IoT Based Home Automation Appliance using RASPBERRY PI3

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Abstract:

Home automation is an important milestone in achieving smart grid and is ever exciting field that has exploded over the past few years. Advancement in technologies have made homes more convenient, efficient and even more secure. Introducing the Raspberry Pi to the world of home automation provides numerous customizations to turn a regular home into a smart home. The project revolves around creating a home automation system with the main focus being controlling the electrical appliances through smart phone. This project deals with design and control of the home appliances using raspberry pi as the central device, and any smart phone which would act as user interface. The mobile device will communicate with a home automation network through an internet gateway, but cannot directly communicate with the devices in the network. The android device would control the home appliances using the internet and raspberry pi as the server system. The relay circuit board is interfaced to the raspberry pi which controls the home appliances.

Keywords: IoT, RASPBERRY PI, sensor, Home Automation

1.INTRODUCTION:

Smart home or home automation can be described as introduction of technology within the home environment to provide convenience, comfort, security and energy efficient to its occupants. Adding intelligence to the home environment can provide increased quality of life. With the introduction of IoT, the research and implementation of home automation are getting more popular.

Today, technology has become an integrated part of people's lives. It has, and continues to influence many aspects of daily life and has allowed better social interaction, ease of transportation, the ability to indulge in entertainment and media and has helped in the development in medicine. The creation of many devices such as mobile phones and computers have caused many people to rely on technology to communicate with their friends, store information such as pictures, movies, documents, and music. The internet has become a common interface that many devices use in order to simplify the daily life of many people. The Internet has given people the ability to search for information, store their own information in the cloud while also giving them better ways of managing information. From the time of its introduction, the amount of people that use mobile phones and the internet to communicate with other people has increased dramatically to become one of the major means of communication.

Smart phones have allowed people to connect to the internet without the need for a computer, while still offering the same functionality but through different means. With the introduction of better hardware and better software, smart phones have become powerful devices and have become an important part of people's daily lives. A major aspect is how the smart phone is able to connect and communicate with other devices. For example, smart phones can be used as a mouse for a computer, or it can connect to the speakers of cars allowing consumers to play their own music. There are many applications of this sort. A field that is recently gaining popularity is home automation which can also use smart phones as information or functionality hubs.

INTRODUCTION TO IOT:

The Internet of things is the internetworking of physical devices, vehicles, buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. In 2013 the Global Standards initiative on IoT defined as "the infrastructure of the information society". The IoT allows objects to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to human intervention.

A thing in the internet of things, can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built in sensors to alert the driver when tire pressure is low or any other natural or manmade object that can be assigned an IP address and provided with the ability to transfer data over a network. Typically, IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond M2M communications and covers a variety of protocols, domains, and applications.

EXISTING SYSTEM

There are many existing methods by which we can implement home automation system. Some of them include,

1.   **Home Appliances control using a Remote Control.**

The lights, fans can be automatically turned on/off with the help of a remote where there will be a sensor instead of

going near to a switch board and putting on/off the switch. Companies like Legrand and Gold Medal already started these kinds of control system and they are at present available in the market.

2. Home Appliance control using free hand gesture.

This is a type of home appliance control system where the person must be present in sight to the appliance that is needed to be controlled and a predefined gesture must be used to turn on the device and another gesture must be used by us to turn off the device. The performance of the proposed system is done with a hardware embedded in that particular device.
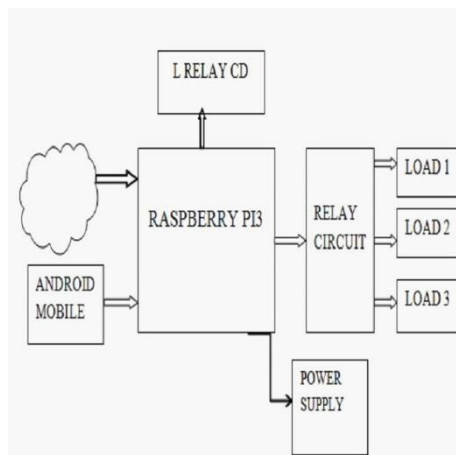
PROPOSED SYSTEM

FIG 1.1: BLOCK DIAGRAM

In this paper, we propose a system, which is different than the existing system. We are going to implement it with the help of direct Wi-Fi using the raspberry pi3 board. The main advantage of this system is that the home appliances can be controlled from the long distances. The Raspberry Pi is a creditcard sized computer that plugs into your TV and a keyboard. It is a capable little computer which can be used in electronics projects, and for many of the things that your desktop PC does, like spreadsheets, word-processing and games.

It also plays high-definition video. We want to see it being used by kids all over the world to learn how computers work, how to manipulate the electronic world around them, and how to program.

• This project deals with design and control of the home automation using raspberry pi3 as the central device, and an android application on any smart phone which would acts as a interface.

• This system helps us in controlling the home appliances from long distances compared to Bluetooth based system

RASPBERRY PI

The Raspberry Pi is a low cost, **credit-card sized computer** that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spread sheets, word-processing, and playing games.

What's more, the Raspberry Pi has the ability to interact with the outside world, and has been used in a wide array of digital maker projects, from music machines and parent detectors to weather stations and tweeting birdhouses with infra-red cameras. We want to see the Raspberry Pi being used by kids all over the world to learn to program and understand how computers work.

There are currently four Raspberry Pi models. They are the Model A, the Model B, theModel B+ and the Compute Module. All models use the same CPU,but other hardware features differ.

The Raspberry Pi was created in February 2012 by the Raspberry Pi Foundation, Originally setup to promote and teach basic computer science in schools and colleges around the UK. They initially released 2 Devices the Model A and the Model B, these computers ranged in spec and abilities.

On the Raspberry Pi website they created 2 images that could be installed easily onto a SD card which would then act as the OS for the device, one of the images was based off of Debian a popular lightweight Linux OS and was called Raspbian, the other was called Raspbmc and was based off the popular media centre software Kodi (Formally known as XBMC).
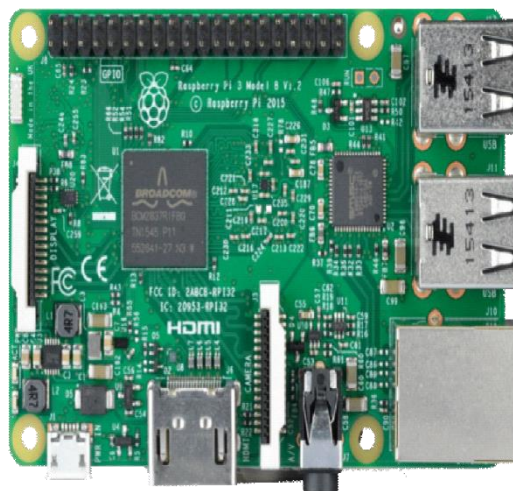

Fig: RASPBERRY PI3 BOARD

IMPLEMENTATION OF PROJECT

Heart of this project is raspberry pi minicomputer. The WiFi module scans for the available network and connects to the network with pass-word. To implement the project, we have to write the appropriate program for the required result. For this we are writing the code in python language. Firstly after connecting the raspberry pi to the system we have to configure the keyboard and configure the Wi-Fi by writing the username and password to which the board has to connect.

- Open Lx terminal and type"sudonano home automation.py" and press enter.

- Start the program with importing all the supporting files, initialize LCD for displaying the output. Then initialize the Wi-Fi for the working of project.

- Initialize the GPIO pins for different inputs and outputs for controlling the home appliances.

- Now write the program and press CTRL+X for saving the program.

- To execute the program type "sudo python home automation.py" and press enter.

- Interface the LCD to Raspberry Pi for displaying the output after execution.

- Make the connections such as relay circuit for switching the loads and L293D for driving the motor to open or close the door.

RESULT AND APPLICATIONS

- The project can be executed by giving the power supply for the Raspberry pi board, relays and LCD. Configure WiFi with user name as "project" and password as "project 1235". Then the Raspberry pi connects for the Wi-Fi automatically and is ready to use.

- By using the android mobile give the appropriate input with the URL written in the program. For example, when the input given is X=1 then the raspberry pi switches the allotted relay, displaying the result on LCD as LOAD 1 ON and turning the allotted light ON. When the give the input as 2 then load1 gets turned off and is displayed on LCD as LOAD I OFF.

Fig: PROJECT OUTPUT WHEN LOAD1 IS ON

CONCLUSION

The devices produced enable the user to control the appliances using pre-existing devices such as their smart phone or home computer. The devices are also very easy to integrate into existing applications and require only a small amount of expertise to install. With more time and resources, it is possible to solve the problems encountered throughout this project turning the prototype into an actual product. The final conclusion would be that the prototype is functional, yet requires more work to complete all the functionalities that would be required of a commercial product. The team truly believes that home automation is the next big step in the lives of consumers. The technology is available, most homes have a Wi-Fi service, most consumers have smartphones. What is left is creating a unified home automation system where the home appliances are all connected allowing the homeowner to control every aspect of their functions.

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