

IoT Based Home Automation using Android

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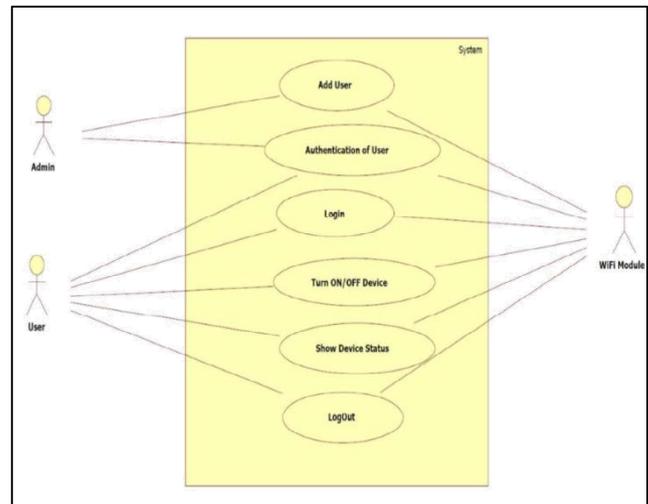
Abstract— Today’s world has seen rapid and lucent spread of Android Devices. Any system, thus, developed which has support of the ubiquitous Android enabled devices will be much appreciated. Our project is based on this idea along with the much-needed Automation System interfaced with the Android Systems. We have harnessed the easy to-understand Android GUI to a constructive work whereby we see to it that the IPNF is automated and energy is saved. This makes our class intelligent enough to save electricity, which I s the need of an hour. We have elucidated this idea into realization with the help of Wi-Fi technology, which really offers easy and really much awaited Home Automation Systems (HASs). This system has an upper hand from other similar developments made with the technologies such as Bluetooth since it works on Wi-Fi. Thus we have offered a scalable and cost-effective Home Automation Systems (HASs).

Keywords: GUI, HAS, Android, Bluetooth

I. INTRODUCTION

Home automation can be defined as a system implemented at a residential place whereby the intention is to make the place intelligent so that energy is conserved and security is maintained. It makes the life of the resident’s flexible, healthy and comfortable. Initially systems were developed in this regard but those systems had to be deployed on Internet and heavy machineries like a big Personal Computer. Our system will be free from all this giant components, which, indirectly suggests that our system has a good quality of portability. Most systems would exchange data or would communicate with the help of Bluetooth, ZigBee and GSM. These systems have their own disadvantages. For example, system-implementing ZigBee has too low bandwidth for the data communication whereas the GSM implementing system has too large bandwidth for the data communication. Thus, there is wastage of the essential bandwidth, which goes without being used. The other systems, which were in use, are, for example Java Based Systems and SMS based systems. Java Based Systems still use web pages, which is a disadvantage if data intranet or Internet is off. SMS based system is more costly since it requires data transfer from the real time service provider. This Wi-Fi protocol has some upper hand benefits like its range is in the radius of 150-200m. The mobile application can also extend the security of the system via an implementation of the password protected application. The hardware of the system is Wi-Fi module, which is NodeMCU-ESP2866 to provide a link between the switches and the Android device.

II. IMPLEMENTATION STEPS FOR MODULE



- Module 1: Admin
- Module 2: User/Client
- Module 3: WIFI Module

A. Module 1: Admin

The system administrators are wide-ranging, and vary widely from one organization to another. Sysadmins are usually charged with installing, supporting, and maintaining servers or other computer systems, and planning for and responding to service outages and other problems. Other duties may include scripting or light programming, project management for systems-related projects. The operating device or the controller we are using is an android phone. It operates on Gingerbread OS (API level 8) with 835MHz single-core processor. The executable application is installed on the device with communicates with the server (PC), which in turn send communicates with the client modules or the house appliances through a relay board designed for parallel interfacing.

B. Module 2: User/Client

Automated controlling of home appliances in automation system can help home and organization, industries and in many ways. There is no doubt that an automation system will help save time and money by eliminating a great deal of manual processes involved in controlling appliances. With automation system, users can more accurately and quickly track status of appliances presents in the home.

C. Module 3: WIFI Module

The communication link needs more security. The Wi-Fi protocols provide more security for secure connection. Basically there are two methods to create a link. The first one is using IP address of the Wi-Fi module directly coded into

the app for initial testing. The second one is, it allow users to search for the device, which becomes a final decision. Then user can select the device from a list, for making connection. In this Android Application the first method is selected. The basic steps for connecting to wife module were the same for both versions of the application. Once got it address of the destination then user can create socket with Wi-Fi module.

III. ACTIVITY DIAGRAM

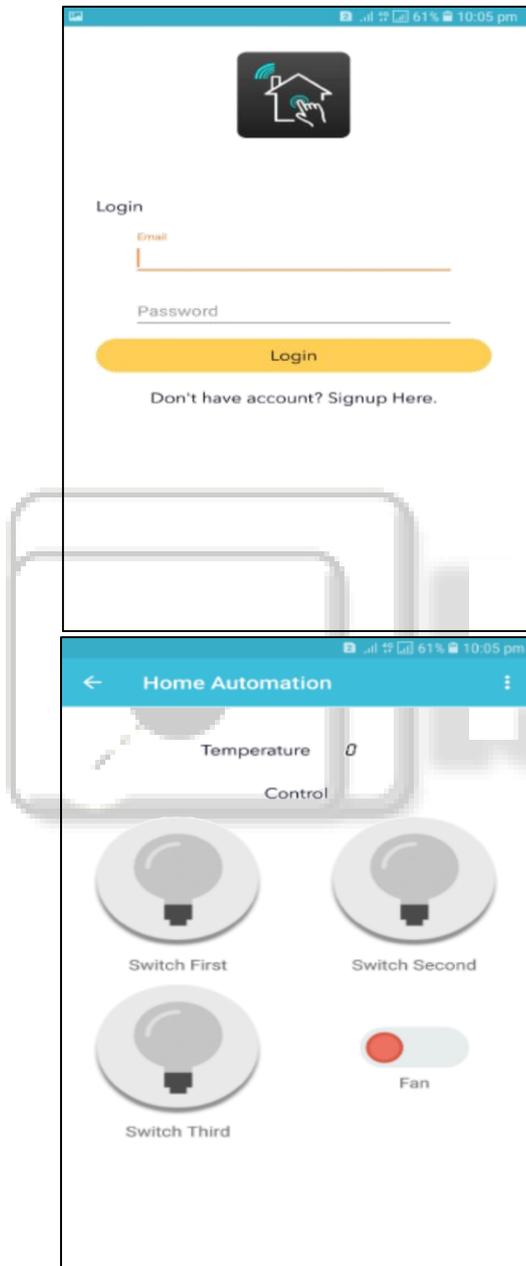


Fig. 2: switch on and switch off activity on android application

A. Mathematical Model

When solving problems we have to decide the difficulty level of our problem. There are three types of classes provided for that. These are as follows:

- 1) P Class
- 2) NP-hard Class
- 3) NP-Complete Class

1) P Class:

Informally the class P is the class of decision problems solvable by some algorithm within a number of steps bounded by some fixed polynomial in the length of the input. Turing was not concerned with the efficiency of his machines, but rather his concern was whether they can simulate arbitrary algorithms given sufficient time. However it turns out Turing machines can generally simulate more efficient computer models (for example machines equipped with many tapes or an unbounded random access memory) by at most squaring or cubing the computation time. Thus P is a robust class and has equivalent definitions over a large class of computer models. Here we follow standard practice and define the class P in terms of Turing machines.

2) NP-hard Class:

A problem is NP-hard if solving it in polynomial time would make it possible to solve all problems in class NP in polynomial time. Some NP-hard problems are also in NP (these are called "NP-complete"), some are not. If you could reduce an NP problem to an NP-hard problem and then solve it in polynomial time, you could solve all NP problems. Also, there are decision problems in NP-hard but are not NP-complete, such as the infamous halting problem.

3) NP-complete Class:

A decision problem L is NP-complete if it is in the set of NP problems so that any given solution to the decision problem can be verified in polynomial time, and also in the set of NP-hard problems so that any NP problem can be converted into L by a transformation of the inputs in polynomial time.

The complexity class NP-complete is the set of problems that are the hardest problems in NP, in the sense that they are the ones most likely not to be in P. If you can find a way to solve an NP-complete problem quickly, then you can use that algorithm to solve all NP problems quickly.

IV. CONCLUSION

The goal of the project is to design a system, which will be easy to implement, and short ranged. The project is implemented through onboard Wi-Fi, which is inbuilt in the mobile phones having an Android as its system. Implementing the actuators for door systems for more security aspects can increase the future scope of this project. WiFi technology capable solution has proved to be controlled remotely, provide class security and is cost-effective as compared to the previously existing systems. Hence we can conclude that the required goals and objectives of class automation system have been achieved. The system design and architecture were discussed, and prototype presents the basic level of home appliance control and remote monitoring has been implemented. Finally, the pro-posed system is better from the scalability and flexibility point of view than the commercially available class automation systems.

V. FUTURE SCOPE

Implements more hardware interface modules, and modify server application software to handle them. Modify hardware interface module to be able to communicate with sensors and actuators that use wireless technologies like X10, Zigbee, etc. By doing this system will increase system mobility, configurable, and scalability. More intelligent should be

added to hardware modules to make them capable to take decision according to triggered alarms. Without referring to server for each event and action. That will increase the response time of the system. While hardware interface module reports server with events and actions in pre-programmed intervals. Replace the WiFi module with more reliable and stable WiFi module, to increase system reliability.

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