

CLOUD based Home Automation using RASPBERRY PI

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Abstract:

IOT or Internet Of Things is an upcoming technology that allows us to control hardware devices through the internet. Every one seems to automate most of the possible things to take advantage in providing ease in life, secure and saving electricity. In this we propose to use IOT in order to control home appliances, thus automating modern homes through the internet. This system uses three loads to demonstrate as house lights. Our user friendly interface allows a user to easily control these home appliances through the internet. For this system we use a Raspberry Pi. This Pi is having inbuilt wifi modem to access internet By using that wifi module we get user commands over the internet. Algorithm is developed in python language, which is default programming language provided by Raspberry Pi. Pi processes these instructions to operate these loads accordingly. PIR, Gas sensor are used detect the person and the leakage of gas in the home. The detected information will be updates in the internet by using wifi module. Thus this system allows for efficient home automation over the internet.

Key words: Home automation, Python, Raspberry Pi, WI-FI dongle, PIR.

I. INTRODUCTION

Today the technological world's centralized principle is to automate each conceivable thing for simplicity in life, providing security, saving electricity and time. In that home automation is one of the major things to automatically on and off the home appliances. Home automation can be characterized as a method for doing something without human inclusion. It may incorporate brought together to control of lighting, heating, ventilation, air-conditioning, machines, security door locking and different systems, to provide improved convenience, comfort, energy efficiency and security. The idea of automate each appliances in home is done from many years ago, it started with connecting two electric wires to the battery and close the circuit by connecting load as a light. Later it can be developed by different organizations, creates its own automation systems with different devices like sensors, controllers, actuators, buses, and interfaces. There are few methods for controlling

home automation systems. These can be separated into two main structures:

- i) Wireless systems and
- ii) Hardwired systems.

Wireless systems: With wireless routines, you can utilize distinctive media, like Bluetooth, infrared, or radio frequencies, to control the automation system.

Hardwired systems: With hardwired routines, you can utilize Ethernet links, like fiber optic links, electrical wirings, telephone lines, and even coaxial links are normally utilized as a part of home security system. In present days most of the automation systems utilizes the combination of hardwired and wireless systems for control the appliances. It should have both equipment and programming set up for proficient systems. The prevalence of home automation has been expanding incredibly because of much higher reasonableness and straightforwardness through Smartphone's and wireless networks. Internet of Things (IoT) is interlinked through these networks; because of the popularity of the home automation is improved by the quality of service provided by the devices. Different home automation systems are proposed by different authors for automatically on and off the appliances with different applications. In that, [1] —Design and Development of Activation and Controlling of HomeAutomationSystem throughSMS using Micro-controller. It predominantly concentrates on the control of home-appliances remotely when the person is far from the home. In this system GSM module is used for sending message, from throughout the world and 8051 microcontroller as a processing unit. Drawbacks: expensive architecture, reliability, cost. [2] —Bluetooth Remote HomeAutomation SystemUsing Android Application. The principle control system executes remote Bluetooth innovation to give remote access from PC/portable PC or advanced cell with design of low cost, user friendly -interface and installation is easy in manner. Drawbacks: Distance, flexible and security. [3] —Design and imple-entation of homeautomation system using raspberrypil. This paper is primarily concerned with the programmed control of light or whatever other home

machines through internet using raspberry pi, microcontroller and sensors. Drawbacks: complex and expensive architecture and high cost. [4] —Control of Door and HomeSecurity by RaspberryPi through Internetl. This paper intends to work a system is being created to join any entryway with the web, so that the entrance control that system can be controlled from anyplace on the planet. Drawbacks: highly expensive and difficult to operate. [5] —Android Based HomeAutomation Using RaspberryPi. This paper aims at controlling Home appliances through Android mobiles using Wi-Fi as communication protocol interfaces and Raspberry Pi as processing unit. The server is interfaced with relay board that controls the appliances which are running in the Home. Drawbacks: Expensive, flexibility.

II. PROPOSED SYSTEM

In order to overcome the drawbacks of previous methods, and improves the security, flexibility, efficiency, interactivenss, 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, the proposed system block diagram is shown in below figure.

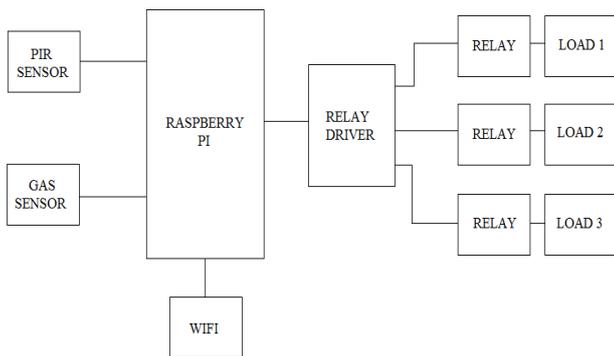


Fig1Blockdiagramfor Home automation using Raspberry pi.

III. IMPLEMENTATION

A. COMPONENTS DESCRIPTION:

1. Raspberry Pi
2. Gas Sensor
3. PIR Sensor
4. Relay Driver
5. Relay's
6. WIFI Module
7. Load

[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 BCM2835 System on Chip (SoC) module with ARM1176JZF-S processor. It having internal storage of 512 MB, 1- ethernet port, 2-USB ports, 26 GPIO pins for peripheral connections supported by raspberry pi, external storage supported upto 32 GB, DSI display connector, CSI camera connector, HDMI connector for display, RCA video and audio jackies as shown in the below figure.

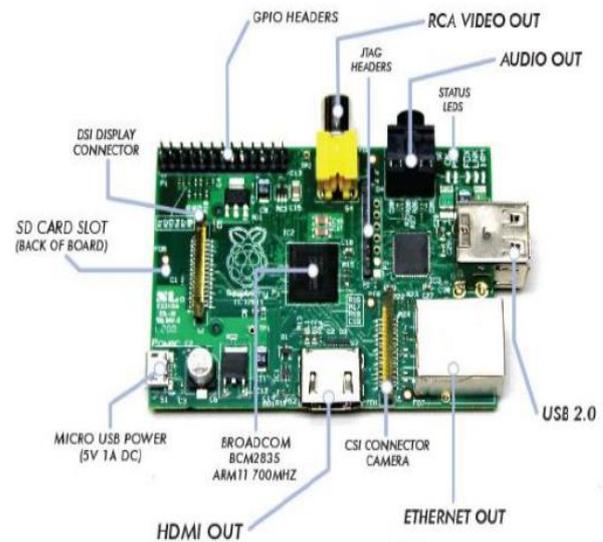


Figure2: Raspberry Pi model-B board

The Raspberry Pi model-B CPU is of ARM 11 family, operates at 700 MHz. The GPU having broadcom Video core-IV, open GLES 2.0, 1080p30, H.264/MPEG-4, AVC high profile decoder and capable of 1Gpixel/s, 1.5 Gtexel/s (or) 24 GFLOPs of general-purpose (GPIO) compute. It operates, 1mA at 5V power supply. The GPIO pin configuration is shown in below.

- 8 --- GPIO pins for external periperal connections supported by raspberry pi.
- 2 --- UART, 2 --- I2C, 5 --- SPI Bus pins for transmitting and receiving data from one source to another source.
- 2 --- 3.3V, 2 --- 5V pins for power supply connected to the external devices.

Python is a default programming language for the raspberry pi with support of BBC BASIC, C, C++, Java, Perl and Ruby. We are considering Python as a main Programming language, for its benefits and features. It is suitable for real

world applications with the addition of NumPy, SciPy, Matplotlib, IPython, and PyLab.

3.3V	1	2	5V
I2C1 SDA	3	4	5V
I2C1 SCL	5	6	GROUND
GPIO4	7	8	UART TXD
GROUND		10	UART RXD
GPIO 17	11	12	GPIO 18
GPIO 27	13	14	GROUND
GPIO 22	15	16	GPIO 23
3.3V	17	18	GPIO 24
SP10 MOSI	19	20	GROUND
SP10 MISO	21	22	GPIO 25
SP10 SCLK	23	24	SP10 CE0 N
GROUND	25	26	SP10 CE1 N

Figure3: pin configuration of Raspberry Pi

[ii] WI-FI dongle: In order to access the internet in the raspberry pi board we are using Wireless-n USB 2.0 Adapter. It is 5 times faster than traditional Wireless-g and Wireless-b networks. It allows all the high-speed features of Wireless-n networks. It is having data rates of 150Mbps for transmitting and receiving and it supports 20MHz/40 MHz frequency bandwidths. It is simple and easy to setup.

[iii] Gas Sensor : Sensitive material of MQ-2 gas sensor is SnO₂, which with lower conductivity in clean air. When the target combustible gas exist, The sensor's conductivity is more higher along with the gas concentration rising. please use simple electrocircuit, Convert change of conductivity to correspond output signal of gas concentration. MQ-2 gas sensor has high sensitivity to LPG, Propane and Hydrogen, also could be used to Methane and other combustible steam, it is with low cost and suitable for different application.

[iv] Pir Sensor: Compact and complete, easy to use Pyroelectric Infrared (PIR) Sensor Module for human body detection. Incorporating a Fresnel lens and motion detection circuit. High sensitivity and low noise. Output is a standard 5V active low output signal.

[v] Relay Driver: 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.

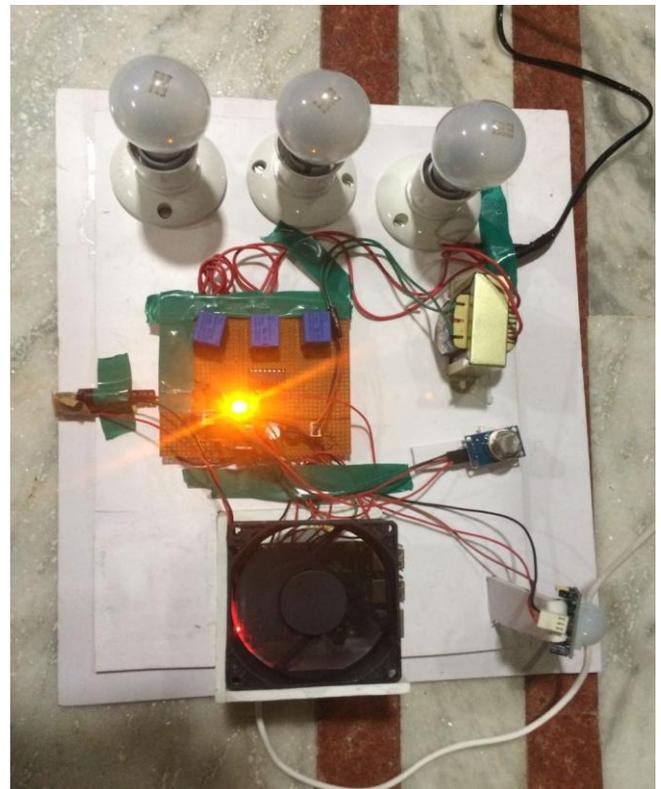


Figure 4: cloud based home automation initially.

IV. WORKING CONDITIONS

IOT or internet of things is an upcoming technology that allows us to control hardware devices through the internet. Here we propose to use IOT in order to control home appliances, thus automating modern homes through the internet. This system uses three loads to demonstrate as house lights. Our user friendly interface allows a user to easily control these home appliances through the internet. For this system we use a Raspberry Pi. This Pi is having inbuilt wifi modem to access internet .By using that wifi module we get user commands over the internet. Relays are used to control loads. The entire system is powered by a 5V Adapter. After receiving user commands over the internet, Pi processes these instructions to operate these loads accordingly. PIR, Gas sensor are used detect the person and the leakage of gas in the home. The detected information will be updates in the internet by using wifi module. Thus this

system allows for efficient home automation over the internet.

The proposed system is a distributed home automation system, consists of server, sensors. Server controls and monitors the various sensors, and can be easily configured to handle more hardware interface module (sensors). The Raspberry pi development board, with built in WiFi card port to which the card is inserted, acts as web server. Automation System can be accessed from the web browser of any local PC in the same LAN using server IP, or remotely from any PC or mobile handheld device connected to the internet with appropriate web browser through server real IP (internet IP). WiFi technology is selected to be the network infrastructure that connects server and the sensors. WiFi is chosen to improve system security (by using secure WiFi connection), and to increase system mobility and scalability.

The proposed model of the home automation system is as shown in the figure 4. The model consist of different sensors like gas, motion . Initially the PI connects to the internet through WiFi. When the connection is established it will start reading the parameters of sensors like gas and PIR. The sensor data are sent to the web server and stored in the cloud. The data can be analyzed anywhere any time. If the sensor parameters are greater than the threshold level then the respective result will be send to cloud. The user can also monitor the electronic appliances through the internet via web server. The lights or any electrical appliances are left on or to control can be seen through the web server and can turn on/off through cloud. Here relays are used to interface the electrical appliances, PIR sensor used to detect the intruder and gas sensor used to detect the leakage of gas in kitchen.

V. CONCLUSION

In the cloud base home automation highly technological environment, by it's over clocking and future expansion capabilities, Raspberry Pi proved to be easy, economic and efficient platform for implementing the home automation system. The results shown that, the basic application of home automation through using Raspberry Pi can be easily implemented and used efficiently. This work can be enhanced for future applications like power grid control and protection, surveillance, power monitoring, fault monitoring, security etc, easily. Apart from, this technique is better than other home automation methods, The user can also monitor the electronic appliances through the internet via web server. The lights or any electrical appliances are left on or to control can be seen through the web server and can turn on/off through cloud. Hence Home automation using raspberry pi based on cloud is efficiently control the appliances.

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