

# IoT based Simple Home Automation using Raspberry Pi

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**Abstract**— There has been an upsurge recently in the Industry of smart electronic devices that has considerably eased their interfacing with each other. This is due to some common elements in their hardware. In most cases, we found that the hardware stack across various unrelated devices are perfectly compatible with each other which paves a way to deploy a common mechanism for their interfacing. Controlling each of these devices requires a central control unit; typically, a computer system which was difficult and costly until a few years ago. Now, with the advent of the low cost, easy to deploy and maintain Microcomputers like Raspberry Pi, it has become super easy even for a school student to control high voltage devices without any huge risks involved in the wiring and programming. Our work focuses on the idea of creating and deploying a simple home automation system with minimum cost and simple programming.

**Keywords** — Microcomputers, Raspberry Pi, Interfacing, Programming, Relay.

## I. INTRODUCTION

Raspberry Pi is a microcomputer development board which can be used to make DIY projects on IoT. Over here, we are using a Raspberry Pi board along with the relevant modules and switches to create a simple home automation project. The pi board is at the base of all the connections, working as a brain of our home 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 2500W where the maximum voltage must not exceed 250V (which is much above the standard household supply) and the current must not exceed 10 Amperes.

The project will cover all the electronic components which are necessarily required in households.

These include but are not limited to Tube lights, Bulbs, Fans, TVs, Refrigerators, Washing Machines, Water Purifiers and others, with a further scope of

expansion. As a necessity we will also provide systems to control the standard home sockets and switches to enable complete control over all the systems of the house. However, high Power consuming devices such as Iron, Geyser, Induction cooker and others which fall in this category are exempted from the scope of this project, hence the word “Simple”.

## II. TECHNICAL SPECIFICATIONS

The main component of the system will be the Raspberry Pi board i.e. the Brain of the system. The pi board consists of a processor and hosts a Linux Operating System named Raspbian Jessie tailor made to suit the needs of IoT. Raspbian Jessie is a highly stable Operating System with Inbuilt support for Python and other programming languages like Java, C and C++.

We'll mainly use Python in our code for the automation system and NodeJS along with other suitable development tools will be used to create the web interface so that the system can be made accessible from anywhere in the Globe. It will be possible to know the status of the electronic components of the house as all the information will be available right inside the web interface.

We are also planning to create an Android Application to make it easier to control the Devices.

The Raspberry Pi, being the center of the system, will be connected to an Internet enabled router and will host the Webserver on its platform. The webserver will host the web interface and will communicate with the Android Application for the control of devices.

## III. HARDWARE REQUIREMENTS

The components required for this project are listed below with their short description, the costs and other price related information is detailed in the Fund Report. Please note that we may need additional components if deemed necessary.

- An Internet enabled standard wireless router – This component will act as a bridge between the Raspberry Pi, the Android Application and the Internet. [A tested compatible hardware is TP-Link TL-WR740N 150 Mbps wireless router]

- Raspberry Pi 3 Model B
- A SanDisk Ultra 16 GB Micro SD card for installing the OS
- Relay Modules as per the requirements – One relay module can replace one switch, so we need one relay module for each ON/OFF switch
- Connecting wires – As per the requirement
- Breadboard
- MCP23017 – I2C I/O Expander
- Electronic devices [Light bulbs] for performing the automation.

These are the basic requirements for building a stable project of Simple Home Automation.

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



In this implementation, we need 35 switches i.e. 35 relay modules. A standard relay PCB (Printed Circuit Board) can contain up to 16 relays but we will be using 8-relay PCBs for easy implementation. So, we need:

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

This will cover all the 35 switches with one extra switch, which will be sufficient for a standard 3 BHK house.

#### IV. DEMONSTRATION

For demonstration purposes and for starting the project on a small scale, we won't require so much equipment. We'll start off this project for automating only 4 bulbs and for that all that we'll need is:

- Wireless Router [same as earlier]
- Raspberry Pi [same as earlier]
- 1 X 4-switch relay module
- Breadboard

- Connecting Wires
- 4 low power bulbs
- Holders for the bulbs
- 220VAC Power Supply

This is all we need for a basic demonstration setup. For a more advanced setup as described earlier, the needs may vary depending on different factors.

A simple video demonstration made by us is available in the link mentioned - [bit.ly/2ARQ16S](http://bit.ly/2ARQ16S)

#### V. TIMELINE

The total time depends on many factors ranging from basic implementation to implementation on a bigger scale. Also, the testing needs to be done before final approval. Considering that we'll work on it for 3 hours per week which comes to 12 hours per month, it can take from 3 months to 5 months from the start date for completion which means it'll take a minimum of 36 hours and a maximum of 60 hours.

#### VI. CONCLUSION

As we all are aware that the world is getting more and more connected and IoT does just that. Many tech entrepreneurs are already starting off with IoT and making huge profits out of it. Keeping the profits aside, if we think of it in a broader way, then we conclude that IoT has a great future and in the next five years, it is going to revolutionize the world. IoT is like clay that can be molded in any way we wish, if provided with enough skills and expertise. We are glad that we are pioneers of the IoT age.

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