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Home Automation System (Has) Using Wi-Fi Module on Windows Platform

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ABSTRACT-
In the present times we can find most of the people clinging to their Smart phones, Tablets, Laptops throughout the day. Hence with the help of the devices, some of the daily household work can be accomplished by personifying the use of the devices. Presently, the Windows platform on devices such as Smart phones, Tablets and Laptops has become a huge market for the common people. Home Automation System (HAS) has been designed for the devices having Windows platform to automate a Wi-Fi module interfaced with an Arduino microcontroller, which controls a number of home appliances like lights, fans, bulbs, and many more using on/off relays. This paper presents an automated approach for controlling the devices in a household that could eliminate the using of traditional switches. Wi-Fi being the most popular and efficient technology for wireless communication is used here to automate the system. The HAS for Windows users is a huge step towards the ease of controlling one to twenty appliances in any home environment.

Key Words- HAS, Windows, Arduino, Smart phones, Tablets, Laptops, Appliances.

I. INTRODUCTION

Today's home require sophisticated control in its gadgets which are basically electrical appliances. This has revolutionized the area of HAS with respect to an increased level of affordability and simplify through the integration of home appliances with the Smart phones, Tablets, Laptops connectivity options like Wi-Fi [2].
With the advent of Smart phones, mobile app development has seen a major outbreak utilizing the opportunity of automating tasks for a smart home, mobile phones commonly found in normal household can be joined in a temporary network inside a home with the electronics equipments. Windows 8.1, Developed by Microsoft Corporation, provides the platform for the development of mobile applications for the Windows platform devices.
Home Automation System is a mobile application developed using Windows platform and is targeting in a vast market which will be beneficial for the masses. Windows maintain its leadership position in global market share.

II. SYSTEM ARCHITECTURE

The Home automation System which is the overall control function of the system basically works using Smart phone application. The Smart phone used in this system is the Windows phone of version 8.1. Through Windows phone the instructions are being sent to the Wi-Fi module. The instructions received by the Wi-Fi module which basically works on radio wave technology converts the data into electromagnetic signals and these signals are transmitted wirelessly to the arduino microcontroller which further operates the information and controls the appliances of our home through the driver circuit. The system communicates serially through the wireless communication in order to control the appliances [9].

The hardware components required to build the Home Automation System are the Smart phone, Arduino microcontroller, Wi-Fi module and the driver circuitry which includes power supply circuit, amplifier, relay switches that will turn on/off the appliances.

III. DEVELOPMENT PLATFORM

This section describes the technologies for the development of Home Automation System. The technologies are Windows, Wi-Fi module and Arduino microcontroller. Windows 8.1 is a version of windows NT, which is a computer operating system boasting a healthy array of connectivity options including Wi-Fi and other wireless data over a cellular connections. The combination of Wi-Fi module is used for the long range communication based mobile application.

A. Windows 8.1

Windows 8.1 is software for mobile phones, Tablets, Laptops that has an Operating System. It provides access to wide range of useful tools for building rich applications. Windows 8.1 was released by Microsoft on August 27,2013. Microsoft supported Windows 8.1 similar to previous service packs of windows. It has visible enhancement which includes improved screen, a unified power system supporting high resolution display. Windows includes set of tools from building the platform which provided developers with productivity into the applications.

B. Wi-Fi module

Wi-Fi which works on radio waves technology is a popular wireless networking technology and provides high speed internet and network. It has a frequency of 2.4 Ghz and has 5Ghz bands. The module is based on the Institute of Electrical and Electronics engineer 802.11 standards. It is used for sensitive applications thus supporting transmission mode as well as multiple network protocol [1]. In this system we are using 802.11g standards protocol. It is a high standard supporting the maximum data rate of 54mbps. In this paper the Wi-Fi module being used is UART Wi-Fi module with antenna supporting 802.11g standards and 802.11b standards protocol. The UART Wi-Fi module is easy to use Wi-Fi transceiver with antenna [7]. It integrates the function of 802.11 MAC protocol software [1,5]. It supports serial data interface with baud rates 1600/38400/57600/115200 and has a maximum data rate of 11mbps. It supports a features of open/web mode authentication which is an automatic networking mode i.e.; automatically scans the target network and automatically connects when disconnected. It has a LOS of upto 300ft. The Wi-Fi module used is a embedded based on universal serial interface network, enabling the interface between the conversion. It integrates RF components thus removing the need for RF designing and testing [7,8].

C. Arduino microcontroller

It is a open source computer hardware and software company, project and users community that design and manufactures kits for building digital devices and interactive objects that can sense and control the physical world. The project is based on a family of microcontroller board designs manufactured primarily by smart projects in Italy and also by several other vendors being various 8-bit Atmel AVR microcontroller or 32-bit Atmel ARM processors [4]. The board features several communications interfaces, including USB or some models for loading programs from PC's. Here in our HAS system we are using Roboduino Mega 2560X3 board. It is based on a simple I/O board and provides a development environment that implements the processing language. The board is based on AT mega 2560 which supports 54 I/O pins, 5 UARTs, 256K flash memory. It supports everything needed in a microcontroller. It adds SDA pins next to AREF. There are 2 extra pins placed near RESET, one is IOREF to adapt a voltage and other one is for future use. Arduino provides advantage in terms of simplifying the process of working with the microcontrollers, inexpensive. It provides cross platform as its software runs on Windows, Linux, and Macintosh OSX operating system and provides clear programming environment along with flexibility.

D. Driver circuitry

The circuit drivers are used for controlling components such as relays, transistor and voltage regulator and many others. This is used for regulating current in the circuit. The voltage regulator IC belongs to 78XX series sometimes called the LM78XX series. This voltage regulator helps in dissipating excess power consumed by the regulator and thus provides a constant voltage. The power supply consists of bridge rectifier, transformer, ceramic capacitor and electrolytic capacitor [1]. The diode in the bridge rectifier drops the voltage to 3V, thus a 5V power supply delivers 12V ac to the rectifier which converts AC to DC and thus drops the voltage to 9V. The voltage is being delivered to the filter circuit which smoothes the ripple and thus the required voltage is being sent to the voltage regulator for maintaining the voltage to 5V. The current amplifier is required for converting the microampere current to mill ampere for driving the relay switches. The relay switches are driven by the ULN2803 high current Darlington array. And through the relay switches the appliances are being controlled of our homes.

E. Microcontroller IDE

For programming the microcontroller the Arduino platform provides an Integrated Development Environment based on the processing project, which includes support from C and C++ programming languages. IDE is a cross platform application written in Java, and devices from IDE for the processing programming Language and the wiring projects [3]. It is designed to introduce programming to artists and other new comers unfamiliar with software development. It includes a code editor with features such as syntax highlighting brace matching and automatic indentation and in capable of computing and uploading programs to the board with the single click [4]. A program written in Arduino is called “Sketch”. Arduino comes with a software library called “Wiring” from original wiring project, which makes many common inputs/outputs operations easier [10,11].

A typical first program for the microcontroller simply blinks the LED on/off. In the Arduino environment the user might write the program as:-

```
# define LED_PIN1.3
Void setup(){
Pin mode(LED,PIN,OUTPUT);
}
Void loop(){
Digital write(LED,PIN,HIGH);
Delay(1000);
Digital write(LED,PIN,LOW);
Delay(1000);
}
```

The Arduino IDE uses the GNU toolchain and AVR library to compile programs and uses to upload programs to the board.

IV. HOME AUTOMATION HARDWARE

Home Automation Hardware works as a client part in the HAS system and is formulated in two ways like:-

A. Automated

Home Automation System comprises power supply, Windows phone, Roboduino Mega 2560X3 arduino board, UART Wi-Fi module with antenna, ULN2803 current amplifier relays and switches. In the system the arduino works as the main programmable unit which receives data through the Wi-Fi module. The Wi-Fi module processes the command received through Windows phone. The processed command further decoded by the Arduino board and the appropriate programmed data is transferred to ULN2803 for operating the relay which in turn controls the appliances of Home Automation System [6].

B. Conventional

In the conventional method all the appliances are controlled through switch board. User has switches attached to the devices for making the devices ON/OFF. User has to move from its position inorder to turn ON/OFF the appliances if the person is operating without the HAS system.

V. ACTIVITY DIAGRAM

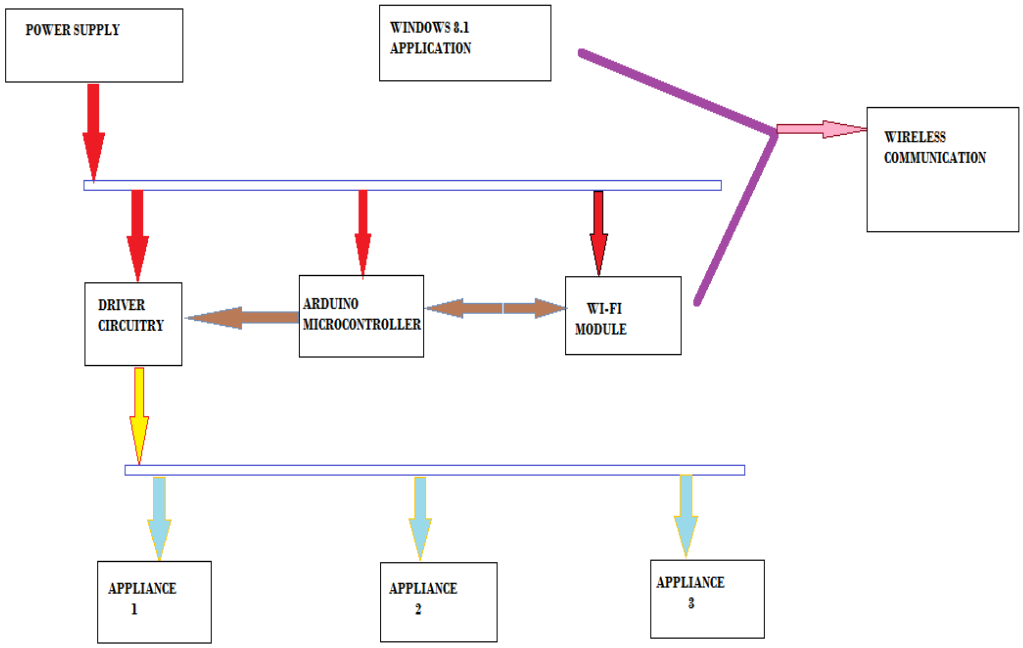

Figure1: Activity diagram of HAS system

VI. CONCLUSION

Design and implementation of Home Automation System using Windows platform has been discussed the purpose of the system is to use the devices inbuilt Wi-Fi connectivity facility for automation of the Home Appliances. Different hardware and software units of the system have been described. The response received from the community in general has been encouraging. This paper presents new system design. This system can be used in different conditions either the user who is present at home and who is having a Windows phone and other is the family members who can access and thus control the appliances of our home by sitting at one position itself. This system provides a wide range of area for accessing the appliances. Wi-Fi provides security as the access codes are required for controlling the system and thus is easy to use and protect the system with the codes. The Home automation system furnishes a good paradigm for any Home Automation system based on the Windows devices and Wi-Fi.

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