

Home Automation using Raspberry Pi & Windows 10 IOT

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Abstract: *With rising enhancement of technology, nowadays things are accomplished at much quicker rate. We have touch access using various devices such as Smartphone, tablets, computers, laptops to Execute things. Not only comfort but the technology has given us more information & ability to communicate, organize & manage our time in sophisticated way. Electronic mail and Palm Pilots Made time management and organization very efficient. Palm Pilots are computing devices such as mobiles, smart phones, etc. that are becoming immensely popular as the means by which everyone are managing their personal information, accesses and enters data, and mines the richness of the internet. Home automation has taken this concept of management and control a further step by enabling you to control electronic devices in your home with a Palm Pilot i.e. Windows 10 Notebooks & Phones. This concept of controlling electronic devices in your home by a Palm Pilot is implemented in our project using Raspberry Pi & Windows 10 IOT Core. It was found that home automation using raspberry pi boards are more efficient than other techniques such as DTMF & Analog circuits. Smart grid system was achieved i.e. energy efficiency increased using Arduino UNO & Genuino UNO and operating became easy using Windows 10 interface.*

Keyword: *Raspberry Pi, Automation System, TCP connectivity, Windows 10 IOT*

1. Introduction

Home automation is based on the application of computer and information technology for controlling of home devices. It can be used from simple remote control of lighting to complex computer/micro-controller based networks which involve changing degrees of intelligence and automation. Home automation results in convenience, energy efficiency, and safety benefits leading to improved quality of life. The network enabled home automation has been increased as it is simple and much affordable Home

automation can be implemented using several ways that include DTMF, Hand gestures, remote controls, Internet & radio connections etc. Similarly, Raspberry Pi provides a good provision to implement various technologies and build a usable product which can be energy efficient and reliable for users. Using Raspberry Pi and Arduino & Genuino controllers, Home automation can be achieved which can be controlled by Windows 10 Application. Development of application will be implemented using Windows 10 IOT Core standards provided by Microsoft Corporation.

2. Problem Definition

In this project, we mainly focus on developing a new home automation system that provides a smart grid system using latest technology like Raspberry PI and Windows 10 IOT using smart devices.

In addition, one of the important aim is eradicate the factor of proprietorship i.e. control the drastic changes is cost if customization occurs.

The main motivation for developing this project is obtaining standardization and extensibility by which compatibility issues with future system can be avoided due to rapid growth of new technologies in automation field.

3. Goals and Objectives

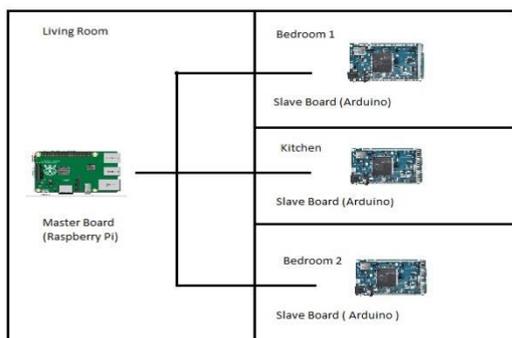
The Android application offers the user an intuitive and simple interface to access the functionalities of the system. The objective of this application is to cover all the common utilities of the system while not overwhelming the user with complex controls or excessive

Information. To avoid having too many buttons and windows in the application, we decided to exclude the following functionalities from the application:

Centralization of devices, Manageable Automation, Achieving Smart Grid system i.e. Energy efficiency, Add, Edit and Remove devices, Activate and deactivate sensors. Add, Edit and Remove locations.

4. Proposed system

- The proposed project is based on a smart Home automation system using Raspberry pi board that gives a reliable and efficient method for automating electronic devices using Windows IOT platform.
- It reduces energy consumption thus leading to smart grid homes.
- Project offers a Windows application for operating several devices from single device remotely where users can control lights, fan, temperature of heaters, speed of fan, switches from one place.
- In case of lights, system will turn on the lights if motion sensor is active and natural light is below the required density. Similarly, fan speed is automatically controlled on the basis of room temperature.
- If user forgets to switch off any device, the device will automatically turn off after a certain time limit if motion sensor is active.
- Hence, the system benefits the electricity consumption by consuming minimum amount of energy.



5. Hardware & Software

• Hardware Requirements

Raspberry Pi 3:

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. The Raspberry Pi has a Broadcom BCM2837 system on a chip, which includes an ARM1176JZF-S 900 MHz, Video Core IV GPU, and was originally shipped with 256 MB of RAM, later upgraded to 1 GB. It does not include a built-in hard disk, but uses an SD card for booting and storage. In this system, we use the raspberry Pi model as a controller. The Raspberry is a credit card sized minicomputer. There are different types of raspberry pi model available, Such as Model A, Model B, Model B+ out of which we will use Model B+ i.e. Raspberry Pi 3

Arduino UNO Microcontroller

Arduino/Genuino Uno is a microcontroller board based on the ATmega328P (datasheet). 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. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

Jumper Wires (Generic)

They are used to transfer electrical signals from anywhere on the breadboard to the input/output pins of a microcontroller.

Breadboard (generic)

It is solder less board which can be reused to construct multiple prototypes of electronic circuits

LDR (Light Dependent Resistor)

LDR is a component that has a (variable) resistance that changes with the light intensity that falls upon it. This allows them to be used in light sensing circuits

PIR Motion Sensor (generic)

A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. It is generally used as motion sensors.

Relay Module

The relay module is a separate hardware device used for remote device switching. Devices can be remotely powered on or off with commands coming from Clock.

Siemens Contactor

A contactor is an electrically controlled switch used for switching an electrical power circuit, similar to a relay except with higher current ratings.

Miniature Circuit Breaker

Miniature Circuit Breakers are electromechanical devices which protect an electrical circuit from an over current.

• Software Requirements

- Microsoft Visual Studio 2015
- Microsoft Windows 10 IOT Core
- Arduino IDE
- Fritzing Application

6. Benefits of the System

- Cost effective and scalable which allow variety of devices to be controlled?
- Saves money as well as energy
- All in one user friendly system

- This system contains Raspberry pi and Arduino as a controller so the system contains all the advantages of it.
- This is noise free system.

7. Conclusion

Raspberry Pi is intelligent, economic and scalable platform for implementing the home automation. This technique is better than other home automation methods in several ways. For example, in home automation through DTMF, the call tariff is a huge disadvantage. Also, in Web server based home automation, the design of web server and the space required is eliminated because it simply uses the wireless fidelity to communicate with client interface and perform operations. Very soon in near future, the traditional grids of today will evolve into a robust, effective, environment friendly and energy efficient system known as the Smart Grid. These kinds of Home automation systems are required because human can make mistakes and forgot to switch off the appliances, they are useful in order to utilize the power effectively and also in a secured manner.

8. References

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