Automated System Using Raspberry Pi for Remotely Controlling Devices Using Android.

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Abstract: The project revolves around creating a home automation system with the main focus being controlling the electrical appliances through an android application. In recent years, there has been a rapid introduction of network enabled digital technology in the field of home automation. This paper deals with the design and control of the home automation system using raspberry pi as the central device, a web server a router and an android application on any smart phone which would act as a user interface. The proposed system is in no need of a dedicated PC with respect to similar systems and offers novel communication protocol to monitor and control the home environment with more than just the switching functionality. The mobile device will communicate with a home automation network through an internet gateway, but cannot directly communicate with the devices in the network. In this project the android devices would control the home appliances using the internet and raspberry pi as the server system. The relay circuit board will be interfaced by the raspberry pi. This relay circuit board will control the home appliances.

Keywords: Raspberry Pi, Home Automation, Django Framework, Relay circuit.

Introduction:- Home automation system can be referred as a system which replaces human interactions by controls. This used connecting sensors and Internet of Thing (IoT). Devices uses internet to connect to each other and operate further. Internet of Thing is a dust that turns the automated home into the smart home. Internet of thing allows object to be controlled and sensed. Home automation is used for connecting various electrical devices in our home or office. These automation systems are designed or manufactured according to need of customer. Using home automation we can control devices remotely i.e. we can control lights, A.C., Cooking Stove, room temperature etc. Home automation systems are used for power saving. Home automation system requires computers which are large as well as heavy to carry around .In our project we are using Raspberry Pi which works as a card size computer and remove the overhead of carrying heavy size tools from one place to another place.

Various automation systems comes according to the type of connection and future usage. Some of them are as:-

1. Remote Control based
2. Dual Tone Multi Frequency(DTMF) based
3. SMS based
4. Zigbee based
5. Wireless Browser based using Raspberry-Pi.

We are using home automation using Wireless Browser base using Raspberry-Pi with the help of internet. We are using raspberry-pi because it's a simple circuit, easy to operate and it offers privacy because at a side single user can view or use the circuit. Raspbian OS is the operating system supported by it. In this type of automation user have the authority to login through an android app. User after purchasing this gets a unique id that only belongs to him and by this unique id he can either on or off the device. This on/off functionalities are responsible because of relay circuit.

In this project Django Framework is used for designing web browser and raspberry pi will work as web-server.

Literature Survey: In this project controlling home lights is main objective. This paper has two parts hardware and software. Hardware part consist of raspberry pi and relay circuit. In hardware part raspberry pi takes signals from server as input and controls relay circuit which is responsible for turning appliances (fan/light) on or off. Software part is web framework and application. Web Framework is what we used to send signals to raspberry pi. Application is for easy control of appliances.

Problem Statement: Creating a home automated system for remotely Controlling the electrical appliances using an android Application.
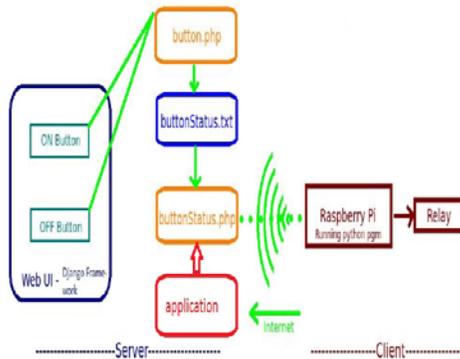
System Design:

Figure 1: Basic System Design

Modules:

1. Raspberry pi: In this project, the key component is Raspberry-Pi board.Raspberry-Pi operates on Linux based open-source operating system which is known as Raspbian operating system. There are two types of models of Raspberry-Pi viz. Wifi operated and Ethernet operated. In this project, we are using Wifi operated model. Initially introduced Raspberry-Pi version had a broad com BCM2835 SoC comprising of an advanced RISC Machine 76JZF-S 700 MHz processor with only 256 megabytes of RAM but newly introduced version has 512megabytes of RAM. It also contains 40 pin GPIO header, quad USB ports, one HDMI port,10/100 BaseT Ethernet socket,5V micro USB port, CSI camera connector, DSI display connector and 3.5mm jack. As Raspberry-Pi does not contain any storage facility, it contains a micro SD card slot.

2. Relay Circuit: A Relay is electrically operated switches, which allow low power circuits to switch a relatively high voltage or current on/off. For a relay to operate a suitable pull in and holding current should be passed through its coil. Relay coils are designed to operate from a particular voltage often its 5V or 12V. The function of relay driver circuit is to provide the necessary current energize the relay coil, when a LOGIC 1 is written on the PORT PIN thus turning on the relay. The relay is turn off by writing

LOGIC 0 on the port pin. In our system four relays are used for device control.

3. Web UI/ Web Framework: Web Framework or Web UI is the interface which is used to control the on/off buttons from web. In our project this framework is created using DjangoRest Framework. DjangoRest Framework is coded in python. We are using "sqlite3" as our database to store the data.

4. Application: application is developed in Android studio (java). It is a simple UI to control buttons without help of browser after succesful verification. Android application consist of buttons to turn on/off light. Back end of this button consist "post" requests which turns off/on the light.

Proposed System related to the paper:
Wireless home automation system:
In this project we are controlling appliances through the web browser/android application integrated with Raspberry Pi and Relay circuit over wifi.
Implementation:
The project is divided into two parts, hardware part and software part. The hardware part consist of controlling relay circuit using raspberry pi while the software part is programming for web browser and application.
Hardware Implementation:
Raspberry pi is the main part of this project which controls relay circuit. Relay circuit is the device which controls appliances (In this project Light and Fan).
Software Implementation:
Software part is programming for web browser and android application. Web browser is based on DjangoRest Framework.
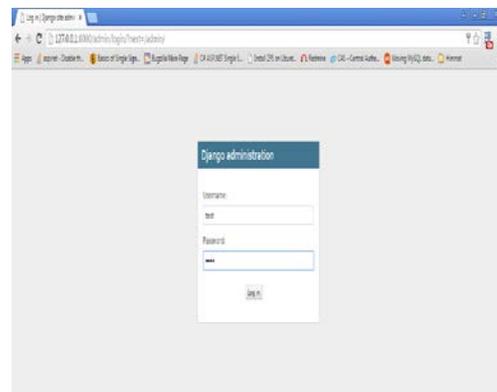

Figure 2: Web Browser using Djnago Framework

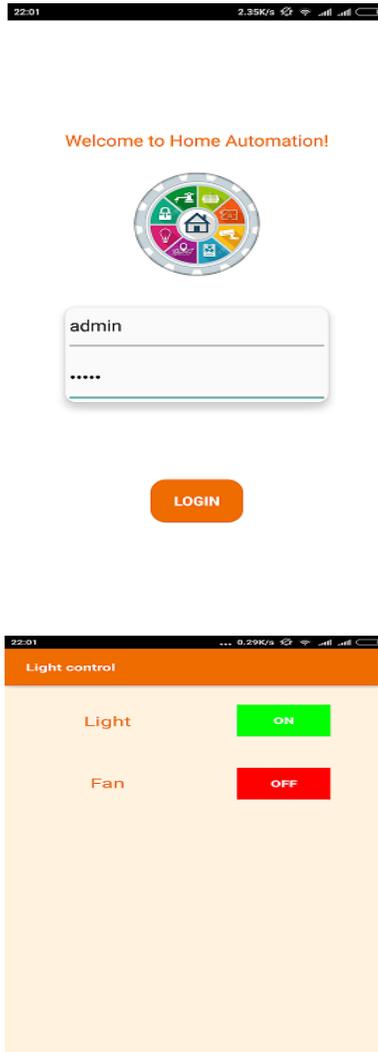Application is created to control devices wirelessly without browser.

Figure 3: Application

Advantages:

1. Saves money and energy.
2. Noise free system
3. We can operate devices using internet from far distances too.
4. Easily connected to the web services.
5. It's less time consuming.
6. Designed to help old peoples.

Disadvantages:

1. If one wire got damaged then whole system will crash.
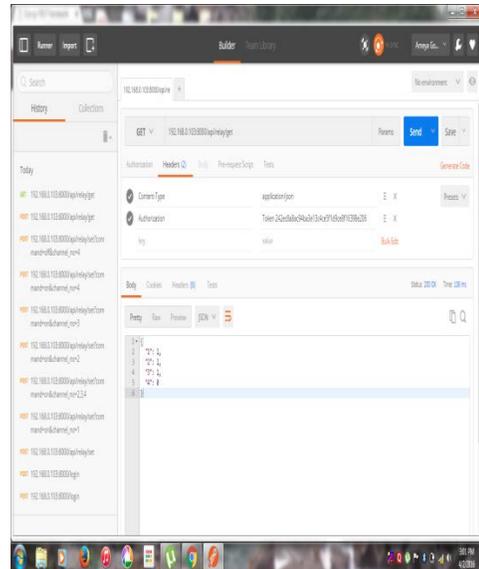2. Human errors.

3. Reliability.

Final Result:

Figure 4: User Input and Channel Status

Figure 5: Final Result

Future Scope:

Making homes even smarter is future scope for the home automation systems. Our homes can be interfaced with sensors such as motion sensors, light sensors and temperature sensors which can provide automatic toggling of devices by analysis certain conditions. Energy can be conserved by turning on or off the light according to the environmental changes. This home automation technique can be easily

converted into or used as security system for our homes. Many solutions can be generated to provide greater control and safety for home owners. The future scope will extend these systems to work on a larger scale environments such as offices and factories. As this technology is new, once a full control is achieved, it is important to clarify that this research also can include local control of HASS. Research in HASS will help other researchers to achieve their goals in future HASS project and will contribute majorly in large scale automation systems.

Conclusion:

The devices produced enable the user to control the appliances using pre-existing devices such as their Smartphone. The interfaces are intuitive and easy to use and provide the user with a more accessible interface then those found in the home. The devices are also very easy to integrate into existing applications and require only a small amount of expertise to install. Our research shows the many types of applications for implementing home automation and the applications are not limited to those discussed in this paper. The technology used could be implemented in a wide variety of applications that require the use of sensors and appliances. This project successfully designed a system that communicates with a mobile device such as a Smartphone or laptop via Raspberry Pi to control light switches but has many possible applications that could benefit from this work.

Acknowledgment:

References:

[1] AI-Ali A. R. and AI-Rousan M., "Java-based home automation system", IEEE Transactions on Consumer Electronics, vol. 50, no. 2, pp. 498-504, 2004.
[2] "A remote controller for home and office appliances by telephone", IEEE Transactions on Consumer Electronics, vol. 44, no. 4, pp. 1291-1297,1998.
[3] Hari Charan Tadimeti, Manas Pulipati, Overview of Automation Systems and Home Appliances Control using PC and Microcontroller, Volume 2 Issue 4, April 2013.
[4] A. ElShafee and K. A. Hamed, "Design and Implementation of a Wi-Fi Based Home Automation System," World Academy of Science, Engineering and Technology, vol. 68, pp. 2177-2180, 2012.