

Home Automation System Using Android and Internet

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Abstract: *The most clamant need of today's generation, in view of the sedulous and busy life of people around, the need of some technique, which makes our life safe, and at the same time energy efficient. The concept of automation creeps from this very need-the need to control things to make life secure. But the attempts would be successful only with the right technology. We have started automating with this maiden effort of home automation. Home automation engulfs the idea of controlling lights and fan. The most luring feature which makes it so unique and particular beside the fact that it runs on world wide web is that it has the user end fixed as Android, which, today has emerged as the most lucrative and user friendly technology We have emulated this idea of combining Android platform along with Internet to save electricity. This maiden effort can well be applied to any electrical appliance since here we have restricted ourselves with switching on and off the lights and a fan along with controlling its speed. This automation system needs a dedicated computer machine, which serves the purpose at the spot of automation.*

Keywords: Android Application, Wi-Fi, Automation, Home, GUI, HASs and AVR.

1. Introduction

Home automation could be described as a system architecture designed and implemented at a residing place where the aim is to convert the place from a dull, non-interactive place to intelligent and efficient energy saving place. When in effect, it may also serve the side purpose of making our home secure. Our system has the greatest quality of portability since it doesn't entail huge machineries and hardware components. Indirectly, it makes our system easy to install and re-install at any given place. Earlier system, which served for this purpose, was done with the help of Bluetooth, GSM and ZigBee. Each of these tech giants had their own demerits. The main demerit of ZigBee is that the BW (bandwidth) is too less for proper transferring of data. The problem reverses itself as soon the GSM bound systems come into play. Thus, the very important resource of crucial BW (bandwidth) is wasted! The software-based approach of SMS is too expensive to handle, since the data charges of the network provider always incurs. Our system uses Internet in experimenting with this effort. What pivotal key point here to be noticed is that our home automation system (HAS) runs practically at any place in the world provided it has internet access. Another important point to be noted is that the computer, which has the Internet access at the implementation place, should have a static IP address. This feature sits as one of the most important demerit in our system. We have a very little hardware setup known as an AVR called ATmega16 microcontroller which establishes a connection between the physical entities and

the Android device. The C-code is hard-coded in the micro controller, which directs the action and sends signal to the

appliance. Some remotely sitting user who has to operate on the appliances at his home uses the android application. As soon as he presses the required button the appliances obey his command at the other end of the system, thus giving him a full-fledged access to control the devices.

2. Related Work And Literature Review

R.A Ramlee, M.A. Othman, M.H. Leoung, M.M. Ismail, S.S.S. Ranjit [1] has implemented the HAS using Wireless Bluetooth Technology. The work from the paper has extended the system by keeping the physical switches where the 5V switches replaced the conventional switches, which guarantees that electric shocks don't take place. This is to ensure that safety must be of the prime concern at home. The system is implemented with the help of Bluetooth module, which is of the measure of frequency 2400 Hz and is able to provide connectivity up to 100 meters at the speed of 3 MBPS. Moreover, a group of devices not exceeding than 7 can be interfaced in a Picante.

Deepali Javale, Mohammad Mohsin, Shreerang Nandanwar and Mayur Shingate [3] has designed a standalone embedded system board Android ADK (Accessory Development Kit) at home. Home appliances, which are to be automated, are interfaced to the ADK and then data is communicated between Android device and ADK. Appliances are connected to the I/O ports of the embedded System and the status is passed to the ADK. The embedded System used here is Arduino Embedded System.

Shaiju Paul, Ashlin Antony, Aswathi B [4] implements this project via Android devices using Wi-Fi as communication protocol and a Raspberry Pi as Server system. The above said server is connected with a relay circuit, which controls the devices at home. Raspberry Pi board is considered to be the mini-processor which ensures that it has a setting up of and selecting raspbian OS from noobs package.

3. Motivation

Having listed the above-implemented systems for home automation we concluded that there might be some more methods to make it more august. Then we found out that the main demerit which outdoes these systems were mainly the mediocre effective communicating area. Therefore to make it more practically viable we thought to implement it on the World Wide Web, which makes it easily accessible pragmatically throughout the globe. It although, has some scope for improvement in the future, it can really serve the purpose for the day! We were pleased to work on this embedded system project since today's world demands everything automated because lives have become busier and the very little nuances in life that may make big differences must demand little attention.

4. Methodology

The system, which we have implemented fairly, takes a front seat from the rest of the implemented systems. Our Home Automation System (HAS) has been the interface of more than one technology. The main advantage of this system is that it has the widest range, possibly the entire globe. This system can be extended to a properly a deployable HVAC (Heating, Ventilation and Air Conditioning) system. Our project can be studied by dividing it to the following parts:

a) Android:

Android is the operating system, which is based on Linux and developed by Google. Google releases android's source code under open source licenses. The operating device, which we are using, is a Android mobile phone .An Android version anything above Ice Cream Sandwich (4.0 to 4.0.4) has been found suitable for running this system. The Android code is installed as an executable on the phone, which communicates with the java server on the Computer System.

b) PHP:

PHP (recursive acronym for *PHP: Hypertext Preprocessor*) is a widely used open source general-purpose scripting language that is especially suited for web development and can be embedded into HTML. It is through PHP, that we can communicate with the server at the other end. PHP is always at the server side to help communication take place.

c) Java:

All our communication is between the Android and the Java Server. We have built a communicating module in Java with the help of Sockets.

Normally, a server runs on a specific computer and has a socket that is bound to a specific port number. The server just waits, listening to the socket for a client to make a connection request.

d) Microcontroller:

ATmega16 is the microcontroller, which we are using in this process. It is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. Atmega16 is based on enhanced RISC (Reduced Instruction Set Computing) architecture with 131 powerful instructions. Most of the instructions execute in one machine cycle. Atmega16 can work on a maximum frequency of 16MHz. ATmega16 has 16 KB programmable flash memory, static RAM of 1 KB and EEPROM of 512 Bytes. The endurance cycle of flash memory and EEPROM is 10,000 and 100,000, respectively.

e) *Relay*: A relay is an electrically operated switch. An electromagnet is used to operate the circuit. Thus we use here relays to switch the electrical appliances on and off.

5. Brief Description

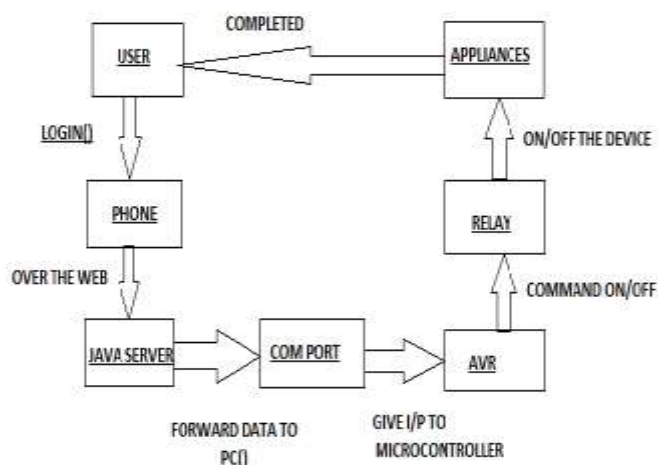


Fig 1: Collaboration View

Keeping in mind, brevity of space, we provide a brief description of the actual working of the project. The user controls the appliances through the mobile phone, which runs on the Android platform. We have made an application and installed into executable file into our phone. Fig 1 shows that the next step towards approach is the Java Server. But this happens only through an intermediate stage of PHP. Normally, every time the PHP is at the server side. This data then comes into AVR microcontroller with the help of COM port. A communications (COM) port is a serial data port on the computer, used to communicate with other devices. It may be a physical port on the back of the computer, through which an external modem or a mouse would connect. An external COM (serial) port has a 9- or 25-pin male connector. The AVR is an ATMEGA16 microcontroller, which receives data. This in turn interprets the data according to the hardcoded embedded C. Each appliance has different symbol for interpreting the state of the device.

For example, f represents an off fan and F represents an on state. Now the relay is responsible for switching on and off the appliance. When connecting to the home machine the user is required to punch in the IP address in the phone application. The above collaboration diagram gives a visual explanation of how the home automation system works as a tied up procedure

intertwined between more than one technology. Now we give an experimental result as to what our project looks like through the mobile phone application.

6. Experimental Results

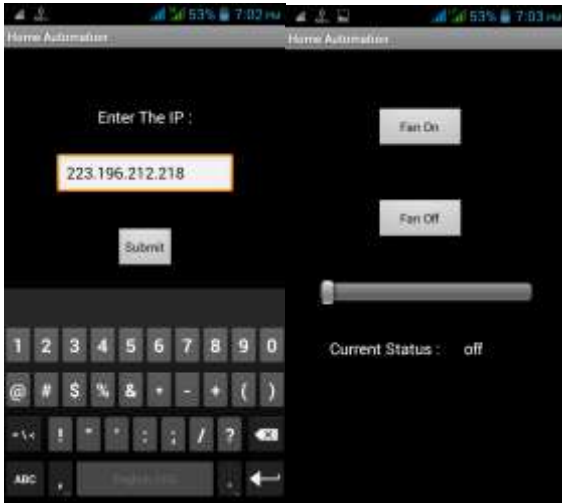


Fig 2: Home Page Screenshot

Fig 3: Fan Status Off

The Fig.2 shows the screenshot of the application of the mobile phone. Here we have correctly entered a static IP address. The next page directs us to the appliances connected to the pins of the microcontroller. The required appliance is selected. Here we have selected the fan icon (Fig. 3). As soon as the "Fan on" button is clicked, it soon gives a pop up message to the user. Next we can also control the speed of the fan in a limited measure.

7. Conclusion

In spite of the holding away features of the system, it can become the most successfully implemented Home Automation System. The main advantage of this system is that, firstly it inculcates the sense of saving energy in a tech-efficient way. Besides, it also has a very low cost of implementation since the way of communication is only through Internet. The widely arguable disadvantage, which can be a future scope as well, is that it can only use a static IP address. Also, this automation requires a dedicated computer system throughout its working.

8. References

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