Home Automation Using Smartphone Application

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ABSTRACT:Home automation (HA) is becoming more and more popular day by day due to its numerous advantages. It gives a way to have things around your home happen automatically. Smart home automation has attracted the interest of the research community during the last decade, at a great manner. Some of these systems are limited to support basic operations, while some others satisfy a range of additional primitives. In this paper, a smart HA system which uses mobile technology for controlling various electric home appliances, operating with respect to the signal sent by the mobile application is proposed. This automated system has less manual operation with greater flexibility, reliability and accuracy. In fully automated mode controlling the appliances depends on the output of the sensors interfaced with microcontrollers. This HA system differs from other system by allowing the user to operate the system from anywhere around the world through GSM and GPRS connection.

KEYWORDS:Android Mobile, GSM Modem, ESP8266 Wi-Fi Modem, Microcontroller, Sensors.

I. INTRODUCTION

Home automation can provide increased quality of life for person who might otherwise require caregivers. It can also provide a remote interface to home appliances. In this proposed system the implementation of controlling a remote various home appliances with android phone. Home automation is the control of any or all electrical devices in our home, whether we are there or away. Generally, when we go out of the house we switch off the light or the electrical equipment's to avoid accidents such as short circuit, firing etc. but sometimes we forget to switched them off, we have to came back home to do so. This is wastage of time and creates lots of chaos and tension. So to avoid any such kind of situation the latest technology coming up worldwide is the smart home technology. The rapid growth of wireless communication motivated us to use mobile phone to remote control a household appliances. In this paper we described a remote appliances control system which can control different household appliances by sending a signal from a mobile phone. This controller is extremely handy at places where we have to control the ON and OFF switching of the devices but no wired connection to that place is available. The microcontroller would then control and device based on the information given to it. The propose solution will need to be easy to use, simple, secure and robust be useful on most mobile phones. Ours mains objectives are hold old aged people and handicapped and to control the home appliances for remote places. The aim of this article to propose a wireless remote control that permits elderly people with physical challenges, in particular, handicapped and disabled people, to command their desired devices without moving around to the nearest control point.

II. BLOCK DIAGRAM OF PROPOSED MODEL

The block diagram of the proposed system is shown in Figure 1. It shows a simple sketch of the implementation of home automation and the various parts involved in it. The Microcontroller is the controlling device through which application interacts with home appliances. Android application is used to send the command to microcontroller which gives the input to the relay control unit for controlling the appliances. The relay unit will amplify the power to turn ON or OFF the particular device based on the input received from the microcontroller.
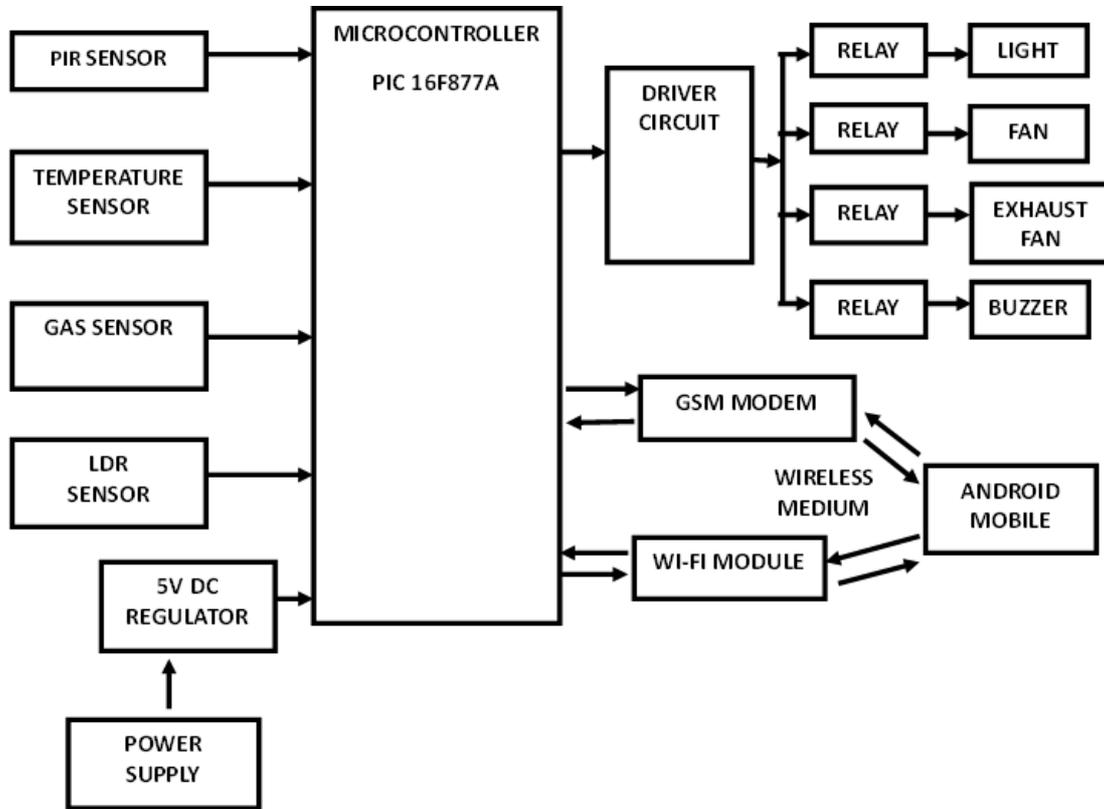
Figure 1: Block Diagram of Home Automation

The main power supply is connected with the step down transformer. The step down transformer is connected to the bridge rectifier. The rectifier will convert the alternate current into direct current. In circuit capacitor used for to convert pulsating dc to pure dc using filter. From the rectifier the voltage is passed to the voltage regulator.Voltage regulator is used to control or regulate the circuit. From the voltage regulator the voltage is passed to the pic microcontroller. From the microcontroller the voltage is passed to all other devices. The GSM and GPRS modem and Wi-Fi Module is connected with the pic controller for the communication purposes.. The relay circuit will indicate the ON/OFF of the various appliances. The appliances are directly connected to the power supply.

III. EXPERIMENTAL SETUP

The experimental setup of the proposed system is shown in Figure 2 which consists of sensors, microcontrollers, relays and mobile units.
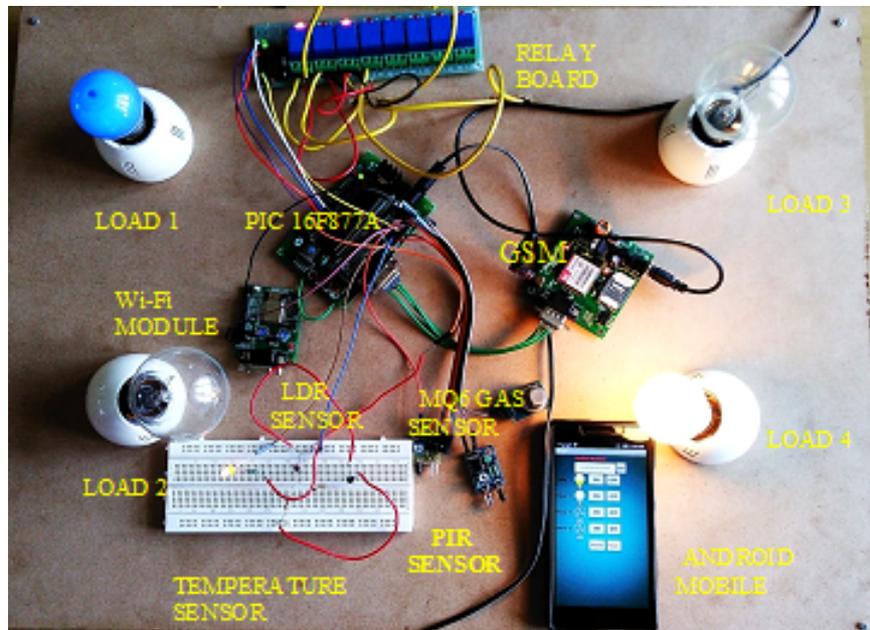
Figure 2: Hardware setup

PIC 16F877A:

The microcontroller is the controlling unit of the device that controls all the operation of electrical drives. A microcontroller or microcontroller unit is a small computer on a single integrated circuit. In modern technology, it is a System on a chip. A microcontroller has one or more CPUs (processor cores). Microcontroller's workingoperating voltage is the 5v. It has reset pin and it used to reset a program to the initial setting. Architecture of PIC16F877A is Reduced Instruction Set Computer (RISC) Architecture and it is an 8-bit Microcontroller System.

PIR Sensor:

A Passive Infrared sensor (PIR sensor) is an electronic device. It measures infrared (IR) source radiating from objects in its field of view. PIR sensors are used in the PIR-based motion detectors. Apparent motion is detected when an infrared source with one temperature, such as a human, passes in front of an infrared source with another temperature, such as a wall.

LDR Sensor:

Light-dependent resistor otherwise called an LDR, photo resistor, photoconductor, or photocell. It is a variable resistor whose value decreases with increasing incident light intensity. An LDR is made of high-resistance semiconductor materials. If light falling on the device is of high enough frequency, photons absorbed by the semiconductor.

GAS Sensor:

A MQ-6 Methane LPG liquid propane gas sensor is used to sense ammonia produced by methane.The sensing element adsorbs it after ionized into its constituents. The resistance of the sensing element cause to change. This resistance change causes to change the potential difference in the form of current (heating current) develops across the output line of the sensor. The MQ-6 can detect gas concentrations anywhere from 200 to 1000ppm. This sensor has a high sensitivity and fast response time. The sensor output is an analogue resistance.

Relay:

Relay can be called as a switch. The relay is used connect or disconnect the two circuit. The main elements of relay are electromagnet, mechanically movable contact, switching points and springs. The relays are considerably adopted to let the low power control signal generated by the microcontroller operate high power devices. The diode connected in reverse bias mode aims to protect the transistor against inductive loads that can damage it due to their back electro-motive force.

GSM:

The GSM shield makes the proposed system able to send and receive short text messages, make voice calls and connect to the Internet. Alternative shields of this kind could stand upon the microcontroller platform, but they must be compatible. Two basics connections of this shield are TX and RX pins, which allow the microcontroller to connect with the GSM shield sending serial data.The GSM operates with a SIM card. The SIM requires a subscription, with the mobile communication provider. Based on this, the user can get access to the mobile network. The UART (Universal Asynchronous Receiver Transmitter) Interface codes and decodes data between the parallel and serial formats. It takes bytes of data and transmits them in a sequence of bits. Thus, the data can be sent, in a serial mode, through TX to the microcontroller, or through an antenna to the network.

ESP82666 Wi-Fi Module:

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to the Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, this can simply hook up to the microcontroller device and get about as much Wi-Fi-ability as a Wi-Fi Shield offers. The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

IV.   ANDROID APPLICATION

In the proposed system the android application is to be developed to send the commands to the microcontroller from the user side. The android application is created in this system is developed in the Massachusetts Institute of Technology (MIT) App inventor platform. The Figure 3 shows the user interface of the android application. In the proposed system home screen shows two control modes. One is SMS Mode and another one is Internet mode. In the SMS Mode of control the commands will be sending to the microcontroller through the GSM Modem as the normal SMS. In the internet mode the commands will be sending to the microcontroller through the Wi-Fi Module. In this mode all the operations will be done with the help of internet. In this mode the Wi-Fi Module and the android mobile both will need to be connected to the internet in order send and process the commands.
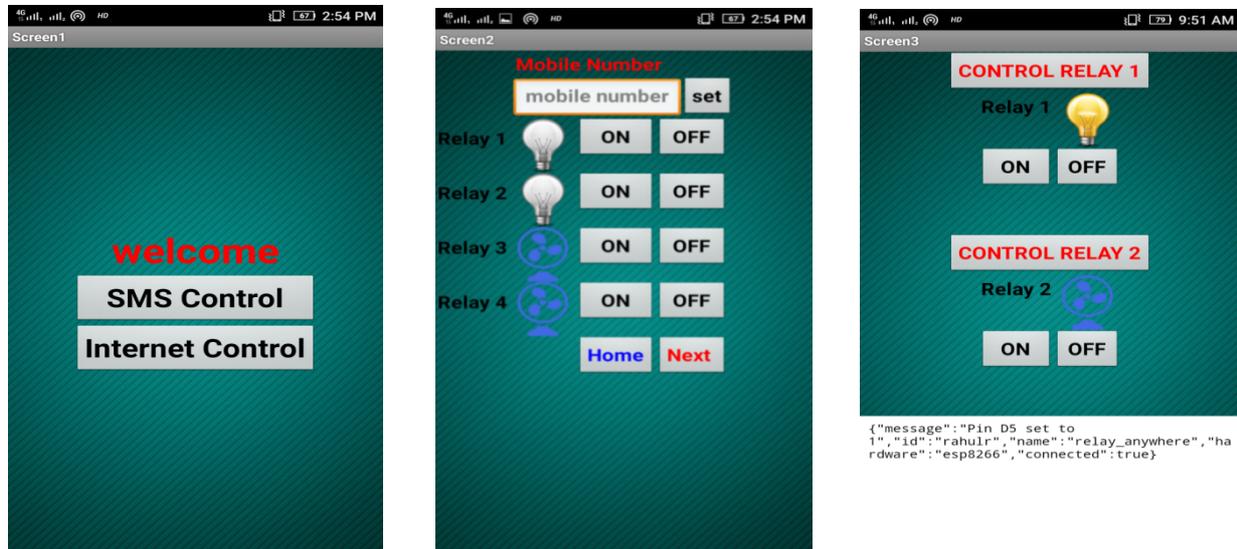
Figure 3: user interface of the android application

WORKING OF ANDROID APPLICATION:

The working behind the every screen in the android application is explained below. In this can add a new screen in the Designer by clicking on "Add Screen" Suppose you named the screen "Home Screen". Then you can add a button on it called "Home Button".

When we click Home Button, use the 'open another screen' block to swap to screen1. We can provide a similar mechanism on screen1 to swap to home screen. When the SMS button or Internet button is pressed then the corresponding control screen is opened. SMS mode is in the screen 2 and the Internet mode is in the screen 3. Figure 4 shows the working behind the home screen of the smart home application.
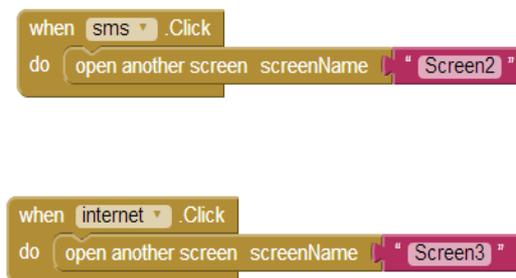
Figure 4: Blocks behind the First screen

Figure 5 shows the working behind the second screen of the smart home application. In the second screen the controlling will be done with the help of normal texting. In order to do that, texting component will be added. The texting component will help to send the text to required number as put in the mobile number text box. When the number has been then the display will shows the pop up notification as number has been set. After that the corresponding relay will be on and off as per our requirement by pressing the corresponding on and off button. In this system the message has been needed to send it's already fixed to the corresponding button. So when pressing that corresponding button will send the corresponding message to the already setted mobile number. For example, when

pressing the button 1 the "on1" command will be send to the number has been set in the initial stage. Similar to that pressing button 2 will send the "off1" command to the corresponding number. Those commands will help microcontroller to process and achieve the resultsas per our requirements.

Figure 6 shows the working behind the third screen of the smart home application. The third screen will be the internet mode of controlling appliances. In order to achieve this both the android mobile and the microcontroller will need to be connected to the internet to process the commands from the user side. In this mode first the corresponding relay we need to control will need to initiated. Here after the screen shows the corresponding relay has been set to control. For example, need to control relay 1 then press control relay 1 button. The notification message shows the relay 1 set to control.

Figure 5: Blocks behind the second screen

Figure 6: Blocks behind the third screen

Then press on button to on the corresponding relay. Similar to that press the off button to off the corresponding relay. In this the image will be change as per the current status of the relay. This will improve the user interface to the desired level. In this web viewer will be used to display the corresponding status of the relay after the user set to control the relay.

V.   CONCLUSION

Home Automation is undeniably a resource which can make a home environment automated. People can control their electrical devices via these Home Automation devices and set up the controlling actions in the computer. The extensive capabilities of this system are what make it so interesting. From the convenience of a simple cell phone, a user is able to control and monitor virtually any electrical devices. This makes it possible for users to rest assured that their belongings are secure and that the television and other electrical appliances was not left running when they left the house to just list a few of the many uses of this system.

The end product will have a simplistic design making it easy for users to interact with. This will be essential because of the wide range of technical knowledge that homeowners have. The future developments to the proposed system are
- Power theft can be caught using this device.
- This device can perform as reminder for bills or tariffs.

- Using this device new tariff can be implemented.
- Prepaid tariffs can also be available using this device.
- Electric consumption can be improved if once gets regular update of its energy consumption.
- Any fault in power system can be detected using this device.
- The capacity of energy meter can be increased up to 10 MWh.

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