

IMPLEMENTATION OF SMART HOME AUTOMATION USING RASPBERRY PI

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Abstract— As the technology improves day by day everyone seems to automate most of the possible things to take advantages in providing ease in life secure and save electricity. The main objective of this paper is to automate all the devices (i.e) Home Appliances through webpage using Raspberry pi, as well as we can have the security for the system by using sensors like PIR ,Water level sensor .So by using this system we can avoid problems coming in our day to day life .The algorithm is developed in python language, which is default programming language of raspberry pi . It presents a low cost and flexible home control and monitoring system using IOT. This technology offers new and exciting opportunity to increase the connectivity of devices within the home for the purpose of home automation. Mobile devices are ideal in providing a user interface in home automation system.

Keywords— Home Automation, Raspberry pi,Relay ,Sensors.

I. INTRODUCTION

Today the technology is getting improved and used for the ease in our day to day life. The life is getting automated for the simplicity, security, saving electricity and time.. Home automation can be done without human efforts. In home automation we can control the devices which can be ON and OFF with a single switch like fans, tubes, air conditioner, security of door lock system, also the sensor helps water level monitoring and saves electricity. It provides convenience, comfort, security and saves energy. The idea of home automation started with connecting two wires to the battery and close the circuit with the load. Later many organizations developed it with devices like actuators, sensors, microcontroller, buses and interfaces. The two types of system includes hardware systems and wireless systems. Hardware systems includes the internet, fiber optics, telephone lines and coaxial wires. This comes under home automation. Wireless systems includes radio frequencies and bluetooth.

The home automation is getting expanded because of the new techniques, easiness and straight forwardness through the smartphones, internet and wireless communication. Quality of services is getting improved by automation facilities provided through the internet of things. In “Raspberry pi based interactive Home Automation systems through the Web page”, this system uses Raspberry pi to control the home appliance through web page. “In this system

Raspberry pi acts as a processing unit and Wi-Fi as a communication network”, therefore the system is reliable. Design and implementation of Home Automation system using Raspberry pi”, the system is programmed to home appliances using Raspberry pi through internet.

The internet of things (IoT) can be described as connecting everyday objects like smart-phones, Internet TVs, sensors and actuators to the Internet where the devices are intelligently linked together enabling new forms of communication between things and people, and between things themselves. Building IoT has advanced significantly in the last couples of years since it has added a new dimension to the new dimension to the world of information and communication technologies.

The Internet has come a long way over the last 30 years. Old -fashioned IPv4 is giving way to IPv6 so that every device on the internet can have its own IP address Machine -to-Machine(M2M) communication is on the rise, enabling devices to exchange the act upon information without a person ever being involved. The scope and scale of the internet have exchanged as well: industry leaders predict that the number of connected devices will surpass 15billion nodes by 2015 and reach over 50 billion by 2020.The challenge for the embedded industry is to unlock the value of this growing interconnected web of devices, often referred to as the Internet of Things (IoT), describing it as the ultimate tool in our future surveillance. This network has the power to reshape our cities.

II. PROPOSED SYSTEM

Every user who is experienced in the existing system may think of a system that may add more flexibility and run with some common applications such as android. The proposed system is designed in such a way to avoid the limitations of the existing system. The proposed system supports more flexibility, comfort, ability and security. The proposed home automation system is working with very popular android phones. It is having mainly three components; the android enable user device , a Wi-Fi router having a good scalable range, and a Raspberry pi board. Here the users have provision to control the home appliances through webpage. This will improve the system popularity since there is no need for a wired connection, internet etc. The instruction from the user will be transmitted through the wifi network. The

raspberry pi board is configured according to the home system and it will enable the relay circuit as per user request. The relay circuit can control the home appliances also. We can add appliances to the system also add additional security features. The main objective of the proposed system is to design and to implement a cheap and open source home automation system that is capable of controlling and automating most of the house appliances through web page.

The system is interactive to provide easy in day to day life, also saves electricity, human efforts. This system includes raspberry pi, sensors like PIR, waterlevel sensor, HDMI display, LAN, relay board, keyboard and mouse, comparator.

Home appliances network (home automation) is required to be without new wiring and to be very easy installation. Field of home appliance network is still young, many initiatives and standardization efforts have already been made. The new kind of system brought webpage and Raspberry pi in to home automation implementation.

The proposed system architectures generally incorporate a Raspberry pi computer for the purposes of network management and provision of remote access. Raspberry pi can be configured according to our home system. The user will communicate Raspberry pi through wifi network. The system is flexible and scalable , allowing additional home appliances designed by multiple vendors, to be securely and safely added to the home network with the minimum amount of network with the minimum amount of effort.

The wifi network should be having adequate strength also.we can use awifi modem for sleeping a wifi. The serial data coming from wifi unit is connected to Raspberry pi circuit. The core of the home automation system consists of Raspberry pi circuit. The core of the automation system consists of Raspberry pi board . It can be viewed as a mini computer capable of doing many functions.

The Raspberry pi board is configured for each home appliances . So according to user intervention the matched out will make high and the corresponding relay will switch on and device start function. The system is scalable and allows multi-vendor appliances to be added with no major changes to its core. The project mainly consists of three modules that includes User Interface ,Wifi Router Configuration, Raspberry pi, Relay circuit and Appliances.

User Interface : User interface is everything that the user can see and interact with. In this module the android enabled phone makes control of the home automation system. Android provides a variety of pre-build UI components such as structured layout objects and UI controls that allow you to graphical user interface for your app. Android also provides other UI modules for special interfaces such as dialogs, notifications, and menus. The interface should allow user to view device status and to control device.

WIFI Router Configuration: The Wifi unit provides the medium for communication . It can be also configured to make security services. The wifi should be configured with a certain address and user commands will be directing through

wifi unit. You may use `sudo nano /etc/ network/` interfaces for configuring wifi with Raspberry pi.

Raspberry pi : The Raspberry pi is a low cost single-board computer which is controlled by a modified version of Debian Linux optimized for the ARM architecture. The core of the home automation system is this mini computer.

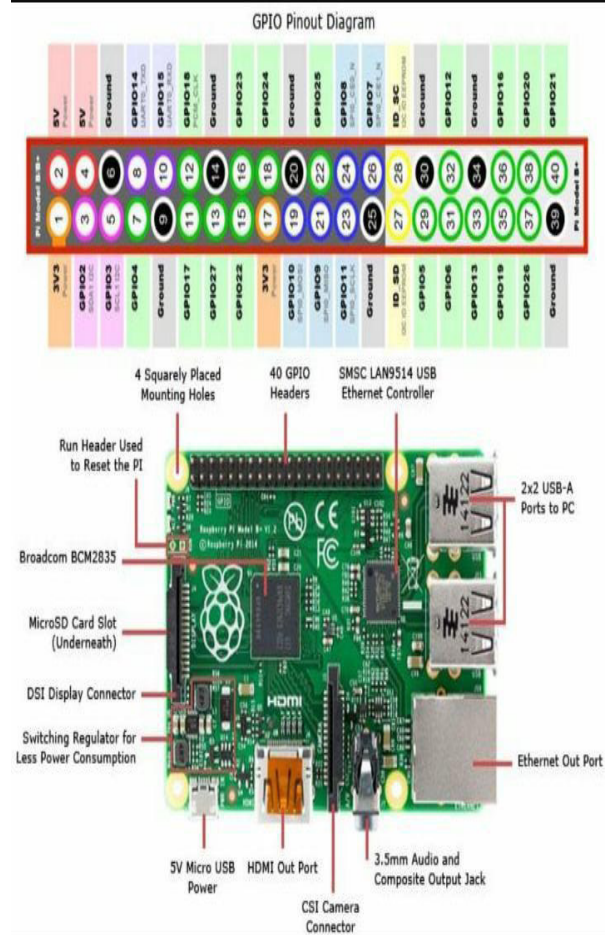


Figure 1 Raspberrypi Kit

Relay circuit : A Relay is an electrically operated switch. Relay are used where it is necessary to control a circuit by a low power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. In our system the output from raspberry pi is directly given to relay circuit. According to the out of raspberry pi, corresponding relay will turn on and makes its device working. We are using a NPN transistor in Relay and its works based on concept of emf. The relay can be selected according to our application purpose. The home automation system ends up with the working of relay circuit. In this home automation system we can add devices very easily in to the system. Also it can be configured with more security and functional services. The raspberry pi mini computer can be make use more better to incorporate variety

of applications to our home automation system. Since our system makes running in low power compared to other system, it is having a tremendous application view. The WebIoPi extensible and highly customizable and makes raspberry pi control more efficient.

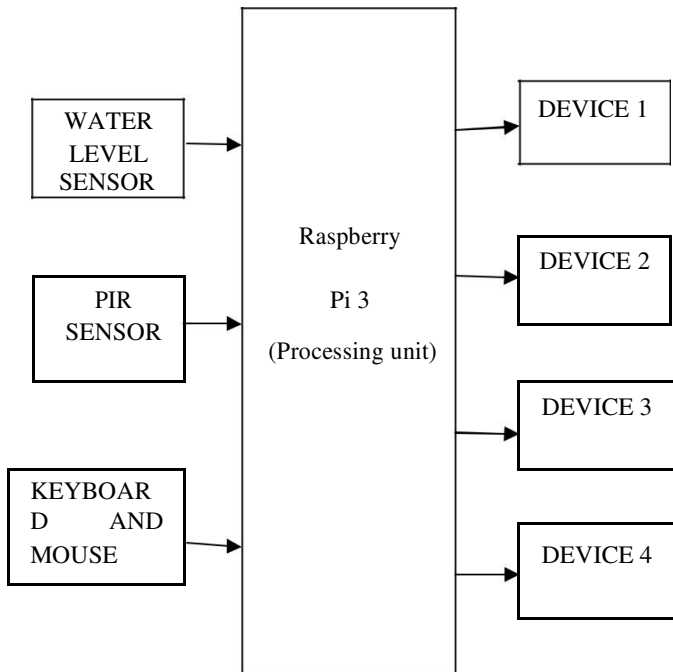


Figure 2 Block Diagram Of Proposed System

The raspberry pi is the credit card sized, single board computer developed in the UK by the raspberry pi foundation. The Raspberry pi has a boardcom BCM2835 system on a chip(SoC), which includes an ARM1176JZF-S 700 MHz processor. It has an internal storage of 512 MB, external storage supported upto 32 GB, 1 ethernet port, 4-2.0 USB ports, 1 micro SD card slot, DSI display connected, 1 HDMI out port, 1 CSI camera connected, 5 volt USB power, RCA video and audio jack. With the python is a default programming language for the Raspberry pi with support of C, C++, Java.

LAN Cable: To access the internet in Raspberry pi we need LAN connection, with the help of which we can access the incoming and outgoing E-mail services. The LAN speed is much faster than the wireless communication. HDMI display: To see the current status of the home appliances as well as the sensors (Water Level, PIR, etc.,) and also we will be able to check the updates regarding Raspberry pi. PIR sensor: Passive Infrared sensor is to detect the motion of human passes through this sensor, the temperature in the background will rise from room temperature to the body temperature and thus the motion or human will be detected.

Keyboard and Mouse: key board and mouse are used to operate the Raspberry pi, so we can easily do the programming and makes changes easily. Relay Board: Relay is an electrically controllable switch which is used in industrial controls, automobiles and home appliances, because of their relative simplicity and controlling the devices, having 8 independently controlled relays. The control signals use +5v logic levels and is of TTL compatible. Comparator: Comparator will take in input from the sensors and will compare it with the given voltage limits for the defined sensors. Accordingly, the output will given to the Raspberry pi.

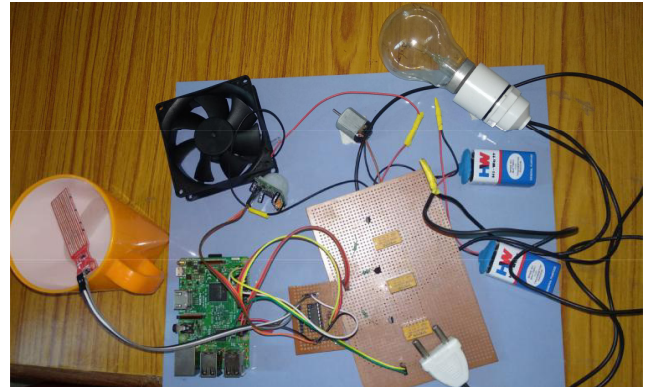


Figure 3 Experimental Setup

III. CONCLUSION

The devices produce enable the user to control the appliances using pre-existing devices such as their smartphone or home computer. The interfaces are intuitive and easy to use and provide the user with a more accessible interface than those found in the home. The devices are also very easy to integrate into existing applications and require only a small amount of expertise to install.

Our research shows the many types of applications for implementing home automation and the applications are not limited to those discussed in this paper. The technology used could be implemented in a wide variety of applications that require the use of sensors and appliances. The project successfully designed a system that communicates with a mobile device such as a smartphone or laptop via Raspberry pi to control a light switches and water level but has many possible applications that could benefit from this work. This paper aims a basic application of home automation using Raspberry Pi which can be easily implemented and used efficiently.

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