Internet of Things Based Home Automation

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Abstract—**As Automation technology is becoming richer day by day, life is getting simpler and easier. Automatic systems are being used over manual system in today's world. With the rapid increase in the number of users of internet, IoT is the latest and emerging internet technology. Internet of things is arapid growing network of day by day object-from industrial machine to consumer goods that share information and complete tasks while one is busy with other activities. Wireless Home Automation system(WHAS) using IoT is a system that uses basic web accessing device to control basic home functions and features automatically through internet from anywhere around the world. The main goal is to save the electric power and human energy. The IoT based home automation system differs from other wireless automation system because it allows the user to operate the system from anywhere around the world through internet connection.**

Index Terms— IoT (Internet of Things), WHAS (Wireless Home Automation System)

1. INTRODUCTION:

In this project we are going to make a home automation system using ESP8266 Wi-Fi module and Arduino Unoboard. Using this we will be able to control lights, electric fan and other home appliances through a web browser using your PC or mobile. These AC mains appliances will be connected to relays which are controlled by the Arduino. ESP8266 and Arduino together acts as a Web Server and we will send control commands through a Web Browser like Google Chrome or Mozilla Firefox. ESP8266 is the one of the most popular and low cost Wi-Fi module available in the market today.

Home automation or smart home is the residential extension of building automation. 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. They use Wi-Fi for remote monitoring and are a part 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 interface that is interacted either with a wall-mounted terminal, mobile phone software, tablet computer or a web interface.

Internet of things is a technology that has started to touch our homes. Here we propose an IOT based home automation system using Arduino UNO board & Wi-Fi module that automates home appliances and allows user to control them easily through internet from anywhere over the world. It is a very simple concept where devices in our home or wherever they are, have the capability tocommunicate with each other via the internet.

Fig 1: IOT System

2. Concept and Methodology:

2.1.1.Hardware Constraint Design:

A) Arduino Uno328 P-PU:

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital
Input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. The Arduino will send the signal to relay board which will turn on/off the respective AC appliances accordingly.

B) Wi-Fi Module ESP-8266:

ESP8266 Wi-Fi module is Wi-Fi serial transceiver module, based on ESP8266. Small size and low cost makes it suitable for sensor nodes. It works on 3.3V and consumes current up to 250mA. Current consumption is quite big so it's usually not powered on battery.

As ESP8266 runs on 3.3V, it may damage if we connect it directly to 5V from Arduino.So we need to reduce the 5V output of the ArduinoTx pin to 3.3V by using voltage dividing resistors to connect to Rx pin of ESP8266 module.

C)4-Channel Relay Module:

A Relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate the switch and provide electrical isolation between two circuits.

The 4-Channel Relay Driver Module makes it simple and convenient to drive loads. Here we used 5V relays from simple 5V digital outputs of Arduino compatible board. You can use any of the control channels independently, so simply leave any unused channels disconnected.

The 5V is nothing but the operating voltage of the relays which is required to generate the magnetic flux. The default state of the relay when the power is off for COMM (power) to be connected to NC (normally closed), this is the equivalent of setting the 4 Relay boards IN pin to HIGH (has +5v sent to it) It is a safety feature to notuse the NC connector in-case Arduinolooses power it will automatically turns off all the devices connected to the relay

2.1.2. Software Design:
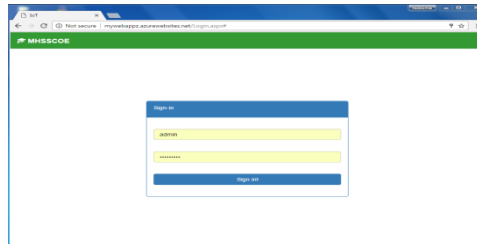**A) Web Page Layout:**

Fig 2: Login Page

We have designed a web page which is user friendly & does not require any specific device/version/application to control the home appliances. This website is stored on a server so it can be accessed from anywhere. Also it doesn't require any specific browser to open. The login page will ask the user to type username & password & the user will get the access of main control page only if the entered username & password gets tally with those username & password which is stored in database.
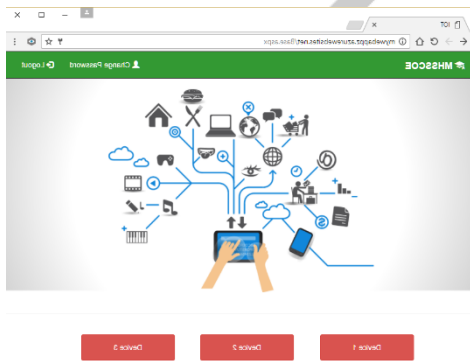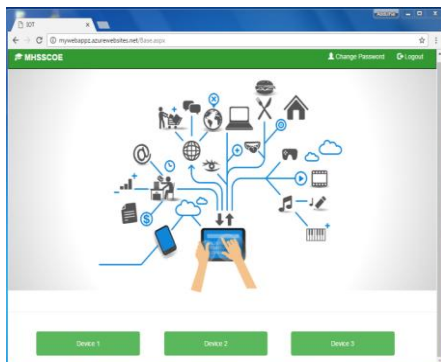

Fig 3.a: Initial state of web page after login

Fig 3.b: Webpage after turning the device on

2.1.3. Working:
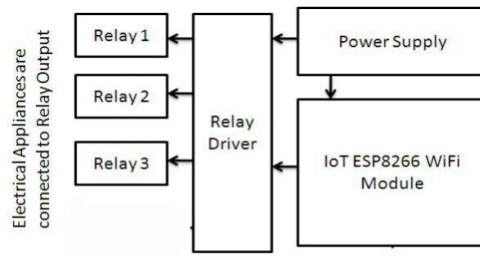Working of the system can be explained in a much better way with the help of Block Diagram as shown.

Fig 4: Block Diagram of IoT Based Home Automation System

In this project we used5 volt regulated power supply. An extra power supply of 5 volt is used for relay board. For this purpose we used battery with 7805 regulator IC. The reason for using different supply for relay board is that if some over current flows through the relays then it can cause damage to Arduino board. To avoid this some protection circuit can be used between relay board & Arduino.

But we didn't made this protection circuit as it will increase the size & cost of the project.

The system is divided into 2 parts: (i) Software part & (ii) Hardware part. The communication link between this software & hardware part is nothing but internet. If the user turns ON/OFF the particular device then the data from the server will come through the internet & goes to the Wi-Fi module ESP 8266. This module is used to give internet access to the Arduino board. Then the Arduino will send the command to the relay board. There is a opto-coupler driver which is used to drive the relay board as Arduino cannot provide the sufficient current. Depending upon the signal from the Arduino the relay board will turn ON/OFF the AC appliances. Here we have used active low relay board which means that on receiving 0v signal from Arduino it will turn ON the device & on receiving 5v from Arduino it will turn OFF the device.
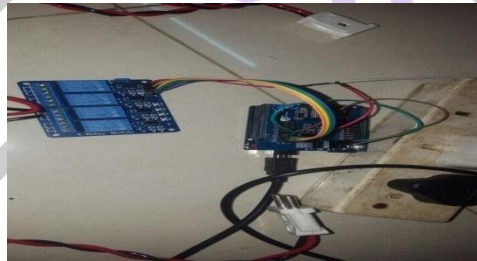

Fig 5: Hardware of System

3. Design and Fabrication:
3.1. Fabrication:

The electronic part that are used such as Relay board circuit, Arduino board and power supply all are fabricated in a copper clad, each component are embedded and soldered
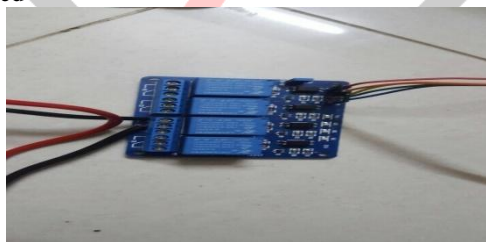

Fig 5.a:Channel Relay Board

3.2. Assembly & Testing:

The software is configured with the electronic parts. Different test has been carried out such as testing of Wi-Fi module, working of relay board as per the program burn into the controller.

Fig 5.b: Assembly of Wi-Fi Module with Arduino UNO Board

4. Conclusion:

The Internet of Things Based Home Automation system allows the user to control various home appliances (which can operates on 230v also) from any device (smart phones or PC) from anywhere in the world through an internet connection.It provides security and saves energy. As we are controlling the home appliances by website, we can access it around the world where the internet is available.

5. Future Enhancement:

Using this system as framework, the system can be expanded to include various other options which could include home security feature like capturing the photo of a person moving around the house and storing it onto the cloud. This will reduce the data storage than using the CCTV camera which will record all the time and stores it. The system can be expanded for energy monitoring, or weather stations. This kind of a system with respective changes can be implemented in the hospitals for disable people or in industries where human invasion is impossible or dangerous, and it can also be implemented for environmental monitoring.

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