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IOT BASED SMART HOME, SECURITY CHALLENGES, SECURITY REQUIREMENTS AND SOLUTIONS

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ABSTRACT

Home Appliances control systems faces four main challenges, these are high cost of ownership, inflexibility, poor manageability, and difficulty in achieving security. The main objectives of this paper is to design and implement a home appliance control system using IOT that is capable of controlling and automating most of the house appliances through an easy manageable Android app interface. The proposed system has a great flexibility by using Wi-Fi technology to interconnect its App to the server. This will decrease the deployment cost and will increase the ability of upgrading, and system reconfiguration. Also this system is a boon for the Elderly people and physically challenged persons.

I. INTRODUCTION

Homes of the 21st century will become more and more self-controlled and automated due to the comfort it provides, especially when employed in a private home. Home Appliances controlling system is a means that allow users to control electric appliances of varying kind. Many existing, well-established home automation systems are based on wired communication. This does not pose a problem until the system is planned well in advance and installed during the physical construction of the building. In contrast, Wireless systems can be of great help for automation systems. With the advancement of wireless technologies such as Wi-Fi, cloud networks in the recent past, wireless systems are used every day and everywhere. (silva., (2009) Electronic and Electrical environment with respect to this context is any environment which consists of Appliances such as fans, television sets, air

conditioners, motors, heater, lighting systems, etc. A remotely accessible environment is an environment in which each appliance can be remotely accessed and controlled using software as an interface, which includes an Android application and a Web application. Such remotely accessible systems are already available in the market, but have a number of drawbacks as well.

Many Authors Developed Home Appliance control using Different technologies. Using GSM module Home Automation we need to call/message to control a Home Appliance. This method has a major disadvantage of Time delay and Complex system. By using Bluetooth based Home Automation we can control the Appliances but the disadvantage is that the Range. In this paper ON/OFF functionality is implemented and all the Home appliances are controlled using the Android Application.

II. Home appliance control

Automation of the surrounding environment of a modern human being allows increasing his work efficiency and comfort. There has been a significant development in the area of an individual's routine tasks and those can be automated. In the present times, we can find most of the people clinging to their mobile phones and smart devices throughout the day. Hence with the help of his companion − a mobile phone, some daily household tasks can be accomplished by personifying the use of the mobile phone. Analysing the current smart phone market, novice mobile users are opting for Android based phones. It has become a second name for a mobile phone in layman terms. Remote controlling of Home Appliances has been designed for mobile phones having Android platform to control an Arduino microcontroller which controls a number of home appliances like lights, fans, bulbs and many more using relay. This paper presents the approach of remotely controlling the devices in a household that could ease the tasks of using the traditional method of the switch. This paper propose the Home Appliances control system using Arduino Microcontrollerthat receives the data fromthe Android mobileand controls the Home Appliances in any home environment / Remotely through IOT.

2.1. Proposed System Feature

The proposed system consists of an Arduino Microcontroller with Ethernet Shield which acts as a server and a Relay to control the Appliances as shown in figure.2.1. The Ethernet Shield, with built in Ethernet port to which the LAN cable is inserted, acts as web server. Appliance control System can be accessed from the Android app of any Android Mobile in the same

LAN/ Wi-Fi using server IP, or remotely from any mobile connected to the internet with appropriate Android app through server IP (Internet IP). Wi-Fi technology is selected to be the network infrastructure that connects Server and the Android App. Wi-Fi is chosen to improve system security (by using secure Wi-Fi connection), and to increase system mobility and scalability.

The below figure 1 shows the Block Diagram of Home appliance control System using Android Application. In this System Hardware ComponentsArduino UNO, Arduino Ethernet Shield, Router, Relays, and Electrical Appliances Light, Fan, Etc. has been used to implement the Hardware setup of the Home Appliance Control.
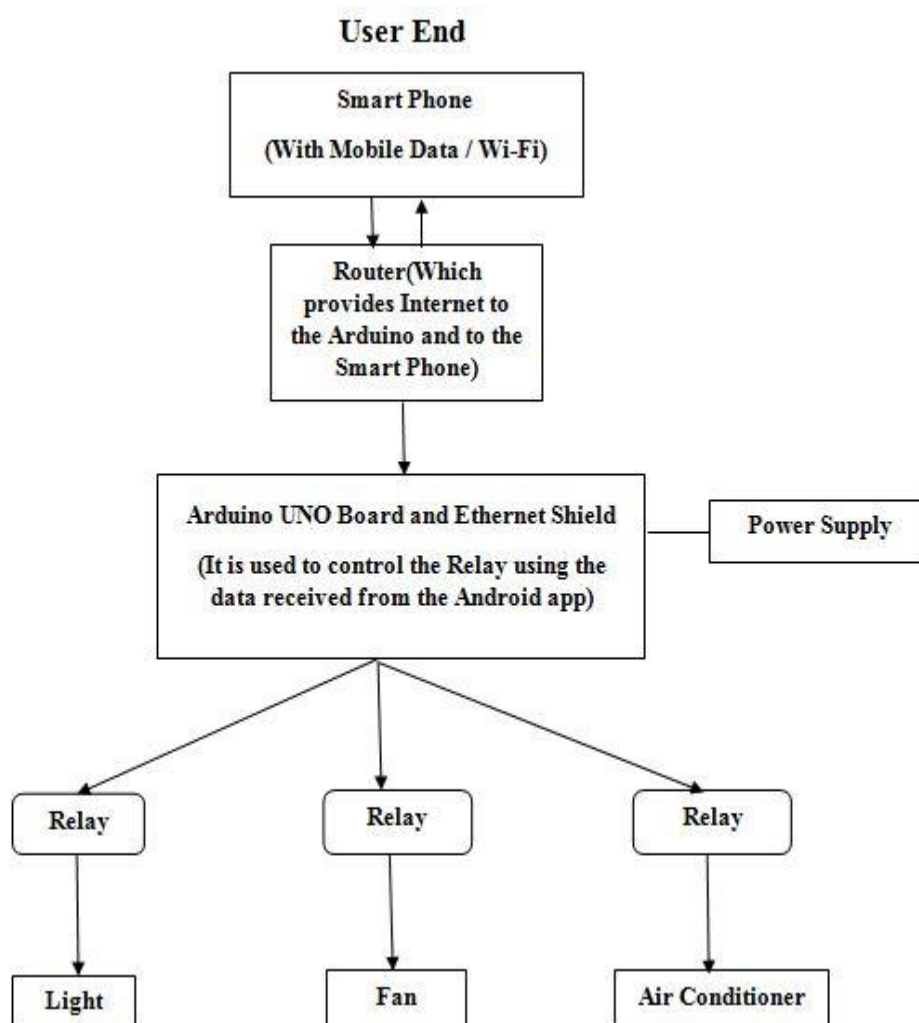

Fig. 1: Block Diagram of Proposed System.

2.2.1. Arduino Uno Board

Figure 2: Arduino UNO Board.

Arduino is an open-source electronics prototyping platform based on flexible, simple to use hardware and software. It's proposed for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments. In simple terms, the Arduino is a small computer system that can be programmed with instructions to interact with different forms of input and output. The current Arduino board model, the UNO, is small in size compared to the average human hand. It has 6 analog and 14 digital IO pins. It operates with 5v power supply, which is connected from either USB port or External power supply. It can function between 5V-20V.It has ATmega328 micro controller. This microcontroller has many features. It has 32KB of flash memory, 4 KB of which are used for the Boot loader, 8 KB SRAM and 4 KB EEPROM as shown in Figure 2.
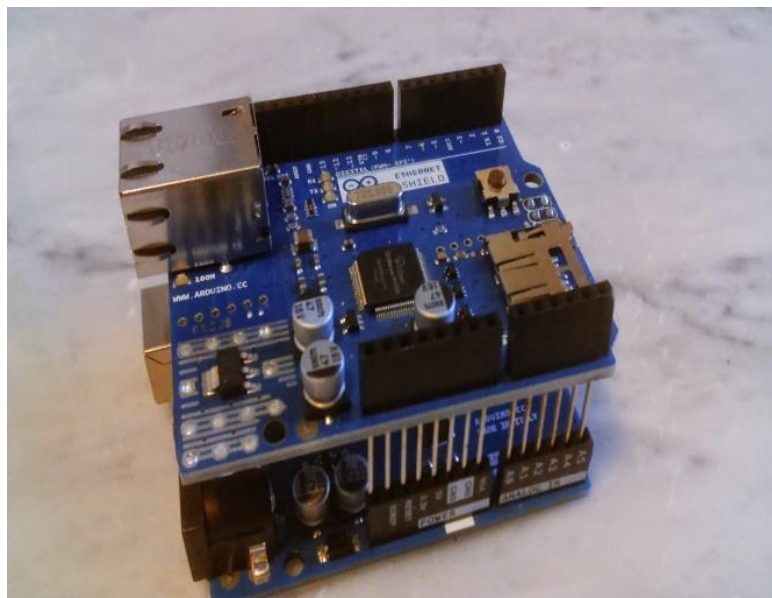

Figure 3. Connection of Arduino and Ethernet Shield.

The Arduino Ethernet Shield allows an Arduino board to connect to the internet. It is based on the Wiz net W5100/W5200 Ethernet chip providing a network (IP) stack capable of both TCP and UDP. Using the Ethernet library to write sketches which connect to the internet via a RJ45 Ethernet jack. The Figure 3.Shows the Arduino Ethernet Shield Board and it will be connected with the Arduino by placing the Ethernet Shield above the Arduino and is shown in Figure.3.

III. System Design And Implementation

The Arduino Board is interfaced with the Relay inorder to control the Appliances such as Light, Fan, AC, Etc. Here the Relay acts as a Switch. Since the Appliances are controlled wirelessly, the Arduino should be connected to the Internet. Inorder to connect the Arduino to the Internet, Arduino Ethernet Shield is used. The Arduino Ethernet Shield should be placed above the Arduino as shown in fig.2.4. The Appliances are controlled using the Application which is installed in the Android Mobile. At first the Android Mobile is connected with the Wifi in the Home Network. Since the Arduino is now connected to the Internet using Ethernet Shield. The Appliances can be controlled by the Android app through Internet. Here the Arduino acts as a Server and Android App is the Client. Thus by sending the command from the Android app it can control the Appliances in the Home.In this Proposed system the Appliances are controlled using Android Mobile through Wi-Fi. This system uses High Security. Inorder to control the Appliances the User needs to Login to the Android App using User_name and Password. User_name and Password are User defined.Figure.3.1. Shows the login page of the developed Android app. ., Korkmaz I., (2013).
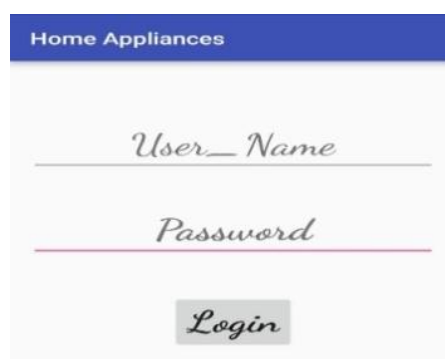

Fig. 3.1: Login page.

After user logged into the Android App another window has been availabe which consists of the Rooms in the Home based on User requirement and it is shown in the Figure.3.2.
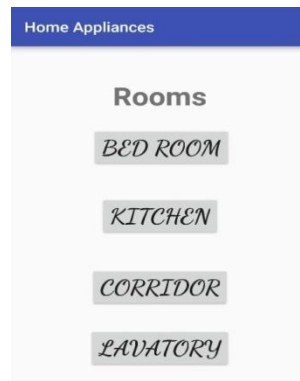
Fig. 3.2: Customized list of Rooms.

By entering into the specific room the Appliances in that room are controlled. (Javale D).,Buttons are used to denote the rooms in Home. By clicking the Specific Room, the Appliances in that room will appear. The window showing the Appliances in a Specific room shown in fig.3.3.

Fig. 3.3: List of Appliances in the Room.

IV.CONCLUSION

This project paper proposes a low cost, secure, universally accessible, auto-configurable, remotely controlled solution of the Home Appliance control. The approach discussed in the paper is original and has achieved the mark to control home appliances remotely using the Wi-Fi technology to connect system parts, satisfying user needs and requirements. Wi-Fi technology has proved to be controlled remotely, provide home security and it is low cost as compared to the previous systems. 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 proposed system is better from the scalability and flexibility point of view than the commercially available home automation systems.

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