

Smart Home Security And Automated System Using Raspberry Pi And Wireless Device



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ABSTRACT: The Smart home security and Automation focus mainly on controlling electrical appliances using internet. Recently many network enabled digital technologies came into existence in the field of home automation. This paper mainly deals with the controlling of home appliances and its devices using Raspberry pi as a main device. Android devices would control the home appliances using the internet and raspberry pi as a server system. Raspberry pi controls the relay circuit and relay control the home appliances. The wireless device communicates with the home automation network through internet. This system doesn't need a dedicated pc like other respective systems. So it can be accessed easily by the user.

Keywords: - Automation, Raspberry Pi, Relay Circuit...

1. INTRODUCTION: Home security system is nothing but a smart system which replaces man power. All the devices use internet to connect each other and proceed further to operate. Home automation is used for connecting various electrical devices in our home or work place. This system is mainly useful for remotely controlling devices. In this Project we use raspberry pi as a central device which is nothing but a micro computer, So that circuit complexity is reduced. Various Automatic systems are used according to the type of connections. We are implementing smart automation and security using wireless browser base using raspberry pi with the help of internet. The software used in this project is WEBIOPI. Raspberry Pi is a simple and latest circuit, easy to operate and it gives privacy because single user can view or use the circuit. The Operating System which is installed in raspberry pi is "RASPBIAN JESSIE". In this type of automation user have the authority to login through

"WEBIOPI". After downloading this user gets a unique Id that is accessible only by that particular user. The ON and OFF functionalities are based on relay circuit. A relay is a switch which is operated electrically. Usually relays use an electro magnet to operate the switch mechanically, but some other operating principles are also used such as solid state relays. When a separate low power signal is used to control the circuit then the relays are used. Relays are also used when single signal must control several circuits. The relay that handles high power required to control an electric motor or other loads is called a Contactor. Because of their relative simplicity, long life, and proven high reliability, relays are used in a wide variety of applications in security systems, industries, telephone exchanges.

2. LITERATURE SURVEY: In this project controlling electrical appliances automatically and opening door without the human interaction is the main objective. This automation system mainly

involves two major parts. Hardware and Software. The Hardware revolves around raspberry pi and relay circuit and the wireless device that is used. Software mainly deals with the software called WEBIOPI which provides interfacing between Raspberry pi and wireless device. This Application is very effective to control the devices from anywhere with the help of internet, in which the Ip address of raspberry pi will be captured in the device in order to access easily and to control the automation and security system.

3. OBJECTIVE: To implement automated system for controlling electrical appliances and security system for opening of door using mobile is the main objective.

4. HARDWARE SETUP: RASPBERRY PI: Raspberry pi has many models but in this project we are using Raspberry pi 3 model B, It is the third generation raspberry pi.

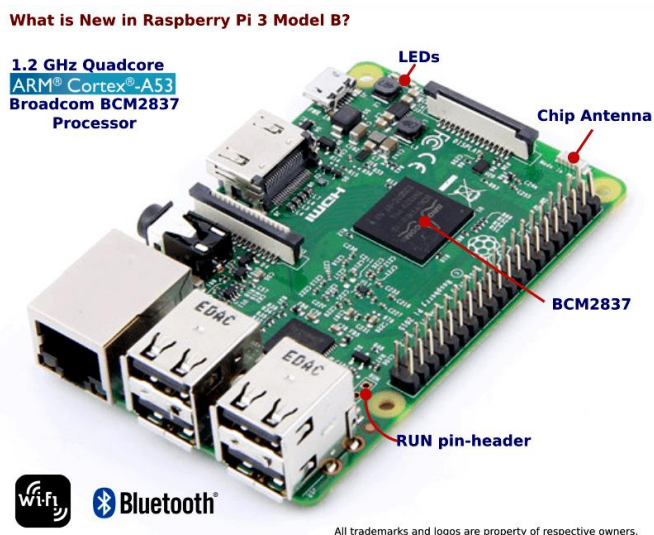


Figure 1: Raspberry Pi3 Model Circuit.

TECHNICAL SPECIFICATIONS: A 1.2GHZ , 64-bit quad core ARMv8 cpu ,802.11n wireless LAN , Bluetooth 4.1 , Bluetooth low energy(BLE) .like the other models of raspberry pi it also has 1 GB RAM ,camera interface(CSI) ,display interface (DSI),micro SD card slot ,video core IV 3D graphics core.

FEATURES: Broad com BCM2387, ARM cortex -A53 quad core processor powered single board computer running at 1.2 GHZ. It also has 1 GB RAM for running bigger and powerful application, There is a micro SD card slot for storing information and loading required os.

RELAY CIRCUIT: Relays are electromechanical devices in which an electromagnet operates between a couple of movable contacts from open

position to closed position. The main advantage of relay is it uses limited amount of power to operate the relay coil, the relay itself can be used to control motors, heaters or ac circuits. The electromechanical device is an output device which comes in various shapes, sizes and designs. It has many applications in electronic circuits. Generally a freewheeling diode is connected across the relay coil .This freewheeling diode prevents the damage to the semiconductor transistor. Freewheeling diodes are also known as fly wheel diodes, these fly wheel diodes are only applicable when the supply is DC voltage which is polarized. Where as an AC coil uses another protection method.

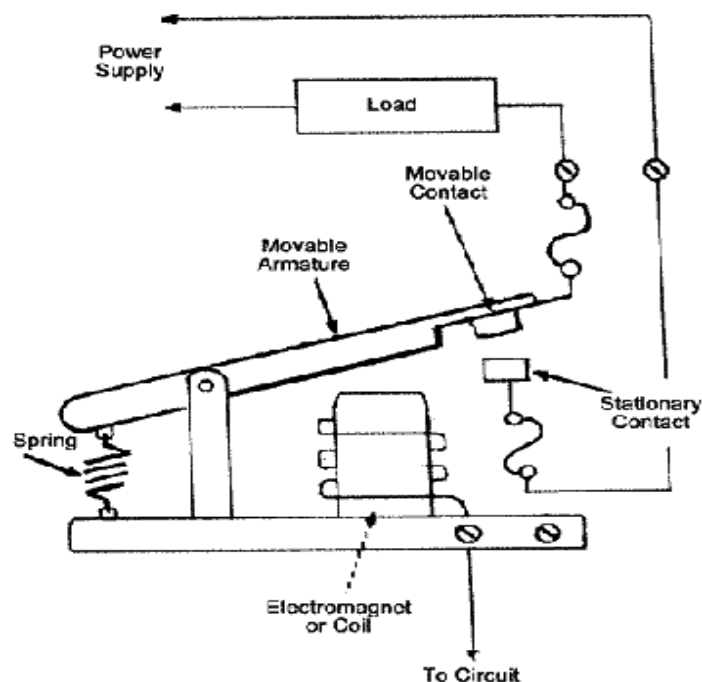


Figure 2: general relay circuit.

TRANSFORMER: A Transformer is an electrical device that transfers energy through electromagnetic induction. If current varies in one coil of the transformer it produces a varying magnetic field this magnetic fields induces a voltage in the second coil. The magnetic field is responsible for the power transfer between the two coils even in the absence of metallic connection between the two circuits. Usually Transformers are raise or reduce the alternating voltages in electric power applications. Transformers mainly serve purpose in transmission, distribution, and also for the utilization of alternating current, there are a wide range of transformer designs which are encountered in both electric and electronic power applications. The transformer that is used in this

project is Maxine 12-0-12v 750MA.Transformers work according to the faradays law of induction.

IC DRIVER L293D: This driver is also known as motor driver because; it allows the dc motor to drive in both the directions. L293D IC has 16 pins and these pins are capable of controlling two dc motors parallel in any direction. It can also control both light weight and heavy weight motors. This IC driver works according to the H-bridge concept. H bridge circuit allows the voltage flow in a front and back directions. Generally direction change in voltage should take place for the motor to rotate in both clockwise and anticlockwise directions. so H bridge is ideal in such characteristics that are required to operate the dc motor L293D motor driver has two enable pins .The pins that act as enable pins are pin 1 and pin 9. for the motor to be driven these two pins must be high, And pin 1 should be high for driving the motor using left H bridge for the right H bridge the pin 9 should be high, If either pin 1 or pin 9 gets low then the corresponding motor in that particular section will stop working. In words we can say that it acts as a switch.

DC MOTOR 30 RPM: A DC motor is an electrical machine that converts electrical energy into mechanical energy. Different types of dc motors follow different mechanism, it may be it may be electronic or electromechanical.this mechanism is to change the direction of flow of current periodically. The speed of a dc motor can be controlled by using two methods, the first one is either by using a variable supply voltage or by changing strength of current in winding filed.Small dc motors are used in toys, tools and other appliances. Whereas large motors are used in propulsion electric vehicles and elevators.

PRINCIPLE OF DC MOTOR: when a current carrying conductor is placed in a magnetic field, it gets experienced with a torque and tends to move, this is called motoring action. The direction of rotation can be changed by changing the direction of current in the wire. A mechanical force is produced when a magnetic field and electric field interact with each other and this is the base of working principle of dc motor, and the direction of rotation of the dc motor depends on Fleming's left hand rule. According to this rule, if the index finger, middle finger and thumb of left hand are extended perpendicularly, then the index finger indicates direction of magnetic field, middle finger denoted direction of current and thumb gives the direction in which shaft of dc motor experience the force. In a dc motor electrical energy is given to

the input port and mechanical energy is obtained at the output port.

5. SOFTWARE SETUP: WEBIOPI is a software frame work which is very useful in controlling the devices using raspberry pi, by using webiopi one can change a normal raspberry pi into a powerful web connected device. Webiopi is based on python language completely. It is developed and verified on raspbian, As it is based on python ,First we need python, Either 2.7 or 3.2 to be downloaded. Now we have to extract and install webiopi.

WEBIOPI FOR RASPBERRY PI 3: webiopi is a server for raspberry pi which allows smart phone remote controls and other automated operations. Webiopi is an integrated IOT frame work especially applicable for raspberry pi; it helps to control the gpio pins of raspberry pi remotely with the help of a browser or any app.

FEATURES OF WEBIOPI: It supports more than 20 devices including ADC and DAC, It is compatible with both python 2 and 3, and it supports GPIO with no dependency. It is extensible. The main advantage of webiopi is it has a login password which is accessible by an authorized user. It includes web apps like GPIO header, GPIO list, serial and device monitor. It has python library with HTTP support.

PROS OF WEBIOPI: In this project we need webiopi mainly to control the gpio pins that are mentioned in python language. Once if we install webiopi on our pi,we can use any browser from any of our network. Webiopi is also useful to debug some typical circuits even without writing any lines of code. One can also control pi's gpio pins over internet ,So that remote controlling of house and other industrial appliances is easy and efficient. We can even customize the user interface with css modifications or use REST API to construct our own web app. the installation of webiop undergoes certain steps, by following those commands this software can be installed easily. As this software is easy to install and easily accessible by the user it is very much advantageous for smart home or industrial automation.

6.SECURITY SYSTEM : DOOR open/close system : This smart security system is very essential now-a-days due to increased theft in many cities, Lack of a proper protection for house is one of the major reasons for this, so we have chosen to design a smart door lock system. This door control can be accessed by only an authenticated person. Opening and closing of the door is done only by that particular user. The complete door lock system is based on the python

language which is used to access the webiopi software; using this software the user can create his own user name and password. After setting the password the user gets a gpio setup with required pins to operate and control various devices using webiopi software. All the user needs is a mobile with a personal hotspot, Along with the door control system setup contained in the project kit. Using all the above mentioned hardware and software setup one can easily control a number of devices and can enjoy the smart home security and automation technique.

OTHER SMART AUTOMATION DEVICES:

The operation of door open/close or any other devices depends upon the operation of the GPIO pins ,by setting the required pins to high and low. Many other devices such as iron box,Television,fan ,Mobile charger,Oven etc can be operated by using this circuit.

7.CIRCUIT DESCRIPTION: This circuit is basically designed to control the desired loads,The load may be a motor or any other device.The ON and OFF operations of the load depends completely on the relay,The on and off operations of the relay are controlled by a couple of switching transistors.As we already know , relay is an electromagnetic switching device which consists of three pins ,The description of the pins is mentioned as follows.

COM : Common ,connect to this always,It is also the moving part of the switch.

NC : Normally closed,COM is connected to this when the relay is OFF.

NO : Normally open,COM is connected to this only when the coil is in ON position.

Usually the common pin of the relay is connected to voltage supply.The NO pin is given to the load .When high pulse signal is given to base of transistor 1(T1),The transistor conducts and shorts the collector and emitter terminal,And zero signals are given to base of transistor 2(T2).Then the relay comes to OFF state.

when low pulse is given to base of transistor 1,The transistor turns OFF.Now 12V is given to base of transistor 2 so that the transistor conducts and relay is turned ON. So, the common terminal and NO terminal of relay are shorted.Then the load gets supply voltage through relay.This circuit is based on home automation and home security so there is a door lock system in this which serves the above security purpose.It also consists of raspberry pi which is a processor, the circuit design also consists of dc motor and motor driver to drive the motor.

8.GPIO PIN DESCRIPTION: The gpio pin description for controlling the required loads using a wireless device(mobile) is mentioned below.

	3.3V	1	2	5.0V	
ALTO	GPIO 2	3	4	5.0V	
ALTO	GPIO 3	5	6	GROUND	
IN	GPIO 4	7	8	UART TX	
	GROUND	9	10	UART RX	
IN	GPIO 17	11	12	GPIO 18	IN
OUT	GPIO 27	13	14	GROUND	
IN	GPIO 22	15	16	GPIO 23	IN
	3.3V	17	18	GPIO 24	IN
	SPI MOSI	19	20	GROUND	
	SPI MISO	21	22	GPIO 25	IN
	SPI SCLK	23	24	SPI CE0	
	GROUND	25	26	SPI CE1	

Figure 3:General pin description of gpio pins

The pin description is obtained only after mentioning a valid username and password,hence it is trust worthy to operate,Also by setting the required input and output pins we can interface various devices and can control remotely in a smart way.

9.RESULT:

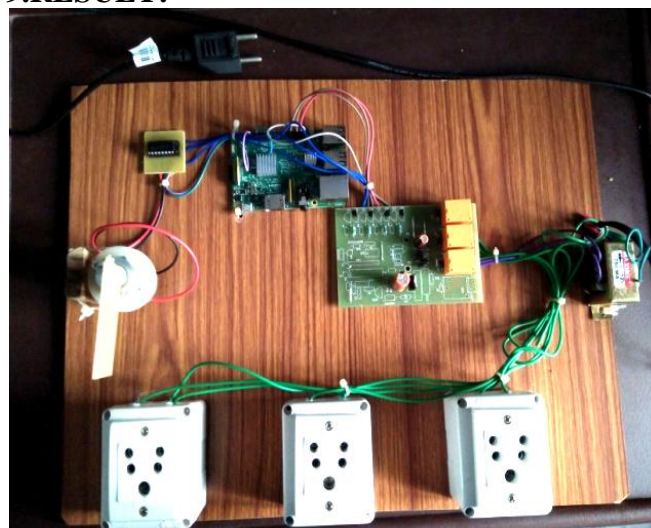


Figure 4: Smart home security and automated system circuit.

10.CONCLUSION: The circuit produced enable the user to control home appliances using wireless devices.This circuit is very easy to operate and

user friendly, All the user needs to do is to gain a little amount of expertise to install the operating system as well as the weio pi software. Our project shows many kinds of applications for controlling home appliances in an automated manner. There are many more other applications related to this project out of which a few were discussed here. This technology can be extended by using sensors. In this project the interfacing of devices using the latest version of Raspberry Pi was done successfully. Also the devices are efficiently controlled by using a smart phone. By increasing the capacity of the relay the capacity of load increases which ultimately finds a path for further extension of the applications, Using which complex appliances can be controlled with ease.

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