systems. The proposed method utilizes the Wi-Fi network to transfer data between

the Host smart phone and the embedded system. The proposed communication is based on TCP data transfer and it utilizes a Wi-Fi *Module HLK-RM04* to switching circuit data and to the Wi-Fi network. The ease of implementation is seen through the use of standard SPI communication between the Wi-Fi module and the embedded device, simplifying the implementation in existing embedded systems.

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X. References

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