

Android Based Home Automation Using Raspberry PI

¹Baswaraj Hodge, ²Eshwar Joshi, ³Shubham Khandelwal & ⁴Yash Kothari.

^{1,2,3,4} Department of Computer Engineering, Savitribai Phule Pune University, Pune

⁵Professor, Dept. of Computer, Sinhgad College of Engineering, Pune Maharashtra, India

Abstract: This project presents the overall design of Home Automation System (HAS) with low cost and wireless/voice command remote control. This system is designed to assist and provide support in order to fulfil the needs of people. Also, the smart home concept in the system improves the standard living at home. The main control system implements wireless/voice command technology to provide remote access from smart phone. The design remains the existing electrical switches and provides more safety control on the switches with low voltage activating method. The switches status is synchronized in all the control system whereby every user interface indicates the real time existing switches status. The system intended to control electrical appliances and devices in house with relatively low cost design, user-friendly interface and ease of installation.

Keywords: Home Automation, Smart home, Home appliances, Android device.

1. Introduction

This project is basically divided into two parts – User uploading the data and searching the query.

In the computer science, more and more tasks are becoming automated. Automation can make things easier, safer, and often more cost efficient. What was once the stuff of world's fairs and science fiction being today a reality, so learn about the benefits and capabilities of applying today's technology to your home.

Home automation is a general term that covers a variety of technological capabilities you can install in your home. Home automation can include controlling aspects of your home remotely through a computer or phone, programming electronic devices to respond automatically to certain conditions or scenarios, or

centralizing the control of a variety of items in your home into a single control center.

2. Literature Survey

2.1 X10:

This granddaddy of home automation protocols dates back to the 1970s and has gone from power line-based to wireless. X10 is not known for robust speed or great communication between units on the home automation network. Because X10 products talk over your home's electrical wires they may have difficulties in two situations.

The first is when there is an appliance running that generates noise onto the power line. Appliances that may cause problems are motors and advanced electronics. The second issue with X10 is when your X10 transmitter is on one phase of your home's electrical wiring and the receiver is on the other side. Many times the signal either bridges the two phases at the transformer at the street or via some 220V appliance in the home.

2.2 Zigbee:

It is based on wireless 802 standards from the IEEE. The ZigBee Alliance is made up of vendors who made products to work with it. It uses one of the key elements in IEEE 802.15.4 which makes a mesh network so that most of the devices communicate equally. It also consumes very low power and uses a mesh network structure to offer excellent range and speedy communication between devices. However, some users have noted that ZigBee devices frequently have difficulty communicating with those made by different manufacturers, so it might not be the best option if you are looking for seamless interoperability.

2.3 Z-Wave:

Z-Wave is a wireless home automation protocol that runs on the 908.42MHz frequency band. Its relatively new in terms of home automation protocols, but has grown quite rapidly in the past few years. The group behind it, the Z-Wave Alliance, now boasts over 1,000 different compatible devices, giving you a wide range of options when it comes to automating your home. One of the key features of Z-Wave is that it utilizes a type of network called a mesh network, which essentially means that one Z-Wave product will pass the signal along to another until it reaches its intended destination. This relay system greatly extends its range. It's also extremely low power, which is ideal for devices that rely on battery power. Z-Wave-enabled devices create a mesh network between them, and it gets more strong like- bull the more devices you add. All Z-Wave modules are produced by a single manufacturer, Sigma Designs. In order for a manufacturer to sell a device, it should be able to talk.

2.3 Insteon:

Insteon may be the best of all protocols because it combines wired power line-based protocol with wireless. Both perhaps work as a mesh; all nodes on an Insteon home automation network are peers that can communicate when in proximity. If one fails, the other mesh can take over. You can buy Insteon devices at Smarthome.com, which is run by Smart Labs, the developers of Insteon. It's compatible with X10. Insteon is a home automation protocol designed to bridge the gap between powerline-based and wireless protocols, so it uses both. It is also compatible with x10 devices, so it is not a half bad choice if you've got a house filled with X10 stuff already and are looking to transition to wireless.

3. System Architecture Overview

Home appliance network (home automation) is required to be without new wiring and to be very easy installation. Field of home appliance network is still young, many initiatives and standardization efforts have already been made. the new kind of system brought android and raspberry-pi into home automation implementation. The proposed system architectures generally incorporate a raspberry-pi computer for the purposes of network management and provision of remote access raspberry-pi can be configured according to our home system. The user will communicate to raspberry-pi through Wi-Fi

network. The system is flexible and scalable, allowing additional home appliances designed by multiple vendors, to be securely and safely added to the home network with the minimum amount of effort. the Wi-Fi network should be having adequate strength also. we can use a Wi-Fi modem for steeping a Wi-Fi. the user can have a nice android interface for using the system. The serial data coming from Wi-Fi unit is connected to raspberry-pi circuit. The core of the home automation system consists of raspberry-pi board. it can be viewed as a mini computer capable of doing many functions. The raspberry-pi board is configured for each home appliances .so according to user intervention the matched out will make high and the corresponding relay will switch on and device start function. The system is scalable and allows multi-vendor appliances to be added with no major changes to its core. This project mainly consist of three modules as follows.

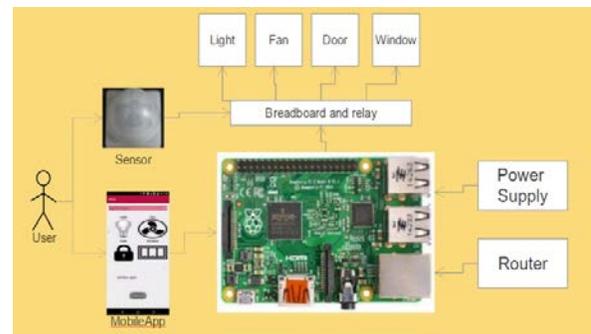


Fig. 1.

4. Methodology:

1.Device Used: The devices used are an Android-based smartphone, a raspberry pi and sensors. These devices made it relatively easy to acquire data to be thoroughly process. Given its mobility and rise in popularity the past few years, a smartphone-based home automation makes these findings unique and applicable for future implementations. The raspberry pi is used to process the input taken from mobile application and sensors. It is connected to relays which is further connected to switch which is used to toggle the appliances state.

2.Efficiency issues and methods to solve:
Sensors detections are coming under efficiency issues means sometimes motion sensor detect object other than user or human being and it will turn on the lights or do other tasks which are scheduled to the sensors. And in temperature detection scenario sometime user is not in home but temperature sensor detect temperature beyond its threshold value so it turns on

AC or fan. So this is not efficient for the project. so there are different methods are introduced to solve this problem the method is that user measurements are known to the motion sensors and temperature sensor is associates with motion sensor so that unless and until motion sensor detect the presence of user. Conflict between various input is one of the biggest issue in the project. when user is at home then he might give input from mobile application to turn off the lights but sensor detect the user presence so it will turn on lights again .so user get frustrated. to solve this problem, it should work under priority situation means different input get different priority i.e. to turn on the appliances sensors has highest priority and to turn off appliances application has highest priority. And after taking input from application as turn off the appliances sensor must go in sleep state for particular time given by the user and sensors break its sleep state after that particular time period to sense the user.

5. Conclusion and Future Scope

This project introduces Android Based Home Automation System Using Raspberry Pi. We analyzed other existing technologies what are their advantages and drawbacks and how our proposed system will be better than them. It also contains the design analysis part which include the scope of the project, feasibility analysis, use case diagrams. The design and plan analysis part would help us in developing the project more efficiently.

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