

Portable Home Automation Using Raspberry Pi 3

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ABSTRACT

This paper intends to highlight a solution that has come from the amalgamation of IOT and cloud. We provided a survey and analysis of existing techniques for Home Automation systems. Analog switches present on the walls inside the home. Operating them is a difficult task as they need to be manually made on or off. This hassle is replaced by a smart technique that involves operating the switches through an Android application. The present smart switches available in the market are very expensive and also require additional devices for their working. This paper uses the Cloud and Android application with IR (Infrared Ray) technology to control the manually operated switches. Google firebase is used as a cloud interface between the user and Raspberry Pi. The switches are interfaced with RELAY IR circuit which operates them as they receive an IR signal as input. Whenever the certain variable in the cloud is changed as on/off Raspberry Pi will detect the change and send those IR signals needed for operation of that switch. The user communicates with the database through the Android application. Then corresponding changes made in the database by the user are detected by Raspberry Pi. After that processor sends a corresponding IR signal to the circuit of switches based on the changes received from the user, this ensures the portable usage of devices. The operation of various other devices can be controlled by using the android application.

Keywords--- Home Automation, Internet of Things, Cloud, Android application, Smart Homes, Infrared Rays

I. INTRODUCTION

In the few years, home automation area has made rapid growth and with that growth, the new technologies and different home appliances are invented. Also, now most of the appliances are advanced in technology which has benefits in home automation area. With this growth of Home Automation Technology, life is made simpler and easier in all aspects. In recent trends, Automated systems are being more preferred over manual systems. Internet which is a most important aspect for many online systems with automation technology it has given rise to the internet of things. Standard home automation systems follow some traditional protocol or different lengthy communication strategies but IOT devices share data and communicate over the internet. The major problem with all traditional protocols (Wi-MAX, Ethernet, Bluetooth, Z-Wave, Fibre Optics) is that they are not suited with each other. This paper uses a basic and most used standard like IEEE 802.11 (Wi-Fi). The content of this paper is as follows: Section II gives a brief about the existing related work. Section III describes the new system with the block diagram of the proposed system and gives the Proposed system implementation details. Finally, section IV provides a conclusion.

II. RELATED WORKS

The growing internet technology has opened new opportunities for development in many fields. The home automation system becomes a topic of interest for many peoples.

Prathmesh Shelke, Shubham Kulkarni, Swapnil Yelpale, Omkar Pawar, Ravdeep Singh and Kirti Deshpande in their paper [1] also shown a similar system which has implemented a home automation system with the use of Nodemcu to control physically operated switches over the cloud. There are certain overheads like the physical connection of switches and Nodemcu needs to be done to operate this takes time to implement the system in home.

Implementation of home automation is considered a tedious and time-consuming process. These overheads of installation and maintenance are reasons people avoid automation in the home. Currently, people buy additional hubs or devices for automating single appliance in the home. Implementation of home automation requires to change wiring in the home and additional devices are needed for configuration.

Vishwateja Mudiam Reddy & Naresh Vinay in their paper [2] designed a system which is integrated with the cloud and web app. With the help of flip-flops, logic gates, and a processor the switches have been controlled. The proposed model was intended for reducing the cost of these systems which was the main barrier in the wide adaptation of this home automation technology. This paper also shows the concept of accessing switches from the web using the cloud. To implement such a smart switch technology there is overhead of connections to physical switches as they need to be wired with the system. Implementation of home automation is a tedious task which includes these overheads to connect each switch to the main system to get access.

Thus, the need exists for a way to provide portable home automation with additional facilities.

III. LITERATURE REVIEW

Prathmesh Shelke, Shubham Kulkarni, Swapnil Yelpale, Omkar Pawar, Ravdeep Singh, and Kirti Deshpande in their paper [1] they suggested a home automation system using Nodemcu which can operate physically operated switches over the cloud using any device. Due to cloud, it is possible to access appliances from any remote location. Vishwateja Mudiam Reddy & Naresh Vinay [2] designed a system which is integrated the cloud and web app. With the help of flip-flops, logic gates, and a processor, the switches have been controlled. The proposed model was intended for reducing the cost of these systems which was the main barrier in the wide adaptation of this home automation technology. Also, Prathmesh Shelke, Shubham Kulkarni, Swapnil Yelpale, Omkar Pawar, Ravdeep Singh and Kirti Deshpande in their second paper [3] they showed how to operate switches using Nodemcu over the cloud. A system with an ability to integrate with very few efforts for off the shelf products was done by Carelin and I. Jacob Raglend[4]. Salma and Dr. Radcliffe[5] with an aim of increasing the popularity of home automation designed a system that used the Novel Network Protocol. It gave the option of controlling the devices through a mobile or laptop. An additional network device was used for remote access instead of a microcontroller. Rozita Teymourzadeh, Salah Addin Ahmed [6] designed a GSM-based system for home automation. Using the GSM protocol for communication, it gets to access the system by using the (SMS). The system also gave information to the user about the current status of an object. The system used ZigBee for home controlling and GSM technology for remote access. It did not provide any GUI for users and also it was prone to security threats as anyone has access to the system. Kaylee Moser, Jesse Harder and Simon G. M. Koo [7] in their paper Internet of Things in Home Automation and Energy Efficient Smart Home Technologies they suggested a energy eddicient way to use internet of things in smart homes. Andre Gloria, Francisco Cercas, Nuno Souto [8] they suggested an IoT gateway dedicated to real-time monitoring and remote control of a swimming pool. Based on a Raspberry Pi, the gateway allows communication and exchange of data between the user. Sheikh Ferdoush, Xinrong Li [9] showed how to create an IoT gateway system to provide continues data monitoring and communicating with Arduino and raspberry pi modules. Khusvinder Gill, Shuang-Hua Yang, Fang Yao, and Xin Lu [10] they How to provide a climate monitoring system which is connected with sensors and parameters from that sensors to be used for monitoring using the raspberry pi to communicate through LAN. This enabled remote control using a simple UI. The system was cost-effective and has good security in the house.

IV. PROPOSED SYSTEM

In the proposed system we have used RLAY_IR along with the Raspberry Pi 3 to operate wall mounted switches wirelessly. Also, we are using the cloud as the interface between Raspberry Pi and Android application. Raspberry pi able to send IR signals with the help of LIRC - Linux Infrared Remote-Control Package it uses this package to record and send IR signals needed to communicate with Switches. Python code is written to detect certain changes in the real-time database once changes are detected then it starts sending corresponding IR signals to the Relay IR. This approach shows how to operate manually operated switches from a remote location and it is to be done portably. This project includes the creation of a portable device which does not need to be connected to any of the switches it should only to be present in the IR signals ranges and it needs to be in front of IR receiver of the circuit.

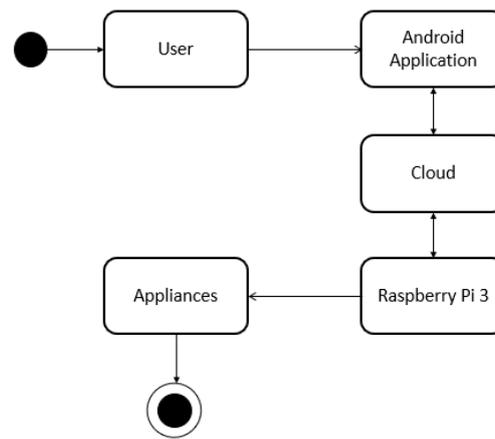


Fig.1: Block Diagram of Proposed System

Objectives of the proposed system are as follows:

- This project shows the operation of wall mounted switch portably.
- Operating on various devices and changing the status of devices using IR communication.
- This will help to achieve home automation portably and to install faster in homes.

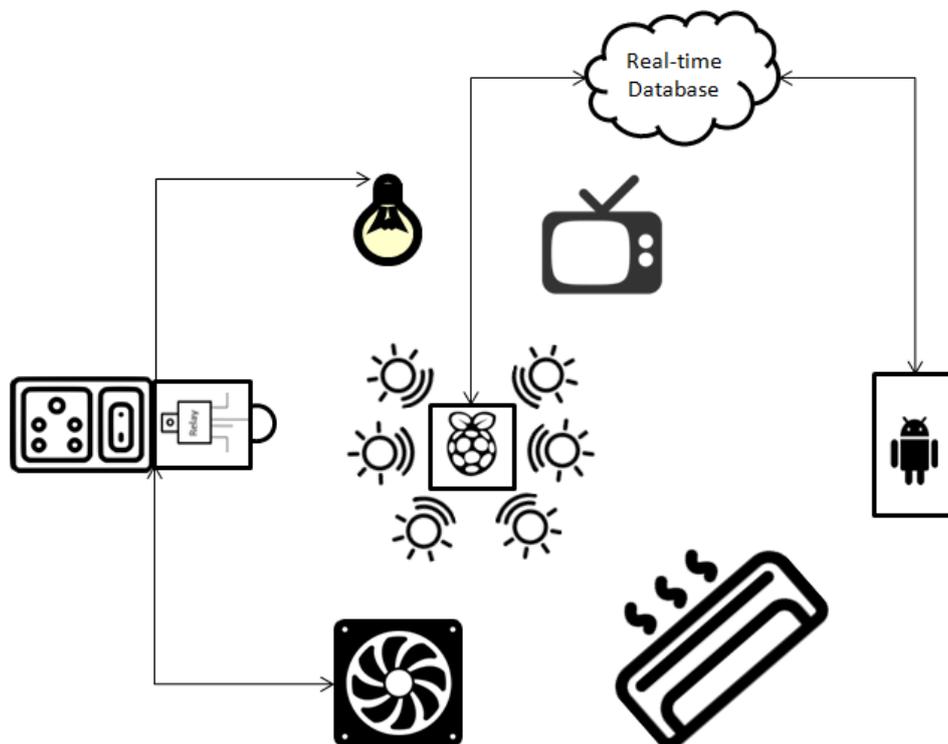


Fig.2: Architecture of the proposed system

Working of the proposed system:

1. The user will operate in android application corresponding changes will reflect in the database.
2. Then, Raspberry Pi will detect changes in the database based on those changes made by the user it will send corresponding hex IR code to Relay IR.
3. Then after signal received by the Relay IR circuit, it will operate the corresponding switch.
4. The device user wants to operate will be reflected with corresponding changes.

V. CONCLUSION

This gives us the conclusion using real-time database we can achieve an automation system which will be accessed over the android application. In the proposed system the home automation implemented with fewer connection overheads and the portable device is created to automate the home. This system also has control over various appliances including the IR supported appliances can be handled from anywhere using the android application. It will provide user convenience as it will be possible to control the devices from remote locations.

VI. FUTURE SCOPE

The project can be expanded in various domains like smart homes, smart cities, etc.

Smart Homes: In the coming years, fully automated smart homes will surely become a reality as the home automation is developing rapidly. Due to good user convenience, smart homes are appealing a wide range of people all over the globe. The User can check usage of electricity, condition of the device and get notifications accordingly.

Smart Cities: This will help in building new and smarter cities. Cities that will have less pollution, traffic accidents, etc. problems.

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