

IoT Based Home Automation and Security System

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ABSTRACT

Home automation can include the scheduling and automatic operation of water sprinkling, user can easily use the Graphic User Interface (GUI) application that has been created in the Android Smart phone by Door lock control system to lock or unlock door and light, fan ON/OFF system through ESP based system. The remote appliances control system based on the Android smart phone GUI is designed on Android Smart phone. A user logs into the smart Android phone interface, and clicks the buttons gently to send message commands from the GUI which will be transmitted to home information center through the ESP network. Then the AVR ATmega processor recognizes the specified command, and controls the home appliance switches in the wireless radio frequency manner to achieve remote control of appliances ultimately. This seminar focuses on the design of Android terminal, the communication between PIC and ESP module, the realization of the wireless module device's driver, the difficulty in supplying the appropriate low-voltage DC for MCU and wireless module just by a single live wire. The users can manipulate appliances anytime, anywhere, letting our houses become more and more automated and intelligent. There are some problems in the PC monitor terminal, such as its great bulk, inconvenience to carry, high cost, limited monitoring range and so on. Therefore, it's a good choice to design a terminal based on phone. Home security also includes the GAS and FIRE detection sensors which will notify the user whenever gas leakage or house catches fire.

Keywords : Android Phone, ESP, Wireless Switch, Arduino, SDK, Fire Gas Detection Sensors, Buzzer

I. INTRODUCTION

Home automation or smart home (also known as domestic) is building automation for the home. It involves the control and automation of lighting, heating (such as smart thermostats), ventilation, air conditioning (HVAC), and security, as well as home appliances such as washer/dryers, ovens or refrigerators/freezers. Wi-Fi is often used for remote monitoring and control. Home devices, when remotely monitored and controlled via the Internet, are an important constituent of the Internet of Things. Modern systems generally consist of switches and sensors connected to a central hub sometimes called a "gateway" from which the system is controlled with a user in-

terface that is interacted either with a wall-mounted terminal, mobile phone software, tablet computer or a web interface, often but not always via Internet cloud services.

While there are many competing vendors, there are very few world-wide accepted industry standards and the smart home space is heavily fragmented. Popular communications protocol for products include X10, Ethernet, RS-485, 6LoWPAN, Bluetooth LE (BLE), ZigBee and Z-Wave, or other proprietary protocols all of which are incompatible with each other. Manufacturers often prevent independent implementations by withholding documentation and by litigation.

II. LITERATURE REVIEW

Shih-Pang Tseng et al. proposed Smart House Monitor Manager (SHMM), based on the ZigBee, all sensors and actuators are connected by a ZigBee wireless network. They designed a simple smart socket, which can remote control via ZigBee. PC host is used as a data collector and the motion sensing, all sensing data are transferred to the VM in the cloud. The user can use the PC or Android phone to monitor or control through the Internet to power-saving

Many Authors designed home automation systems by using different technologies. By using GSM based home automation System we need to send message/make a call to control home appliances[14]. It has more time delay and complex system. By using Blue-tooth home automation system also we can control all the home appliances. But the main disadvantage is Range[9,12]. Some authors designed home automation using Wi-Fi. But in those designs they implemented only ON/OFF functionalities. In our design we implemented ON/OFF functionality along with the voltage variations and all the home appliances are controlled by using android application.

III. DESIGNING AND IMPLEMENTATION

3.1 ESP Technology

The ESP8266 is a low-cost Wi-Fi chip with full TCP/IP stack and MCU (micro controller unit) capability produced by Shanghai-based Chinese manufacturer, Espressif Systems. The chip first came to the attention of western makers in August 2014 with the ESP-01 module, made by a third-party manufacturer, Ai-Thinker. This small module allows micro controllers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands.

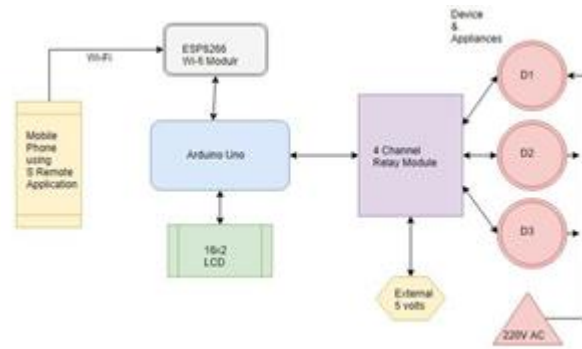


Figure 1. Block Diagram Of Home Automation

3.2 Arduino

Arduino is an open-source electronics prototyping platform based on flexible, simple to use hardware and software[5]. 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 Mega, is small in size compared to the average human hand. It has many analog and 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 ATmega1280 micro controller. This micro controller has many features. It has 128KB of flash memory, 4 KB of which are used for the Boot loader, 8 KB SRAM and 4 KB EEPROM.



Figure 2. Arduino Board

3.3 Android

Android is a software stack for mobile devices that include an operating system, middle ware and key

applications. Now days we have many tools to develop android applications. We can develop android applications using Android SDK, MIT App Inventor, Intel SDK and etc. According to user convenient we can use one of the tools. In this system we developed android application using android SDK. The Android SDK provides the tools and APIs necessary to begin developing applications on the Android platform using Java. By providing an open development framework, Android offers developers the capability to build very rich and new applications. Developers have full access to the same framework APIs used by the core applications. Android includes a set of C/C++ libraries used by various components of the Android system. They include System Media library, C library, Surface Manager, SGL, LibWebCore, SQLite, Free Type and 3D libraries. The Android SDK compiles the code along with any data and resources into an Android package, an archive file with an .apk file extension. All the code in a single .apk file is considered to be one application and Home Automation using android System is the file that Android powered devices use to install the application. Once installed on a device, each Android application lives in its own security sandbox.

S = Start state of system

E = End state of system

I = Set of input

O = Set of output

F = Set of functions

Success = Desired output is generated .

Failure = Desired output is not generated .

I = I1, I2

where , I1=Password(number, symbols, alphabet)

3.4 Firebase

Firebase apps remain responsive even when offline because the Firebase Real time Database SDK persists your data to disk. Once connectivity is reestablished, the client device receives any changes it missed, synchronizing it with the current server state.

3.4.1 Accessible from Client Devices

The Firebase Real time Database can be accessed directly from a mobile device or web browser; there's no need for an application server. Security and data validation are available through the Firebase Real time Database Security Rules, expression-based rules that are executed when data is read or written.

3.4.2 Scale across multiple databases

With Firebase Real time Database on the Blaze pricing plan, you can support your apps data needs at scale by splitting your data across multiple database instances in the same Firebase project. Streamline authentication with Firebase Authentication on your project and authenticate users across your database instances. Control access to the data in each database with custom Firebase Real time Database Rules for each database instance.

IV. DESIGN AND IMPLEMENTATION

4.1 Relevant mathematics associated with the Project

Let M be the proposed system,

$M = S, E, I, O, F, \text{Success}, \text{Failure}$ where ,

I2=Select the user's key selection.

O = O1, O2, O3

where,

O1=Lock the door.

O2=Unlock the door.

O3=LED is ON

F = f1 , f2

where, f1=SendSMS()

where, password get incorrect system send SMS through pop up block.

f2=Transmit()

,It is used for transmit NFC for security purpose
Success= If password is correct then door will be lock or unlock.

Failure= If password is not correct then door will not be unlock or lock and alarm get occur.

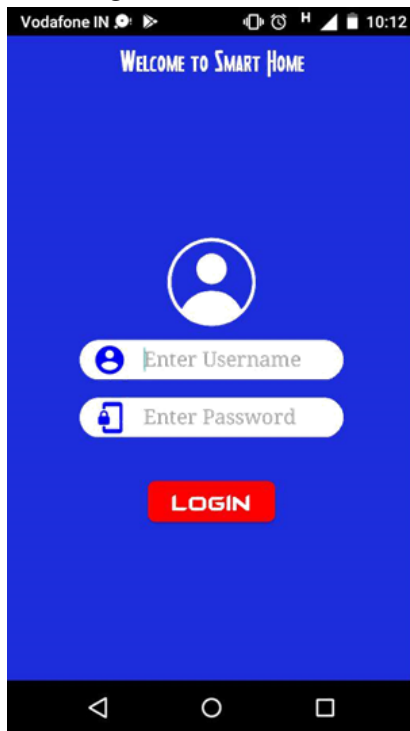


Figure 3. Authentication

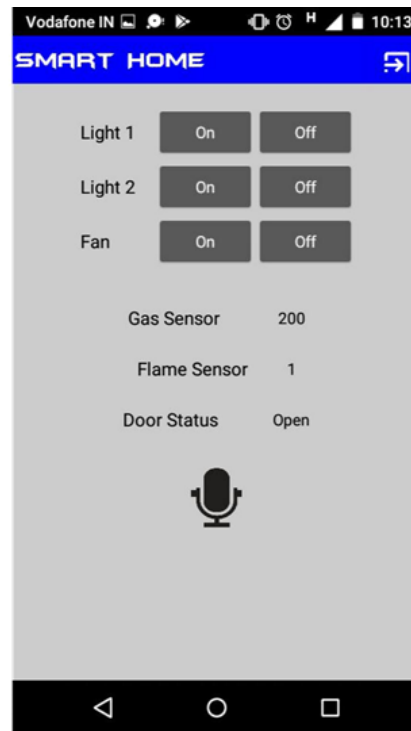


Figure 4. SS2:Manual Operation in App

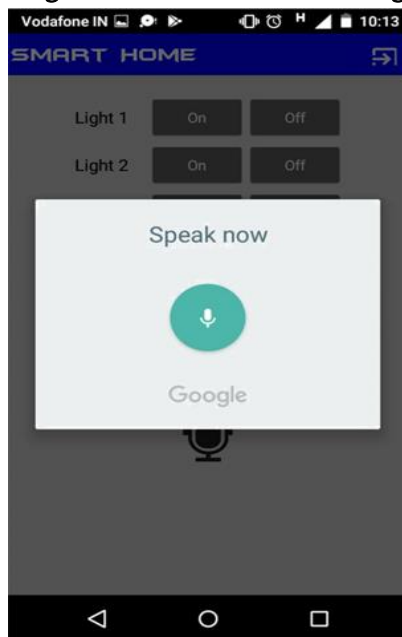


Figure 5. SS3:Google Speak

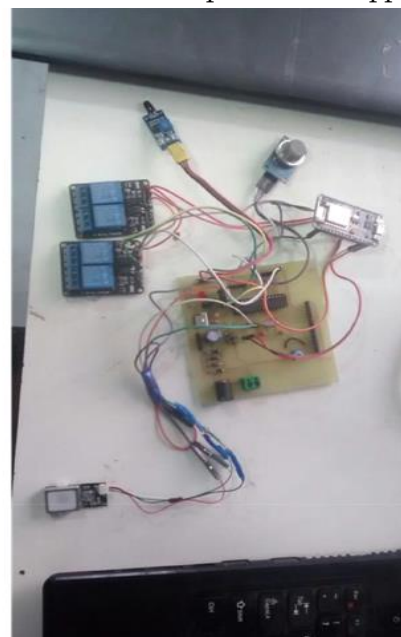


Figure 6. Implementation

V. CONCLUSION

This project proposes a low cost, secure, universally accessible, auto-con gurable, remotely controlled solution. 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 capable solution 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.

VI. RESULT DISCUSSION

It will certainly improve the overall managing quality of the system and will save the user from manually activating and deactivating the sensors each time he/she leaves or come to home. The sensors are connected through wires but it can be connected through a Wireless Sensor Network to remove the complexity of passing the wires from one room to other.

VII. ACKNOWLEDGEMENTS

As with mobile application the system will be modified to control through internet so that the user can log in through internet to control the appliances and get real time notification of the status of the sensors by using internet.

VIII. REFERENCES

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