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Intensification of Home Automation using IoT

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Abstract

In the last few years the advancement technologies were improved in many ways using internet of things. It gives efficient and accurate results. Now we proposed a novel technique, which is used to operate any electrical component or components in home, office or any other place and control all these components like electrical bulbs, fans, refrigerators, etc. Through privacy based and customized way using electronic mail (e-mail). The experimental results conducted on Home Automation using Raspberry Pi.
Keywords: Electrical Devices, E-Mail, Relay Module, Raspberry Pi 3 Kit

I. INTRODUCTION

As matter of fact, Internet of things is a technology to form a new and create intelligence of physical devices such as vehicles, buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity that enables these objects to collect and exchange the data. The IOT allows objects to be sensed and controlled remotely across the existing network infrastructure, and resulting in improved efficiency, accuracy and economic benefit and reduced the human intervention.

Internet of things is being developed rapidly without consideration of security. According to Survey conducted in 2014, 39% of the people said that security is the biggest concern in adopting Internet of things technology, is a major challenge in IOT.

The perception of a network of canny devices was conversed early in 1982, with a modified Coke machine at Carnegie Mellon University, it is the first Internet-connected appliance, able to report its inventory and whether newly loaded drinks were cold. The term "Internet of Things" suggested by Peter T. Lewis in 1985.Earlier works on these lines were proposed on various approaches as follows:

The environmental monitoring applications of the IOT use sensors to assist in environmental protection by observing air or water eminence, atmospheric or soil disorders and arrangements of wildlife and their habitats. IOT also provide way for detecting natural calamities like earthquake or tsunami and provide early warnings.

The devices of IOT can be used in hospitals. These health monitoring devices such as blood pressure monitors and heart rate monitors and other advanced devices capable of monitoring specialized implants. Some hospitals have begun implementing smart beds that can detect when the patient occupy bed and attempting to get up and also controlling blood pressure of patient without the manual interaction of nurses. Specialized sensors can also be equipped within hospital to monitor the health of patients.

The internet of things is the internetworking of somatic devices,automobiles,erections and other item embeded with electronics,software,sensors,actuators and network connectivity that facilitate these substances to accumulate and altercation data. In 2013 the global standars initiative on internet of things defined the IOT as the infrastructure of information society. The IOT allows objects to be controlled remotely across existing network infrastructe, creating opportunities for more direct integration of physical world into improved efficiency,accuracy and economic benefit in addition to reduced human interaction.

As of 2016, the vision of the internet of things has endued due to a convergence of multiple technologies, including wireless communication, realtime analytics,machine learning. This means that traditional fields of embeded systems, wireless sensor network, automation and all other contribute to enabling the internet of things. The concept of a network of smart devices was discussed as early as 1982. Mark weisa's seminar paper on ubiquitons computing in 1991. The computer of 21st century as well as academic venues such as ubicomp and percon produced vision of IOT.

According to a technology research and advisory corporation, there will be nearly 20.8 billion devices on internet of things by 2020. ABI investigation appraisals that more than 30 billion diplomacies will be wirelessly attached to IOT by 2020.

A. Background Work

In existing techniques, the applications are implemented through web or mobile apps, so these applications are accessed by other persons if they know the proper uniform resource locator (URL) or IP Address and controlled all devices which are connected to the Kit. So these applications have less security for raspberry pi Kit.

In existing technique, the whole system is divided into two quantities one is client and another one is server. In this applications the server has a web interface configuration and it contains buttons which are used to control the devices to turn on or turn off. The server containing web pages developed in php, html pages and text files to store data and this data refers the button's status that means either the button is turn on or turns off.

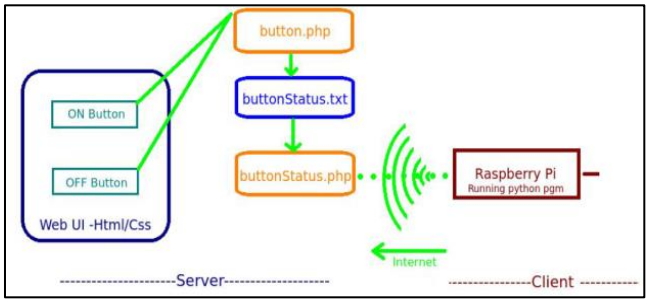

Fig. 1: Home Automation based on web application

The client side consists of Raspberry Pi kit with relay circuit connection. The kit is running depends on python program instructions. Here we have some drawbacks in existing systems

- It is totally web based so any one can operate easily if they know the url.
- Especially there is no security on web based automation.
- No algorithm is implemented to maintain the security.
- It is too expensive to maintain web application.

In this paper, we propose a novel technique, which is used to control the raspberry pi kit by authorized users only. Here, each device is controlled by two values (respond keys) either ON or OFF and these keys are completely customized by developer or programmer.

B. Home Automation

The Internet of Things is very simple perception where devices in our home or any other place, have a capability to communicate with each other through internet. Generally, sensors are used in this technology to pass information to the internet. Home automation systems connected to the internet, which can be used to regulate piece of equipment in your home like lights, door locks, air conditioning, etc through a web or smartphone application. A lot of technologies are being established for passing data to the internet but here we will show you how you operate the home automation system using raspberry kit that is completely web based using normal hypertext transport protocols. You will be able to control any appliance in your home from anywhere when you are done with this Raspberry Pi home automation system. The following requirements are need to develop this system

1) Hardware Requirements

- Hdmi Monitor
- Usb Key board
- 9v Battery
- Raspberry Pi Model kit
- Bc547 transistor
- Solder prototype board
- Diode
- Relay module
- Software Requirements:
- Html or CSS
- Linux or Rasbian
- Php
- Python Programming

Here the whole system is divided into 2 parts 1. Server and 2. Client, the server is completely web interface, user interface and it have buttons that allow you to control the electrical components which are connected to the kit. The server contains php files and text files to store information. Client contain a raspberry kit along with relay module connected to its general purpose input/output pin and it is running on python programming to post a unified resource link i.e., the kit continuously read the contents of link, based on the input the concern activity will done. The following procedure is used to operate the kit.

- Step1. Prepare Php files and html files.
- Step2. Set up the relay module for Home Automation System.
- Step3. Set up the Raspberry Pi Kit.

II. BASIC ALGORITHM OF HOME AUTOMATION BASED ON IOT

Here the below diagram shows the flow of execution of present implemented home automation system.

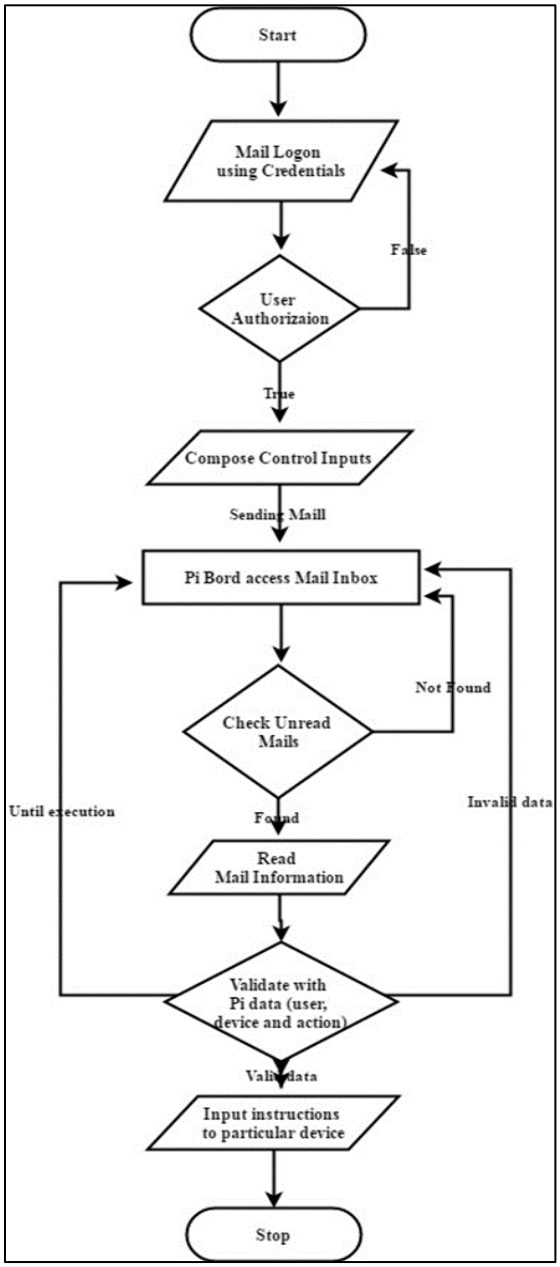

Fig. 2: Flow of Execution

A. Pseudo Code

1) Start
2) Logging into e-mail account
3) Send a mail with customized values
4) Check unread mails
5) If found then goto step 8
6) Else
7) Goto step 4
8) Read mail information compared with pi
9) If match found then
10) Goto step 13
11) Else
12) Goto step 4
13) Perform action based on values
14) Goto step 4 until exit
15) Stop

III. HOME AUTOMATION USING IOT

In this paper, we propose a novel technique, which is used to control the raspberry pi kit by authorized users only. Here, each device is controlled by two values (respond keys) either ON or OFF and these keys are completely customized by developer or programmer. Here, the kit is third generation kit and its response is so fast compared to previous versions.

Properties of Kit

- Bluetooth 4.1
- 802.11n wireless Lan
- A 1.2GHz 64-Bit Quad-core ARMV8 CPU
- Bluetooth low energy

The following diagrams shows the components of Raspberry Pi 3 Model Kit

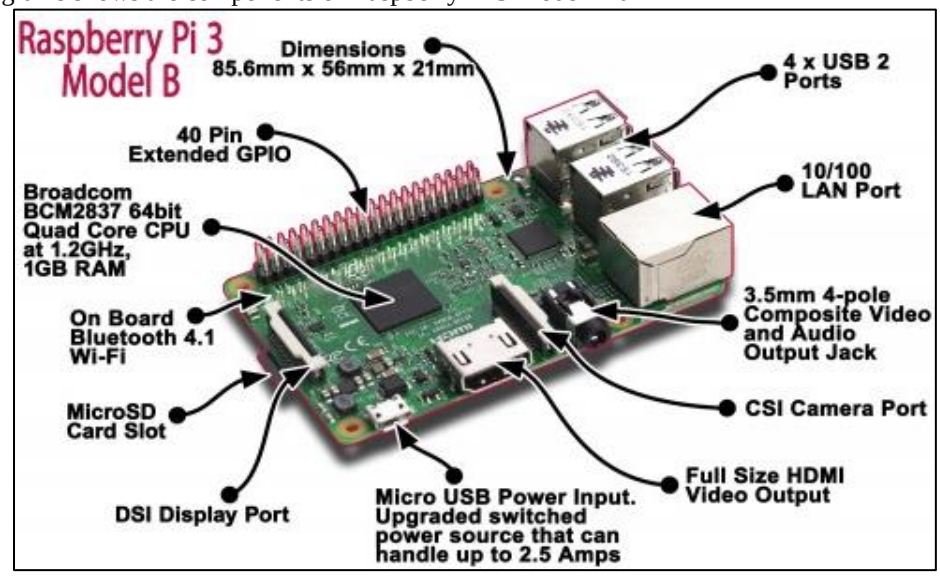

Fig 3: Raspberry Pi 3 Model B

The following diagrams shows Pin Diagram of Raspberry Pi 3 Model Kit

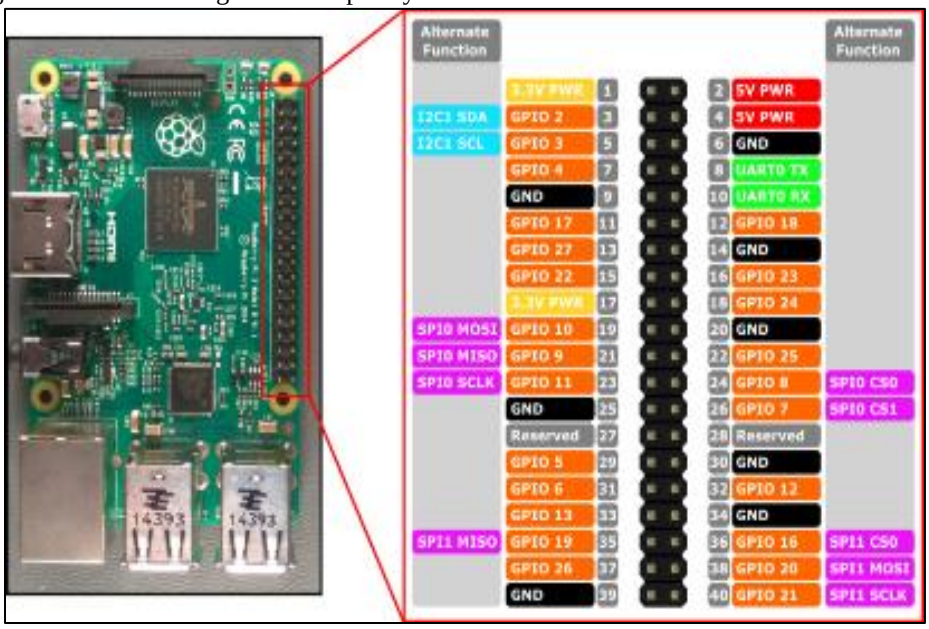

Fig. 4: Pin Diagram of Raspberry Pi 3 Model B+

The entire setup is arranged by using the following block diagram

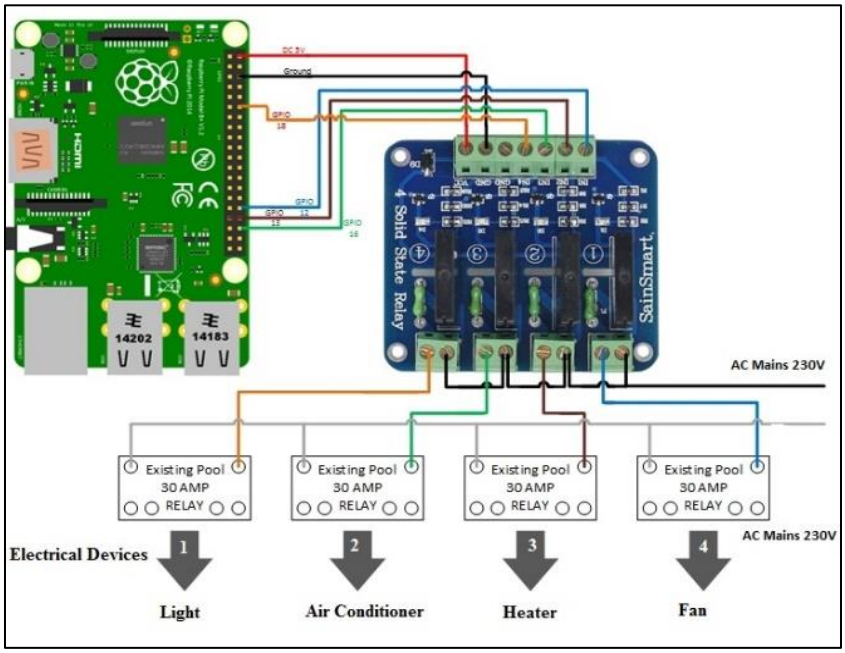

Fig. 5: Connection Circuit Diagram

In this technique we maintain an account for raspberry pi kit and this kit can accept the messages send by the authorized users only. Whenever a new email was received then the kit automatically detects and verifies it, if it is authorized then the devices are activated or deactivated. The total controlling is totally depending on respond keys. Here the kit is validating with two fields which are in received e-mail.

– Authorized user
– Respond Key

Other person also sending messages to kit but it is not responding because we maintain the database and validate every new e-mail. Here the below diagram shows how it authenticate the received emails and its performance.

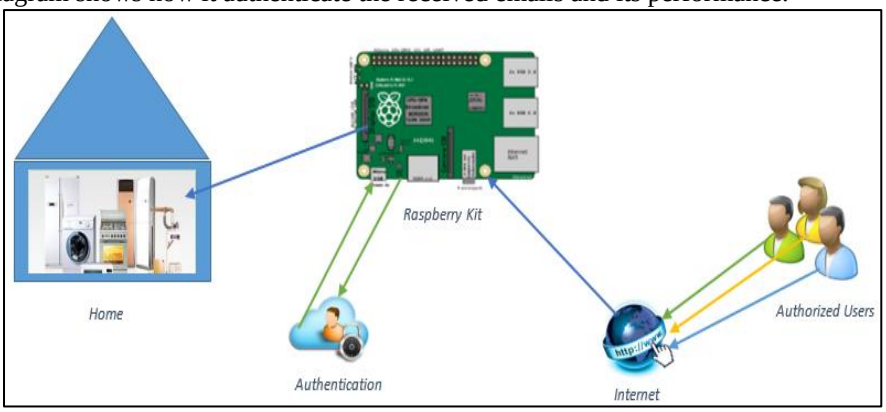

Fig. 6: Home Automation System based on e-mail

IV. EXPERIMENTAL RESULTS

For security reasons we send the instructions for each device through customized commands for controlling the devices which are connected to the kit. The main purpose of passing information is either the device(s) ON or OFF and the information is only known by registered user and kit.

We connect any number of devices to Kit, for example we one device there are 2 test cases, we connect two devices there 4 test cases, we connect 3 devices there are 8 test cases and so on.so here we use the following formula for test cases

Total test cases=2^n where n is no. of devices

The following truth tables are showing device(s) performance

Table – 1
For One device

Test Cases	*Device*
1	*OFF*
2	*ON*

Table – 2
For two device

Test Cases	*Devices*	
	Device-1	*Device-2*
1	*OFF*	*OFF*
2	*OFF*	*ON*
3	*ON*	*OFF*
4	*ON*	*ON*

Table – 3
For two device

Test Cases	*Devices*		
	Device-1	*Device-2*	*Device-3*
1	*OFF*	*OFF*	*OFF*
2	*OFF*	*OFF*	*ON*
3	*OFF*	*ON*	*OFF*
4	*OFF*	*ON*	*ON*
5	*ON*	*OFF*	*OFF*
6	*ON*	*OFF*	*ON*
7	*ON*	*ON*	*OFF*
8	*ON*	*ON*	*ON*

The following graph shows the difference between previous version of home automation system and present implemented system.

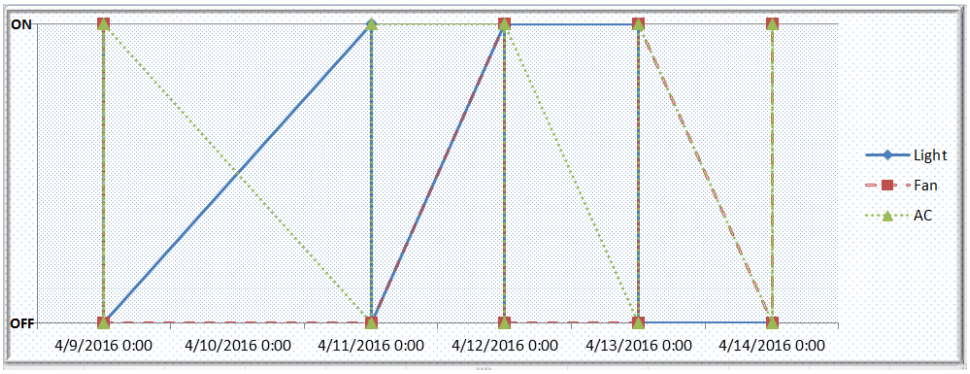

Fig 7: Comparison Graph

V. CONCLUSION AND FUTURE ENHANCEMENT

In this paper we maintain static database for authentication purpose but in future there may be a chance to implement new applications and maintain large databased like Oracle or MySQL. In future there may be chance to apply cloud computing concept and store all the information in cloud by using this technique we estimate our units and we calculate our bill also.

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