ISSN 2395-1621

Home Automation Using Raspberry Pi Constructed on Internet of Things

#1Anbhule Neha, #2Arte Juee, #3Bade Sandeep, #4Chavan Sarthak

1694neha@gmail.com,
juee.arte99@gmail.com
sarthakchavan1803@gmail.com,
sbade001@gmail.com

#1234Department of Computer Engineering

JSPM'S, Narhe, Pune.

ABSTRACT

In the present world, there are many high tech applications in our homes that make our lives easier. It is necessary to device these applications remotely. To automate a machine, a secondary machine is required to 'Think' and control machines to do tasks as per the suitability of the user from long distances. An automation system is planned for the users to control home electronics applications with high movement and security. A set of switches will be controlled by internet with the use of a Raspberry pi micro-controller board. A Raspberry pi micro-controller board obtains user idea from a website that is admission through a user name and password. The modified user friendly website has several buttons to control the applications. A Raspberry pi will be located in a room and will be connected to all electronic applications in the home with the help of electromagnetic relays. The Raspberry pi can be controlled from any distant place with the help of merged cloud service. Webiopi framework gives us a platform to interact with Raspberry pi's General Purpose Input Output pins. The Raspberry pi then either passes or stops current through an electromagnetic relay connected to the planned switch and this closes/opens the circuit allowing the application to run or get switched off. Thus globally accessible automation of electronic applications can be made possible with the use of a Raspberry Pi micro-controller board, an internet connection and relay switches in a user friendly way.

ARTICLE INFO

Article History

Received: 25th April 2017

Received in revised form : 25th April 2017

Accepted: 28th April 2017

Published online : 2nd April 2017

Keywords: Automation; Raspberry pi; Merged services

I. INTRODUCTION

In To automate objects refers to the idea of devices and applications working by themselves acting upon the command of the owner or user. In the present age, technology has become an important part of everyone's lives to such level that smart phones and internet are a common necessity for many.

We have established a way to automate home applications using an Embedded Web Server combined with a Raspberry Pi.

The implanted system which can serve the web documents on request by a client from other systems. Such type of a web server is called as Embedded Web Server (EWS). It mainly deals with organization of lively contents and is fast, compact, simple to use. EWS strategy contains a complete web server with TCP/IP support, running different OS, memory, request wise. Several EWS constructed systems are designed for automation and also in monitoring purpose. Data communication system is presented using with ARM processor that contains internet software which suite for monitoring, monitoring and remotely admission the system.

The topic of the received e-mail is read by the established algorithm fed into raspberry Pi and the system responds to the corresponding instructions. We have coded the Raspberry pi so that it acts upon message codes fed to it by email.

We implemented the home automation through the use of a raspberry pi controller via an android boundary. It employs the use of a Wi-Fi Local Area Network to connect the controller to the android boundary. Thus by connecting any mobile phone to a Wi-Fi network setup at our home, office or any other locality, it is possible to control electrical applications or machines connected to the processor board.

The mobile phone is boundary to the Raspberry pi with the use of an android application using control buttons. They boundary the Raspberry pi with the switches by using relay. The control can only be achieved with Wi-Fi and hence is not applicable at large distances but it gives sufficient control from nearby places.

A wireless sensor network (WSN) is composed of spatially disseminated nodes equipped with sensing devices to monitor and measure characteristics of the physical environment at different locations. The Raspberry Pi micro controller is one such node. From various other nodes, the Raspberry Pi was chosen for automation by studying the data given by.

We have mentioned that the research available into home automation in public domain lies mainly in the academic arena, with little industrial research being available in open literature. The implementation of home automation technologies into commercial systems has been limited, and where available consumer uptake has been slow. The above-mentioned systems offer little in the way of interoperability. Attempts have been made to provide system interoperability and remote admission to home mechanisation systems through the improvement of home gateways. We planned a home energy management focused home gateway, which connects the home network with the Internet.

The idea of monitoring objects remotely is very interesting and helpful. The motivation behind the goal is very simple, always it is not possible to be near to the home physically but it's very important to control the applications for many purposes. So the remote monitoring takes the control of the home. It would serve mankind well and make lives more safe and comfortable. Therefore, in this paper, automation of electronic applications is executed with the help of the internet, a raspberry pi micro-controller board and relay switches.

II. HARDWARE PROTOTYPE

Self-running or automated devices would require the use of a processor that processes the input complete by the user and interfacing mechanisms to connect the processor with the input and output. The input interfacing is done with the use of Merged services which enables a user to admission the processor from anywhere in the world. The processing function is performed by the Raspberry pi and the output boundary is the Relay system which consists of an Electromagnetic relay and Digiduino board to control the application. Specifications of the Raspberry Pi, Merged services and electromagnetic relays will be described next.

A. Raspberry Pi Micro-Controller

It is stated that the Raspberry Pi is a series of credit card-sized single-board computers established in the UK by the Raspberry Pi Foundation with the intention of indorsing the instruction of basic computer science in Schools. The board is shown in Fig 1.

The Raspberry Pi is constructed on the Broadcom BCM2835 System on a Chip (SoC), which contains an ARM1176JZFS 700 MHz processor, Video Core IV GPU and has 512 megabytes. The system is a Micro SD model and has sockets for boot media and determined storage. The GPU (Graphics Processor Unit) is accomplished of Blu-ray quality playback, using H.264 at 40MBits/s. It has a fast 3D core admission using the supplied Open GLES 2.0 (A graphics rendering application programming boundary) and Open VG (Virtual Graphics) libraries. The chip specifically helps by

Fig. 1. Raspberry Pi Micro Controller Board

Providing HDMI (High Definition Multimedia Boundary) and there is no VGA (Video Graphics Array) support.

The foundation provides Debian and Arch Linux ARM distributions and also Python as the main programming language, with the support for BBC BASIC, C and Perl. The most distinctive feature of the Raspberry Pi is the GPIO (General Purpose Input Output) module, which allows interfacing with general purpose electronics. Each pin gives 3.3 volts of voltage.

B. Electromagnetic Relay

A relay is an electrically operated switch. Relays are used where it is necessary to control a circuit by a lowpower signal or where several circuits are must be organised by one signal.

A simple electromagnetic relay consists of a coil of wire wrapped around a soft iron core and a metal switch. When current passes through the coil, a magnetic field is induced by the coil, hence closing the metal switch. When no current is present, the switch is opened and circuit is disconnected.

This relay circuit was built by using a transistor and an electromagnetic relay. When Raspberry Pi supplies 3.3 V, the Digiduino board amplifies the voltage to 5V and supplies it to the relay. A magnetic field is induced which closes the key and when no magnetic force is present, the spring pushes the key back to open state. The transistor is connected to a GPIO pin of the Raspberry pi. When the pin is turned on, the transistor passes current to the relay allowing the switch to be closed. The circuit was built by using one single relay, but can be extended to any number of relays as per the user requirement.

C. Merged services

It is stated that Merged eliminates the need for in house expertise in networking, services, mobile, security, and firmware improvement. At the heart of the Merged technology is a sophisticated software-defined networking fabric that can be used with any hardware product. This fabric employs two levels of secure IoT (Internet of Things) cloud networking service to allow users a variety of services and features. Direct

network connections are peer-to-peer, encrypted, and each connection session is protected using a unique security key.

The Merged Fabric is different from all other current IoT connectivity solutions which either rely on security vulnerable port-forwarding or hub-and-spoke connectivity. The alternatives to Merged both requires an always-on Internet connection and raises the privacy concern of running data through a third party server. Merged approach allows developers to choose to use standard TCP (Communication Control Protocol)/IP (Internet Protocol) connectivity, without concerns typically associated with remote connectivity. The open merged technology also allows developers the choice to avoid exclusive closed 'walled garden' approaches taken by closed platforms.

A website has been created using merged services for acquiring user input. Merged is an online cloud server that has been used to allocation data from the user to the Raspberry pi. The website has been given user admission through a simple.

User name and password criteria and it shows the user a set of buttons that can be pressed. This service has been boundary with the Raspberry pi and a bulb was lit.

III. SYSTEM ARCHITECTURE

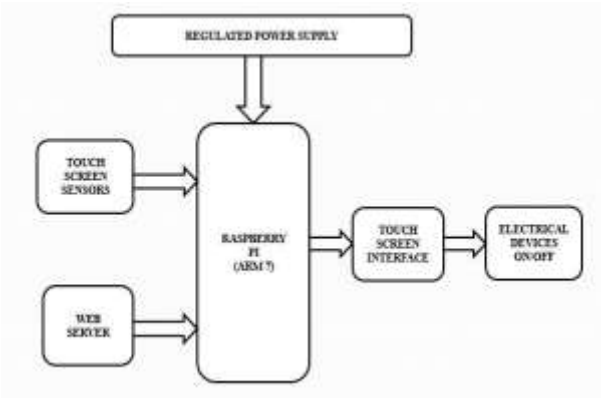


Fig. 2. System Architecture

IV. IMPLEMENTATION

A. COMPONENTS DESCRIPTION:

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

a. Raspberry Pi
b. WI-FI dongle
c. TV tuner card
d. Relay board
e. Key board and mouse

[i]Raspberry Pi:

Raspberry Pi is a handling unit, established by Raspberry Pi foundation in UK is of size equal to the debit card. It has Broadcom BCM2835 System on Chip (SoC) unit with ARM1176JZF-S processor. It having internal packing of 512 MB, 1- Ethernet port, 2-USB ports, and 26 GPIO pins for exterior connections supported by raspberry pi, external packingsupportedup to 32 GB, DSI display connector, camera connector, HDMI connector.

Texel/s (or) 24 GFLOPs of general-purpose (GPIO) calculate. It functions, 1mA at 5V power supply. The GPIO pin configuration is shown in below figure.

Python is a default programming language for the raspberry pi with backing ofC,C++,Java,Perland Ruby. We are considering Python as a main Programming language, for its profits and features. It is suitable for real world presentations.

[ii] WI-FI dongle:

In order to admission the internet in the raspberry pi board we are using Wireless-n USB 2.0 Connecter. It is 5 times faster than traditional Wireless-g and Wireless-b networks. It permits all the high-speed structures of Wireless-n systems. It is having data rates of 150Mbps for communicating and receiving and it supports 20MHz/40 MHz frequency bandwidths. It is modest and easy to setup.

[iii] TV tuner card:

A TV tuner card is a method, that allows Tele-Vision signals to be established by the computer. The card contains a tuner and an analog to digital converter along with demodulation and boundary logic. The video port of the raspberry pi is associated to TV tuner card and TV tuner card USB port is connected to laptop to view the presentation of the raspberry pi working operation.

[iv] Relay board:

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

[v] Key board and mouse:

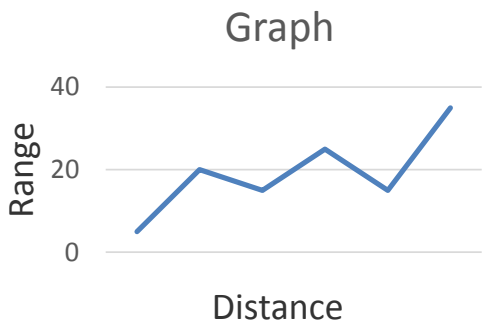
Key board and mouse are used to function the Raspberry Pi, just like our regular computer (PC).

B. INTERFACING:

[1] First write the Raspbian OS in to a SD card by using Win32Disk Image, and placed it on Raspberry Pi board, and then give power to the Raspberry Pi.

[2] Attach TV tuner card to the laptop to view the display of the Raspberry Pi operation.

V. RESULT ANAYSIS



VI. CONCLUSION

A novel architecture for a home automation system is planned using the raspberry pi board, merged services and electromagnetic relay. Raspberry pi micro-controller board is used to control the switches of applications through internet. A website has been created using merged services for acquiring user input. When the GPIO pin of the Raspberry pi pin is activated, relay closes the switch which controls the application. The implemented automation system provides an efficient, comfortable and flexible user boundary for monitoring electric applications remotely.

REFERENCES

[1] Girish Birajda, Shrikant Mahindrakar, “Embedded webserver constructed home automation using raspberry pi”, International Journal of Modern Trends in Engineering and Research,vol. 1, no.5 ,September 2014,India.

[2] Sarthak Jain, Anant Vaibhav and Lovely Goyal “Raspberry pi constructed interactive home automation system through e-mail”, 2014 International Conference on Dependability, Optimization and Information Technology - ICROIT 2014, India, Feb 6-8 2014.

[3] https://www.raspberrypi.org

[4] Vladimir Vujovic, Mirjana Maksimovic “Raspberry Pi as a Sensor Web node for home mechanization”, 37th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), 2014.

