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Use of Raspberry Pi to Aggrandize Smart Homes

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Abstract

The Internet of Things (IoT) is phenomenon of connecting the available devices in such a way that the all connected devices will become smart devices and are capable of communicating with one another and exchange the desired information and can act on the instructions given to done to perform a particular task. The back bone of IOT is connection less technology and internet. For the effective communication the smart devices make use of micro electromechanical system (MEMS).

Introduction

With the progressing trends in the technology field IOT has taken a leap and has become an integral part in policy making of any technical as well as non-technical organization. IOT has got accolades prom both the ends that is from speciality press as well as popular media. When it comes to internet of thing it's a collaboration of many network products, interconnected systems and sensors .In advent of development of computing devices in a compact form which offers a good interconnection easily which was not supported by other technologies before. There is a whole repository of research papers available along with the articles which is leading to a new era of IOT-Revolution. As the development of new IOT implementation is taken place there is a whole new market is setting up which is looking in the implementation of IOT in a large scale and to go ahead with that business .As there is large scale implementation is taking place IOT is giving the assurance of transforming whole idea of manual working into a more automated process. But as internet of things is based on the products that are internet enabled as before the actual implementation the care must be taken on how the products can be interconnected. In the advent of this new technology the modern products like internet enabled. New products like Internet-enabled embedded hardware components are resulting into home automation, hospital automation etc. which with their performance and utility is attracting more and more customers to try this new smart home technology. Smart home automations offers its users more security and efficiency because it depends only on interconnected devices of which performance evaluation can be computed correctly and results can be compared with pre-existing technology. Another wide area of implementing the IOT is by using wearable devices which will gives its user a wide range of measuring values like pulse rate and calories burnt etc. which is benefitting its users as well as becoming an intrinsic part of developing a smart hospital. On the other hand this technology is helping the differently abled persons to get the service at home only and same holds true for the elderly people also who will be having some constraints related to their age. Along with the health industry the IOT is benefitting big time towards traffic monitoring which monitors the traffic and predict the congestion and send a alarm to its use to take a alternate route, which intern is helping in forming a smart city.

Not only in the modern cities the IOT is spreading its arms in the rural area also by giving a complete package of technology which is dedicated to agricultures and alternate energy production. Based on IOT automated irrigation projects are developed which are based on the idea of moisture content of the soil if the moisture content is less than the threshold value the trigger will be sent to irrigated the field automatically without any human intervention. Similar concept is also used in applying pesticides to the crop automatically and at the end to harvest the crop. IOT is becoming more and more intrinsic part of the human life each machine is able to communicate with other machine and like a chain of intelligent machines is made which are self-sufficient in accomplishing any given task. In spite of having numerous benefits still the implementation of IOT is not done in its desired level as there is lobby of internet society which believes in enforcing the law on a maleficent user in the advent of a crime but when dealing with only the machines as in the case of all IOT products it will becomes a question of concern whom to punish and how if at all a crime takes place. By keeping all the advantages as well as the problems associated with IOT a strict law should be made with highlighted dos and don'ts.

SMART HOME AUTOMATION SYSTEM

Here the backbone of the proposed system is the support of many features that will come along with the IOT and those are the range in which the appliances can be made more and more flexible and along with that the system scalability will be increased to make the system ready to serve all the requests that are coming on its way. In the advent of smart phones becoming a vital object in supporting all the sensoning devices to react on to signal of the smart phones and Android is giving all the smart phones to develop a platform to develop or install a app which is best suited to their requirement of the IOT device. Android enabled phones are giving users the facility to give the command to any device remotely and the action will be performed by the intended device through the central control panel. Dropbox play a vital role in checking the status of the devices connected to their phones remotely as drop box will store the action taken by the appliance once the command is given so that the performance of each device can be measured and evaluated. The Dropbox account feature is inserted to ensure the security and reliability of the home automation system.

Virtues of Smart Home Automation System

The reason why this smart phone automation dint not become so popular in the past was because of some intrinsic difficulties in may the appliances more independent using previous technologies. Now as the technologies are progressing more and more uses of smart home automation are coming into light out of few are listed as follows:

1. As all the equipment are connected to report generation software it is very simple to compute the report on how good or bad an equipment is working. The reports also let us know how much power the appliance is consuming through the report. not only an advantageous feature, but it also safeguards the stability of communication.

2. As the light and other appliances will be enabled with the sensors so when there is no need of lights the system will switch if off which in turn increases the life span of the appliance and safe cost.

3. As the power consumption can be monitored by reports that can be used to upgrade overall performance of the overall home.

4. As the no of equipment in the home will be limited that's the reason it's easier to manage and control.

5. The appliances can perform continuously as home appliances will be very flexible by nature.

6. Due to sensors presents in the appliances the electricity bill can be reduced to a greater extent.

7. There will be a great inclination in achieving more comforts and facilities with just one drop a button as all that can be achieved with one signal.

Architecture of the system

Raspberry Pi : The Raspberry Pi is a credit card sized microcomputer with input output pins along with all the periphery required for any full-fledged. Raspberry pi will have to be connected to a monitor or LCD display unit which can be connected using HDMI cable.Raspberry pi resemble any other desktop computer in its functionality the only difference relies on size. It's a open source hardware.It is enabled with 1.2GHZ arm cortex processor with 2 GB RAM It is competent enough to be used in electronics projects and many other places. The main motive behind developing raspberry pi was to make affordable PCs so that more and more people can get accustomed with the technology getting invented day by day. There are many free operating systems which are available in internet which can be installed and worked on to. Raspberry pi Support a list of operating system which are LINUX based and freely available like NOOBS, UBUNTO,PIDORA. Along with the availability of freeware soft wares the raspberry pi comes with its own default operating system called raspberries OS Fig2.1 (a) demonstrate to basic model of raspberry pi. Steps to be followed in installing the OS onto raspberry pi is demonstrated in Fig. 2. 1(b)

(a)

(b)

FIGURE 2.1 . (a) Installation of Raspberry Pi. **(b)** Installation of supporting operating system into the raspberry pi module

Packages Installation into Raspberry Pi

In advance to install any package into raspberry pi a care must be taken to look into the pre-requisite of any given package. By execution of required commands the user can feed software into Raspberry Pi. Like Linux the Raspberry Pi can straight away take all its software from the internet itself. Before the installation process start internet connectivity should be checked and using which the assurance can be taken that the required packages will get installed automatically as and when required from the internet.Due to internet connectivity the updated package will be installed automatically by the OS. In built language which is supported by the raspberry pi is the python so at the time of installation it should be made sure that all the desired packages are installed and associated libraries are linked correctly. The packages like pip, dev etc. are must for home automation. A fully functional python programming environment like python editor is provided by these packages to work. As the peripherals will be used to connect any hardware component General purpose input output package is the must and care must be taken to attach the pins correctly. Usage of Operating pins of Raspberry Pi can be done by inserting required. For performance evaluation graph plotting is must for this matlab should be installed. After plotting graph the devices should be connected to a server for apache server is used.

It mainly consists of web applications for data and service management,cloud-based services for user identification,

data storage and mobile operating systems, respectively programming interfaces

The general steps are as follows:

1. Creation of Dropbox account.

2. Dropbox Uploader is downloaded.

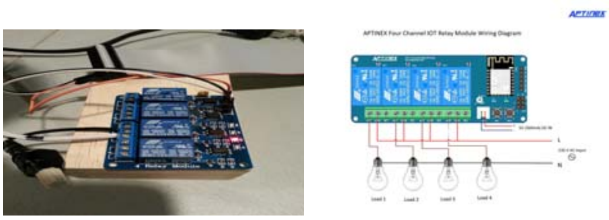
3.To get supporting erin to download the Dropbox details of raspberry pi.

4. The script of uploader with .sh extension is executed. Which intern allow user to log into the account created in the Dropbox to get the details of application programming interface.

For storing the information the Supporting Dropbox app should be developed or installed into the phone which is supported by the phone to handle or control the devices.

Relay Circuit of Raspberry pi

As shown in Fig. 2.4(a), whenever necessary a relay circuit can be used to make or break electrical connections of home automation system. The relay circuit used is easily driven or activated by the operating pins of Raspberry Pi. Contacts of its own are present in a simple relay circuit to perform the task according to their connectivity in the circuit and switching semiconductor devices for the activation. A relay not only isolates the driven circuit from its contacts alone but at the same time, the direct.



(a) (b)

FIGURE 2.3. (a)Demonstration relay circuit used in raspberry pi (b) Interconnection of varying load and circuit.

Android Application

Using Android phone, Raspberry Pi can be controlled by making use of Raspberry Control Android Application. This application protocol has Various features such as:

- Strong bonding with Raspberry Pi.
- Safe to access operating Pins.
- Beautiful graphical user interface.
- Abound with 1-wire and I2C features.
- Built-in MJPEG stream client.

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One of the most recommended and suitable methods are The console based installation of the Raspberry Control on the Raspberry Pi. For this, all that has to be done is opening the terminal, a console utility on Raspberry Pi.

1.The latest version of the Raspberry Control software has to be downloaded from its software link

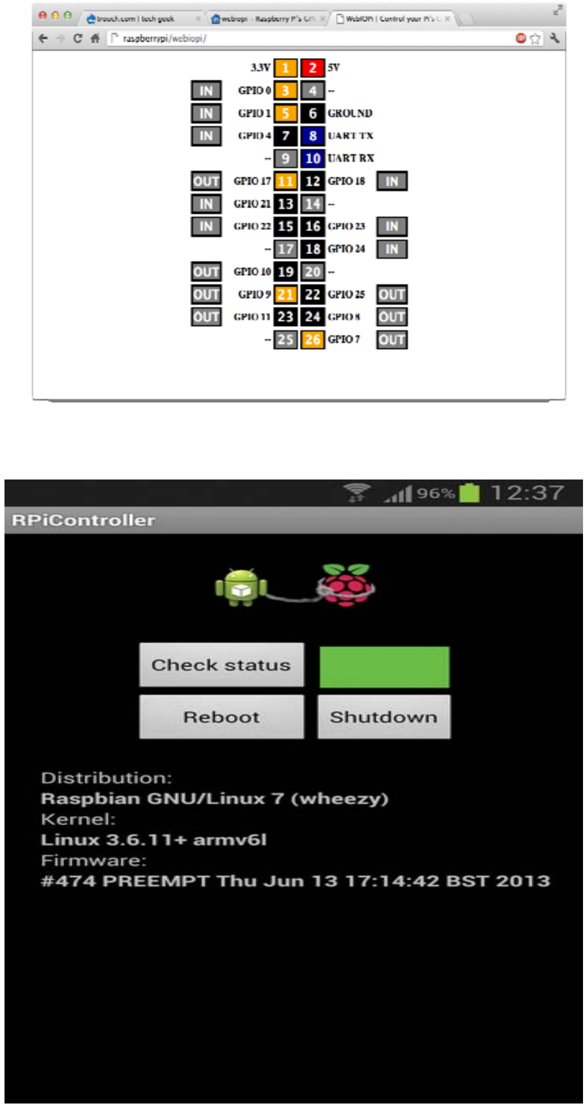
2. Navigating the downloaded file in a particular location and extract the tar.gz archive into any directory of the system.

3. Run the setup script.

4. Raspberry Pi has to be rebooted.

5. Download Raspberry Control Android Application from the Google Play Store and then this application should be installed into the user android phone.

A link between the Raspberry Control android application and the Raspberry Pi is set up via a static IP address which is provided by the raspberry pi. While establishing a link between the Raspberry Pi and the server via WI-FI, a fixed IP address is assigned by the server to the raspberry pi. The user uses the command “Hostname–I” to examine the Raspberry Pi’s IP address from the terminal. 192.168.11.110 is used as the IP address. It is important to make sure that the Raspberry Pi connection is active throughout the installation process.



(a) (b)

FIGURE 2.4.Method of connecting android phone with Raspberry pi (a) Raspberry pi GPIO pins (b) Android App for Raspberry pi.

Experimental Results

The advantage of using smart home automation gives the flexibility to its users to compute to power consumption of each device and compare that with the existing results and performance evaluation of the overall system. This is done by constantly monitoring each individual device and its performance which is plotted against the time consumed in second and the task completed. The power consumed is evaluated is against the number of devices which are connected across the to which is termed as CT and PT values respectively. Once the power consumed is evaluated that value will be converted to a control string which can be used to plat the graph of consumption against the load connected. Seeing the graph further development is done experimentally to increase the through put of the appliance by consuming least power and giving the maximum through put. The power consumption can be reduced by incorporating more sensors into the machine and evaluating the performance. graph from any place as shown in Fig. 2.5. The time range can be extended as per the user requirement.

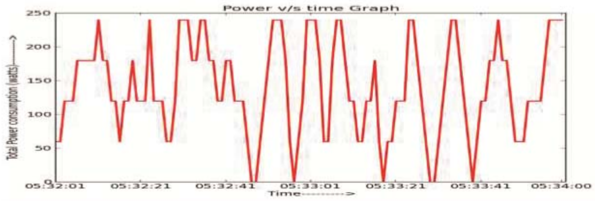


FIGURE 2.5 Evaluation graph of power consumption of load and the time

Conclusion

The main purpose of automating the home is to make the all the devices in to home to communicating with one another in such a way that the overall security and performance of the system can be increased and power consumption can be reduced. The main agenda is to control the device from a remote location along with making the devices intelligent enough to take their own decisions based on some trigger given by the users. The Zigbee protocol will come very handy in those situation. The implementation using cloud computing can make more self-reliant. By installing numerous number of raspberry pi which is nothing but a credit card sized micro-controllers which gives us the effect of using and implementing the automation very reliable and easy to implement. As and when the time progress raspberry will used in numerous place and is the future of automation.

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