Home Automation Using IOT

[1]Deepak M.C, [2]Harsha H.C, [3]Kanishka P, [4]Afshan Inhas, [5]Harish Naik

Abstract

Technology is exponentially growing on a daily basis to an extent where anyone can control devices from anywhere. With the use of remote control, the television can be controlled from a certain distance from the remote. It is not necessary that you need to be close to the device to operate it. Just think of a world where you will be able to control your home devices from remote places through an android device without sophistications. Home automation is very popular nowadays as it provides numerous facilities such as . Energy consumption is the major thing that has to be concentrated upon in our daily life. In this paper we discuss about controlling the Home appliances like fans and lights from any corner of the world through the mobile application with the help of raspberry pi 2, relay hub and android version mobiles. A new approach is designed and implemented where we achieve an internet-based smart remote control system for home automation which is cost effective and reliable.

Keywords: Android application, raspberry pi 2 and relay hub.

Introduction

Nowadays 21st century has become more and more self-controlled and automated due to the comfort it provides. Everyday a new technology is discovered and developed. The recent survey shows that in this century of digitalization people are being attracted to automated devices. Since 2013 IOT has emerged to make smart devices smarter. A smart home system is an integration of smaller electrical devices that communicate with each through internet. Commands are sent over the internet and these usually involve switching off or switching on the devices based on user requirements. Nowadays extensive researches are carried out to improve the smart home system. One of the important ways to improve smart home system is by changing from wired transmission to wireless communication because the major weakness of the wired connection is the limitation of network ranges and upgrading difficulty. Wireless communication reduces the hassle of making a new connection and will increase the network range.

Home Automation

Home automation is the control of an electrical device in our home from a remote location. Home automation is one of the exciting developments in technology. There are many products available in the market today that allow us to control over the devices automatically either by remote control or by voice command. Home automation includes centralized control of lighting and air conditioning and other systems to provide improved convenience, comfort, and security.

Need For Automation

Not so long ago we looked into the face of future when we talked about automated devices. These are some of the criteria that briefly tell us about the need for automation in our homes and day to day life.

a) A human presence can be replaced by an automated device; moreover humans do many errors whereas automated devices can work with no error and versatility.

b) Replacing human operators in tasks that involve hard physical labor and in tasks that involve working in dangerous environments such as fire, space, under water etc.

c) It helps in improving processes, efficiency, accuracy, flexibility and reduces cost.

Related Works

2.1 A New Intelligent Remote Control System For Home Automation and Reduce Energy Consumption

According to this paper, they have designed and implemented an internet based smart remote control system for home automation dedicated to power management that adapts power consumption. Sensors and home appliances are connected to the designed and implemented control panel and they are monitored and controlled from any corner of the world through an Internet cloud. It is scalable and allows additional appliances to be added to it with no major changes to its core. [1]

2.2 GSM Based Home Automation System Using APP-INVENTOR for Android Mobile Phone

This paper describes GSM (Global System Messaging) based secured device control system using App Inventor for Android mobile phones. App Inventor is a latest visual programming platform for developing mobile applications for Android-based smart phones. No need to write programming codes to develop apps in the App Inventor, instead it provides visual design interface as the way the apps looks and use blocks of interlocking components to control the app's behaviour. [2]

2.3 E-MAIL Interactive Home Automation System

According to this paper, a basic home automation application is designed and controlled through internet by reading the subject of E-mail. Led's are used to indicate the switching action. The popularity of network enabled home automation has been increasing greatly in recent years due to simplicity and much higher affordability. [3]

2.4 Enabling IOT Services Using WIFI – Zigbee Gateway for a Home Automation System

Home automation system is a process of adapting to basic household activities like control of Lighting, Heating on user command. A dedicated hand held device is ideal in providing a user interface in a home automation system, due to their portability and their wide range of capabilities. The hand held device runs on Linux OS which is an open source platform and can work on limited memory communication between the appliances a home automation network through low power communication protocols such as ZigBee. [4]

2.5 Internet of Thing Based Home Appliances Control

Internet of thing is growing network of everyday object from industrial machine to consumer goods that can share the information and complete task while you are busy with other activities. How internet of thing can be use for handling home appliances smartly. Smart home applications provide the comfort, convenience and user friendly handling the many home appliances. The paper includes various models for web connectivity and also basics of information about the energy conservation system. [5]

2.6 Android Phone Enabled Home Automation

Misuse of power energy can be curtailed by automating the devices and appliances. Mobile communication is playing a vital role in the domain of automation. Android phones are powered with application programs to automate the required devices. This paper focuses to automate the home appliances using Bluetooth short range communication. The status of the device is linked to the local internet to enable the graphical user interface (GUI) for device monitoring. Sending the command signals using Android Bluetooth and monitoring the device status using IEEE 802.15.4 wireless communication device interfaced to the internet are the main two steps considered in this study. [6]

2.7 Home Automation and Grid Mapping Technology Using Iot

According to this paper, the use of sensors in common household items can transform them into smarter devices is the next step. Grid based mapping is an easy way to map an entire house. Control of electronic devices through mobile phones or computers is at the core of this technology. And they have discussed on how home automation system can be implemented and how the use of cloud computing technology along with Iot devices can be used so that the data collected by these devices can be safely stored and monitored and to be used by the user to control it. [7]

2.8 IOT based control of Appliances

Life is made simpler and more productive through IOT. IOT can be considered as the network of multiple things including inanimate things as well as living organisms. Deploying a sensor network to collect the sensor data in the surrounding environment and remotely actuate the necessary controls is possible through IOT. As the Wi-Fi hotspots are increasingly becoming common in the recent times, the existing infrastructure can be used to develop a cost effective solution to enable the existing appliances with IOT. This paper also aims to prototype a solution to enhance the old appliances and make them smart. [8]

2.9 Smart Refrigerator

This paper tells the concept, architecture, building process and functionality of such a device that incorporates the systems stated above: a refrigerator that is exposed as an IoT object and interacts with the items stored within, gathers information about them, process this information into relevant data that is later conveyed through an Iot platform to its owners, in other words, a smart refrigerator. [9]

2.10 A Semantic Approach to IOT Data Aggregation and Interpretation applied to Home Automation

This paper proposes a framework based on semantic technologies to aggregate Iot data. Our approach has been assessed in the domain of the Smart Home with real data provided by Orange Home live solution. We show that our approach enables simple reasoning mechanisms to be conducted on the aggregated data so that contexts such as the presence, activities of people as well as abnormal situations requiring corrective actions, be inferred. Despite this heterogeneity, future Iot applications including Smart Home, Smart City, Smart Energy services, will require that all data be easily compared, correlated and merged and that interpretation of this resulting aggregate into higher level context, which better matches people needs and requirements, bringing the user experience to the next level. [10]

3. Proposed System

The proposed system is divided into four modules namely the application module, device control module and hardware module.

3.1 Application Module

In this module the user has to install the application first and he can control devices present in his house from remote locations using the application. The user can utilize different services provided in the application's menu layout. There are buttons provided to control the device states (on/off) in the layout. Based on the user's actions the data is sent to the device about the imminent operation to be performed.
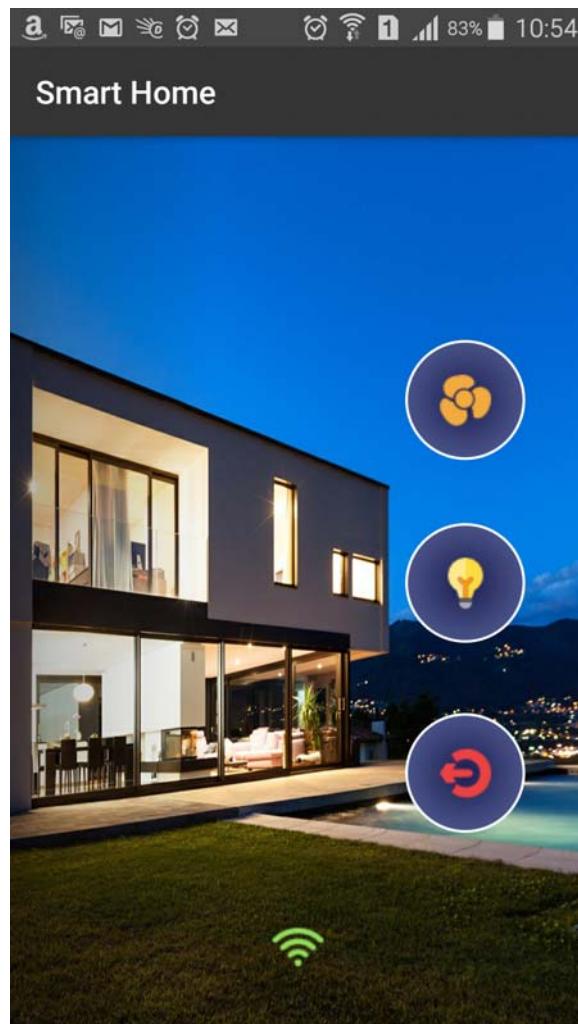
Fig 1 View of the application module

Fig View inside the Status button

Fig View inside the Fan button

Fig View Inside the Led button

3.2 Device Control Module

In this module the data sent by the application is received by the Raspberry pi 2. This data is evaluated into meaningful lexical semantics that act as commands to the devices. Once the data is analyzed it is parsed into state (on/off) commands. These commands are sent to the appropriate device which results in the change of state for that particular device. Finally the device status is updated to the application.

3.3 Hardware Module

Any application without the necessary hardware becomes lifeless and void. The hardware module of this project mainly consists of devices such as relays and other simple electrical devices that affect the current state of the connected device. These devices simply follow the commands given to them and switch on or switch off the device.
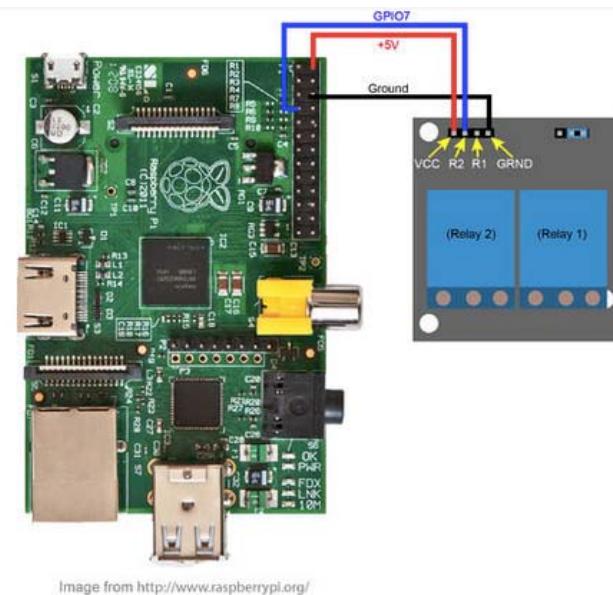
4. Application Process

At first, When the users open the application they would be asked to provide input for the permissions (accept/decline) if they decline the permissions then the status of the device wont be downloaded into the smart phone.

If the permissions are accepted, then the application downloads the status on the smart phone. The main screen on the Applications consists of two buttons one for the led and one for the fan. Inside the led button we have 2 sub buttons which are action and status in action we can control the devices on /off action once the led is on the data is sent to the raspberry pi2 and from the raspberry pi2 the data will be uploaded on to the server and then the led turns on. In the status button we get to know if the device is currently on/off and their voltage supply. Now on the fan button we have 2 sub buttons which are action and status in action we can control the devices on /off action and in the status we get to know if the device is currently on/off and their regulator speed.
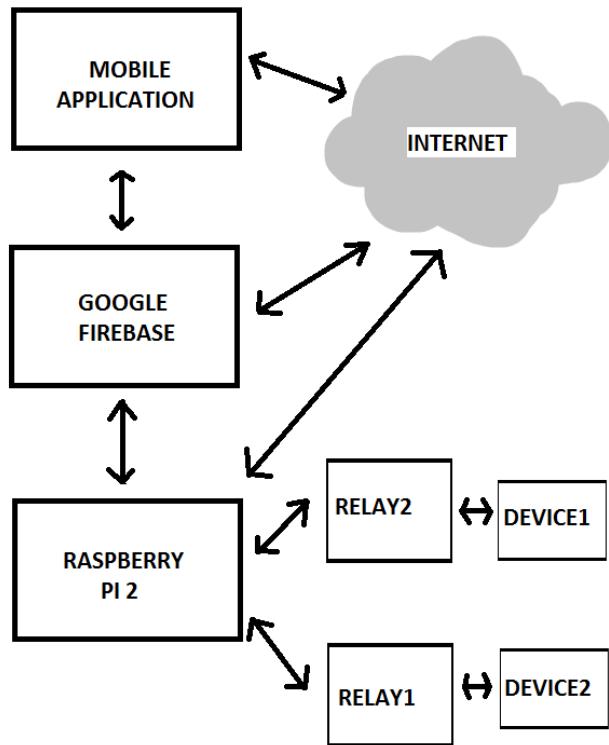
5. Application Development

The application is mainly built for Android smart phones. It is developed in android platform using android studio version .The database used here is Firebase. Python scripts are used for communication between the four modules.

6. Results and Discussion

The proposed application has been tested using multiple android smart phones. Then the raspberry pi is connected to the internet and been tested and then the script is checked if its in working condition. Then the user has to provide input through the smart phone application when the user turns on the light from the application then the signal is sent from the application to the raspberry pi and then the light turns on it is not necessary that the user has to stay near the device he can control it from any corner of the world then the fan module is checked by setting the status to on after the fan state is set to on the fan turns on. This has been tested on multiple devices in different conditions and we have achieved positive results all the time.
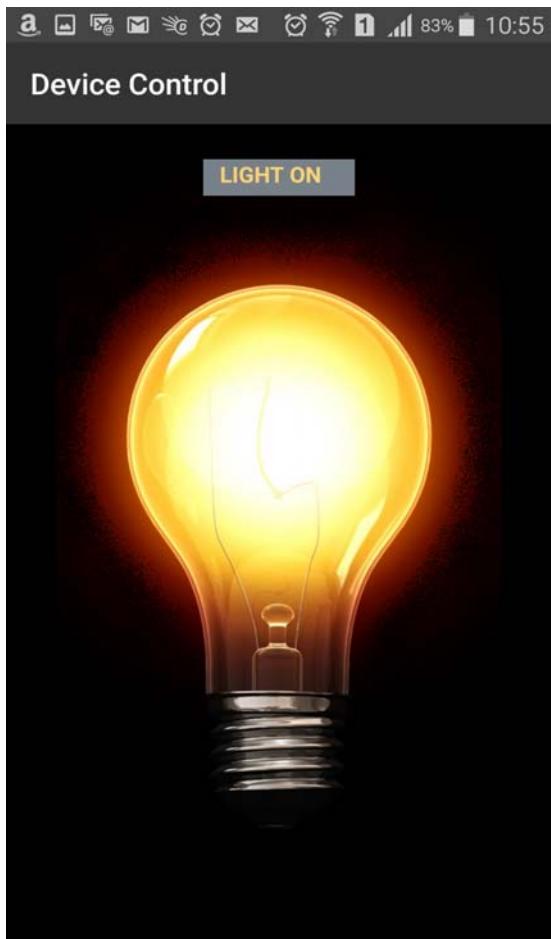
Fig View of the Light turning on the phone

Fig View of the Light turning on

Conclusion

The proposed system is used to develop an android application which will help us to control simple electronic devices such as lights and fan over the internet from anywhere using his/her Smartphone. This helps the user to save electricity.

The application consists of three modules: the application module, the device control module and the hardware module. The application module provides different services which helps to control the devices status to turn on/off. The device control module receives the data sent by the raspberry pi 2 and then sends it on to the appropriate devices which in turn causes that particular device status to be turned on/off. The hardware module consists of the necessary hardware needed to control the devices which are relays ,wires, led's ,dc fan. These devices simply follow the commands given to them and switch on or of the device,

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Author details

Student 8TH SEM B.E DEPARTMENT OF CSE, T JOHN INSTITUTE OF TECHNOLOGY, EMail ID:deepak0338@gmail.com

Student 8TH SEM B.E DEPARTMENT OF CSE, T JOHN INSTITUTE OF TECHNOLOGY, EMail Mail ID:harshadota2@gmail.com

Student 8TH SEM B.E DEPARTMENT OF CSE, T JOHN INSTITUTE OF TECHNOLOGY, EMail Mail ID:reddykanishka21@gmail.com

Student 8TH SEM B.E DEPARTMENT OF CSE, T JOHN INSTITUTE OF TECHNOLOGY, EMail ID:inhasafshan@gmail.com

Assistant Professor, Department of CSE, T JOHN INSTITUTE OF TECHNOLOGY, Bangalore Mail ID:harishnaik@tjohngroup.com