Home Automation Using Raspberry Pi

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Abstract- *There has been a sudden rise in the world of smart electronic devices that has made everyone work so busy with their regular schedules. In their busy schedule people get tired of looking after their day to day appliances. In most cases, we found that people in this era are prone to earn money. Thus both men and women are now committed with their work. Thus work-life balance goes missing in the upcoming eras. People have no time to look after themselves. Controlling the appliances in an automated way is difficult in the olden days. But in this era that would be greatly possible. Our work focuses on the idea of automating and deploying a simple home automation system with minimum cost and simple programming.*

Keywords- Microcomputers, Raspberry Pi, Interfacing, Programming, Relay.

I. INTRODUCTION

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom used to develop projects based on IoT. Here, we are going to use a Raspberry Pi board in addition to the required modules and switches to develop a simple home automation project. The Raspberry pi board is the basic tool we use to make connections between all the other components. Therefore Raspberry Pi is found to be the brain of this automation process and we are automating almost all the electrical and electronic components of our home which fall under the rating of up to 250V 10A or an equivalent power of 2500V where the maximum limit of the voltage must not exceed 250V (which is much above the standard household supply) and the current limit must not exceed 10A.

Almost all the electronic components are covered in this project which are necessarily required in households.

This project includes Tube lights, Fans, TVs, Bulbs, Washing Machines, Refrigerators, Purifiers and others, with an idea of further expansion. If necessary we will also provide some systems that can control the switches and standard home sockets that will take over the complete control over all the systems of the house. However, devices such as Iron, Induction Cooker, Geyser that consume high power are excluded from the scope of this project, and hence the word "Simple".

II. TECHNICAL SPECIFICATIONS

The most important component of the system will be the Raspberry Pi board. Therefore it is considered as the Brain of the system. The Raspberry pi board has a processor and it hosts a Linux OS named Raspbian Jessie tailor. It is made to suit the needs of IoT and it is a highly stable Operating System. It is with inbuilt support for Python and other programming languages like C, C++ and JAVA.

In our implementation for the automation system we use Python and NodeJs for programming and other required tools for creating the web interface. By doing so, the system can be made accessible throughout the Globe. By implementing this project, it would be possible to know the status of the electronic components of the house as all the information regarding the components will be available within the web interface.

We also have an idea to create an Android Application that makes the control of devices easier.

The Raspberry Pi is the center of the system, and it will be connected to a router which is internet enabled on its platform. The web interface is hosted by the web server and it will communicate with the Android Application in order to control of devices.

III. HARDWARE REQUIREMENTS

The lists of all the components required for this project are listed below along with their description in short. The information about the costs and other price related information is mentioned in the Funds report.

Note*: The project might need some additional components if required.

- Wireless router – it must be enabled with Internet. It acts as a connecting bridge between the Raspberry Pi, Android Application and the Internet.

- Raspberry Pi 3 Model
- Relay Drivers – 5V (Based on the requirements) a single relay module can replace one switch, so we need one relay module for each ON/OFF switch
- Connecting wires – Based on the requirements.
- Rectifiers and Regulators – for the purpose of converting alternate current if required.
- Diodes- that passes electric current in a single direction by blocking the other direction.
- Other Electronic devices [Light bulbs] based on the requirement.

The above mentioned are the basic requirements for developing a stable project of Simple Home Automation using Raspberry Pi.

A simple illustration for a 3 BHK apartment is given as an example below:

In the above implementation, the requirement is 35 switches (i.e.) 35 relay modules. A standard relay Printed Circuit Board(PCB) can have up to 16 relays but in this implementation using 8-relay PCBs makes the implementation easy. So, the requirements are:

- 2 X MCP23017 for port expansion
- 4 X 8-relay PCB
- 1 X 4-relay PCB

These components will take over all the 35 switches with one additional switch, which will be more than enough for a standard 3 BHK house.

IV. DEMONSTRATION

In a small scale, for the purpose of demonstration and starting the project we don't require more equipment. Initially, we start this project for automating only 4 bulbs and for that all that we will need are as follows:

- Raspberry Pi
- Wireless Router
- Breadboard
- 1 X 4 - switch relay module
- 4 low power bulbs
- Holders for the bulbs
- 220V AC Power Supply
- Connecting Wires

The above mentioned components are required for a basic demonstration setup. For a more advanced setup as described earlier, the requirements may vary depending on various factors.

V. TIMELINE

The timeline of the project depends on the level of implementation from smaller scale to bigger scale. Once the project is about to be completed, it must be tested before final approval. Taking all these in account, we will work on it for 4 hours per week which comes to 16 hours per month it can take from 2 months to 5 months from the day it had been started for completion that means it will take a minimum of 35 hours and a maximum of 60 hours.

VI. CONCLUSION

This upcoming era requires connectivity between all the people and components used by them and IoT just does that. Now many entrepreneurs and organizations are using IoT to make huge profits. Apart from making profits, IoT has a great scope in the upcoming years. It is one of the developing technologies that is going to rule the world in the upcoming days. IoT can be expanded in any way as per our requirements, if we possess the required skills. We must feel good that we are in the era of Internet of Things (IoT).

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