

IOT Based Home Automation System on Raspberry Pi

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Abstract - This paper proposes the study of an interactive IOT based home automation and security system on Raspberry Pi. In this work “an IOT based home automation system is developed using Raspberry Pi, reading the subject body of E-mail which we send. In this the subject body of the received E-mail is read by the code which is fed into Raspberry Pi and will perform the actions accordingly. This code is developed in python language, a default programming language provided by Raspberry Pi.

Keywords: Home automation, E-mail, Python, Raspberry Pi, WI-FI dongle.

I. INTRODUCTION

Today the techno-savvy world's centralized principle is to automate each probable thing for simplicity in life, providing security, saving electricity and time. In that home automation is one of the prime things to automatically on and off the home appliances. Home automation can be defined as an approach of doing something without human incorporation. The aim of a smart home is not only comfort but to decrease the utilization of stock / supplies such as power, gas, etc. Because of the recent pricing on energy, stock / supplies conservation had become a part of an individual's day-to-day life. If an individual has the plausibility to regulate his home automation remotely he can decrease the consumption of energy eventually leading into reduced expenses. Moreover environmental sustainability has obtained relevance in the recent years. This paper deals with the study of an interactive IOT based home automation and security system on Raspberry Pi. In this work “an IOT based home automation system is developed using Raspberry Pi, reading the subject body of E-mail which we send. In this the subject body of the received E-mail is read by the code which is fed into Raspberry Pi and will perform the actions accordingly. This code is developed in python language, a default programming language provided by Raspberry Pi .Raspberry Pi as a processing unit, WI-FI dongle as internet connecting device to access and sending E-mails to user, key board and mouse is to operate the raspberry pi and relay board for the controlling and switching operations.

II. PROPOSED SYSTEM

In order to overcome the drawbacks of previous methods, and improves the security, flexibility, efficiency, interactiveness, and provides easy life, saving electricity in accordance with the user needs, proposed these interactive home automation system by taking Raspberry Pi as a processing unit, WI-FI dongle as internet connecting device to

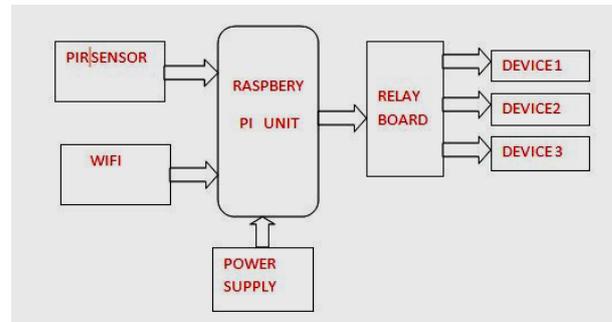


Fig 1. Block diagram of proposed system

access and sending E-mails to user, key board and mouse is to operate the raspberry pi and relay board for the controlling and switching operations, the proposed system block diagram is shown in below figure.

COMPONENTS DESCRIPTION:

The implementation of the proposed system consists of following major components.

- I. Raspberry Pi
- II. WI-FI
- III. PIR Sensor
- IV. Relay board

[i] Raspberry Pi:

Raspberry Pi is a processing unit, developed by Raspberry Pi foundation in UK is of size equal to the debit card. It has Broadcom with a 900MHz quad-core ARM Cortex-A7 CPU. It has an internal storage of 1 GB, 1- Ethernet port, 4-USB ports, 40 GPIO pins for peripheral connections supported by raspberry pi, , Full HDMI port, Combined 3.5mm audio jack and composite video Camera interface

(CSI) , Display interface (DSI) Micro SD card slot ,Video Core IV 3D graphics core.[5]



Fig 2. Raspberry pi 2 model b [5]

[ii] WI-FI dongle:

In order to access the internet in the raspberry pi board we are using Wireless-n USB 2.0 Adapter.

[iii] PIR Sensor

An IR sensor allows sensing motion, and detecting whether an object has moved in or out of the range. They are inexpensive, low-power, small, easy to use. So they are normally found in appliances and devices used in households or trades. They are frequently mentioned as PIR, "Passive Infrared", "Pyro electric", or "IR motion" sensors. [1]

[iv] Relay board:

Relay is an electrically controllable switch widely used in industrial controls, automobiles and appliances. Here we are using 8-channel relay for switching and controlling the devices, having 8 independently-controlled SPDT relays. The Control signals use +5V logic levels and is of TTL compatible. [4]

DESCRIPTION OF FLOW CHART

The flow chart designed below goes as, the system gets started and it gets connected to SMTP server, logging IN to the concerned mail id and checking the inbox of the email. If the new mail arrives, read the subject of the mail, if the subject gets 0, light gets ON else the light gets OFF, simultaneously check the status of sensor, if any intruder is detected then it will send the mail to the host present in the home, else it will look forward for the new mail. The loop gets continually activated.

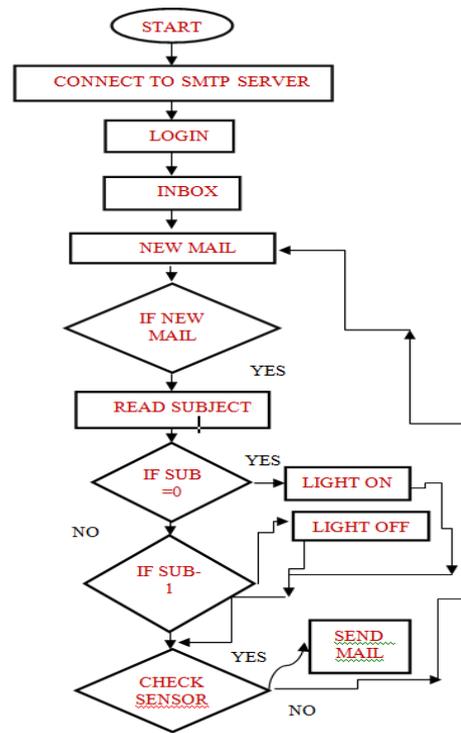


Fig 3. Flow chart for proposed system

III. PREVIOUS WORK

C.Bruhathireddy in the paper “Design and implementation of home automation system using raspberry pi “ proposed that the aim of this project is to develop a system that will provide remote control of home appliances and also provide security against intrusion when the home host is not at home. This project is made with the help of the microcontroller and Raspberry Pi. The various appliances are connected to the microcontroller and the sensor is connected using wireless network. [1] Security against intrusion when the home host is not at home. This project is made with the help of the microcontroller and Raspberry Pi. The various appliances are connected to the microcontroller and the sensor is connected using wireless network. [1] R.A.Ramlee in the paper “Bluetooth Remote Home Automation System Using Android Application” proposed the overall design of Home Automation System (HAS) with low cost and wireless remote control. The main control system implements wireless Bluetooth technology to provide remote access from PC/laptop or smart phone. [2]

Shaiju Paul, in the paper “Android Based Home Automation Using Raspberry Pi” proposed that the project aims at controlling Home appliances via Android device using Wifi as communication protocol and Raspberry Pi as server system. The server be interfaced with a relay circuit board that controls the appliances running in Home. The communication with server allows the user to select the appropriate device. The server communicates with the

corresponding relay. By this we offer a scalable and cost effective home automation system [3]

IV. SIMULATION/EXPERIMENTAL RESULTS

In order to verify the proposed system practically, through the digital input / output ports we give the signal to ON/OFF the light and PIR Sensor is connected as well which detects whether an intruder is there or not. If the mail is received to Raspberry Pi, first it initialize the system whether the Raspberry Pi, GPIO pins are properly connected or not and then start the process of reading the subject of received new mail. Check the syntax which is written in the proposed algorithm, whether the device is ON or OFF. Based up on the ON and OFF conditions, which are in the subject of our send mail, the GPIO pins are activated and deactivated. GPIO PIN 7 works as an output through which light is connected by relay switch, GPIO PIN 11 works as an input through which PIR sensor is connected, and GPIO PIN 3 works as an output which shows the status of PIR sensor. Initially PIN 7 and PIN 3 are taken FALSE [0]. After activating and deactivating, the raspberry pi performs the action accordingly. The loop is continuously running after every 30 seconds. After 30 seconds it will check for new mail, if the new mail is received then it starts the process of reading, if not, it will go on running up to the receiving of new mail.

[1] If $i=0$, GPIO PIN 7 output turns out to be TRUE, LIGHT gets ON

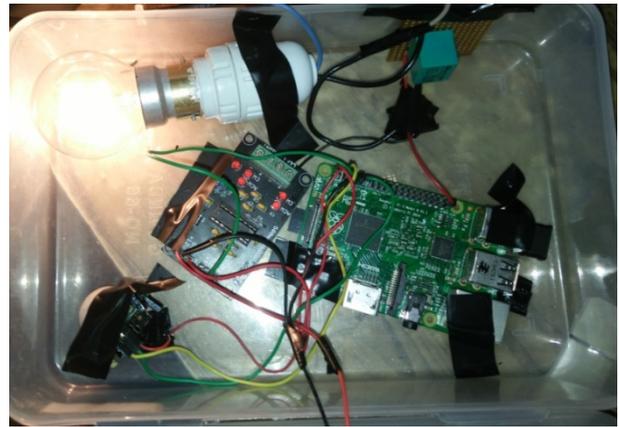


Fig 5. Activated According To the Received Mail

[2] If $i=1$, GPIO PIN 7 output turns out to be FALSE, LIGHT gets OFF.

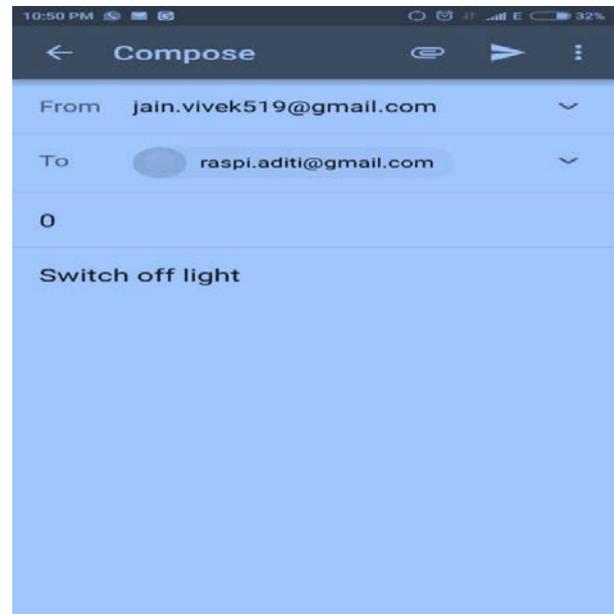


Fig 6. Inbox of Received Mail-Id

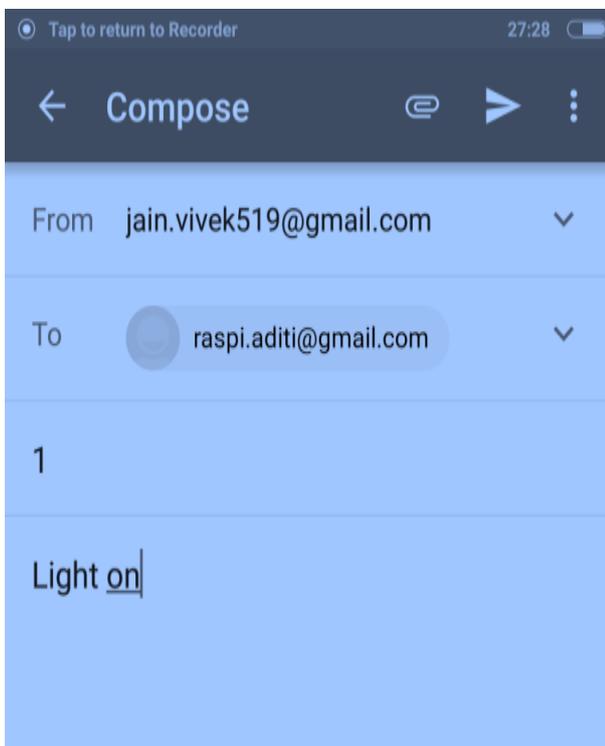


Fig 4. Inbox of Received Mail - Id



Fig 7. Activated According To the Received Mail

V. CONCLUSION/ FUTURE SCOPE

In this techno- savvy environment, RaspberryPi proved to be easy, cost- effective and efficient platform for implementing the home automation and security system. The results shown that, the basic application of home automation through reading e-mail using Raspberry Pi can be easily implemented and used efficiently. Such type of home automation systems are useful and necessary as human can make fault , may forget to switch off the appliances when it's not even required and in this case, they are helpful so that we can utilize the power efficiently probably in a protective manner.

This work can be enhanced for future applications like power grid control and protection, surveillance, power monitoring, fault monitoring, etc, easily.

Apart from, this technique is better than other home automation methods, using SMS and DTMF as the call tariff, is a big drawback, which is not in the case of this proposed method, and in the Web server based home automation, the design of web server and the space required is eliminated by this method, because of it uses already existing web space provided by Gmail.

The system can be used in several places like banks, hospitals, labs and other sophisticated automated systems, which reduce the hazard of unauthorized entry. Evidence can be given to the security department if any robbery issue occurs. But the system needs to be monitor always that the internet bills are paid in due time to keep connected with own home.

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