Smart Home Automation System by Intetgrting Sensors and Raspberry PI

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Abstract

In this generation we are almost doing everything by automation and trying to replace the manual works. It provides a platform that allows one to connect the devices sensing and controlling the home appliances in order to reduce the power consumption (or) power wastage. In this project, all the electronic appliances are connected to the board to save the electricity by consuming a minimum amount of electricity. This system can be used to automate the things in home, office and college. The system was designed using Python Programming language and can be controlled and accessed remotely through an Internet of Things platform. Experimental results demonstrated that the system is able to accurately measure: temperature, humidity, light level .The LDR sensor will monitor the intensity of light level. PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. DHT22 uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin .This will help the owners to provide a simple, fast and reliable way to automate their environment.

Keywords - *consumption, electricity, thermistor, LDR, DHT22*

I. INTRODUCTION

The IoT-based architecture provides high-level flexibility at the communication and information. It is an approach which is relevant in many different environments such as patient monitoring system, security, traffic signal control or controlling various applications. The IoT project aims to bringout the various opportunities of using IPv6 and other related standards to overcome the disadvantages using of the Internet of Things . The IoT projects proves a dominant and thorough study of all sensible functionalities, mechanisms and various protocols that can be used for building IoT architectures however interconnections may occur between alltotally different IoT applications.As in the networking field, where several solutions emerged at his infancy to leave place to a common model, the TCP/IP protocol suite, the emergence of a common reference model for the IoT domain and the identification of reference architectures can lead to a

faster, more focused development and an exponential increase of IoT-related solutions. These solutions can provide a strategic advantage to mature economies, as new business models can leverage those technological solutions providing room for economic development. The idea of automating each appliance i the 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, which creates its own automation systems with different devices like sensors, controllers, actuators, buses, and interfaces. In present days most of the automation systems utilize the combination of hardwired and wireless systems for controlling the appliances. A variety of home devices can be controlled with the help of a home automation system. All kinds of home appliances like doors, lights, fan, electric heater, surveillance systems, and consumer electronics belong to the home automation system devices. Home automation system is adopted by using the technology available for the purpose of controlling the devices as well as the systems used in the home automatically .

This is implemented by using Raspberry Pi B. In Home automation results in convenience, energy efficiency, and safety benefits leading to improved quality of life. Home automation refers to the application of computer and information technology for control of home appliances and domestic features. Its application varies from simple remote control of lighting to complex computer/micro-controller based networks involving varying degrees of intelligence and automation. The popularity of network enabled home automation has been increasing greatly in recent years due to simplicity and much higher affordability. Moreover, with the rapid expansion of the Internet, there is the potential for the remote control and monitoring of such network enabled appliances. However, the new and exciting opportunities to increase the connectivity of devices within the home for the purpose of home automation through internet are yet to be explored. IOT is one of the stages of the present Smart City, and Smart Energy Management Systems.

A. Home automation

The introduction of home automation in the 1970s failed to improve the lifestyles of users for several reasons. Firstly, determining economic

benefits of home automation technologies is difficult. Secondly, the costs of implementing smart home technology must be justified by the effects brought about by their installation. There is a need for home automation technologies to be cost effective, easy to install and flexible with many network infrastructures and appliances.

In 2003, Housing Learning & Improvement network published a smart home definition offered by Interetec which states that a smart home is "a dwelling incorporating a communications network that connects the key electrical appliances and services, and allows them to be remotely controlled, monitored or accessed". The following section includes a brief summary of previous research into smart homes within the past decade.

In 1995, Welfare Techno Houses were constructed in Japan. The purpose of these experiments was to provide health monitoring for elderly and disabled person at home by using fully automated measurements to support daily health care and improve quality of life. The University of Texas at Arlington has conducted the Mav Home project over the past 7 years. The Mav Home (Managing an Adaptive Versatile Home) is a home environment that detects environment states through sensors and intelligently acts upon the environment though controllers. The sensors in the home form an adhoc network with interconnect together to make appropriate decisions.

The Smart home known as House automation, with the use of new technology, to make the domestic activities more convenient, comfortable, secure and economical.

II. EXISING METHOD

The Existing System consists of physical appliances in home that are been controlled through switches. These devices can be switched ON & OFF manually whenever needed this system is less secured and prone to electrical hazards. Also the wastage of electricitytends to be a major factor of concern.

Raspberry pi is a mini computer. Arduino and rasp2 are not having inbuilt wifi. If we make this project by using rasp2 and arduino we have to connect wifi module. So it is better to use rasp3. In existing the IR sensor is used but it does not give proper results so we used PIR sensor.

A.Voice recognition based home automation

A voice recognition based home automation system proposed and implemented by a researcher . The wireless communication between the smartphone and the Arduino UNO is done through Bluetooth technology. This will be more helpful for handicapped and aged people who wants to control appliances by speaking voice command The main drawback of this system is that communication between user and voice recognition tool depends on signal to noise ratio (SNR), if voice signal is noisy then communication can highly effect and the system will fail to show accuracy.

B. Bluetooth based home automation system

Home automation systems using smartphone, Arduino board and Bluetooth technology are secured and low cost. A Bluetooth based home automation system proposed by R.Piyare and M.Tazil . The Bluetooth system uses a PC or smartphone as receiver device. It has a high communication rate, great security and low cost, so it can be implemented a real time system. Bluetooth network has limited range of 10 meters if the smartphone is out of range, then it will not able to control the home appliances, this is one of the main disadvantages of Bluetooth based home automation system.
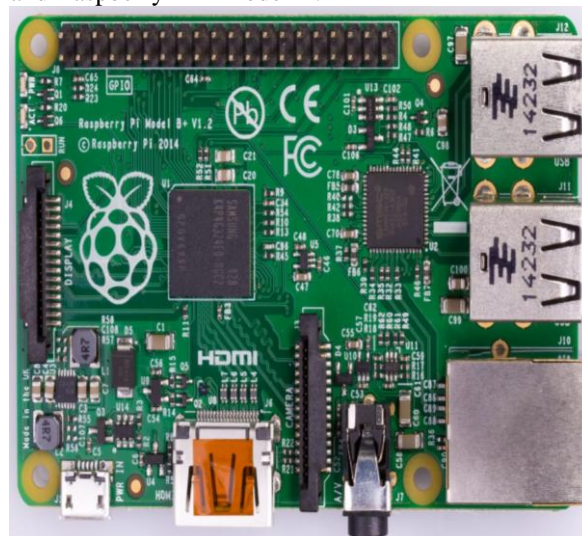
III. COMPONENTS REQUIRED

A. Raspberry pi modelB
B. Relays for connecting home appliances
C. LDR sensor
D. PIR sensor
E. Humidity and Temperature (DHT22)

A. Raspberry pi modelB

This paper presents an intelligent home automation to control the home appliances and electrical and electronic equipment by using sensors. It will turn ON or OFF the home appliances and electrical equipment by using relay circuits with the concept of IOT. This is implemented by using Raspberry Pi B. In Home automation results in convenience, energy efficiency, and safety benefits leading to improved quality of life. Now with a Quad-Core 64bit CPU, Wi-Fi & Bluetooth! The Raspberry Pi 3 Model B is the third generation Raspberry Pi. This powerful credit-card sized single board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ and Raspberry Pi 2 Model B.

B. Light Dependent Resistor(LDR)

A Light Dependent Resistor (LDR) is also called a photo resistor or a cadmium sulfide (CdS) cell. It is basically a photocell that works on the principle of photo conductivity. The passive component is basically a resistor whose resistance value decreases when the intensity of light decreases. When a LDR is kept in the dark place, its resistance is high and, when the LDR is kept in the light its resistance will decrease. light dependent resistors (LDR), are light sensitive devices most often used to indicate the presence or absence of light, or to measure the light intensity.

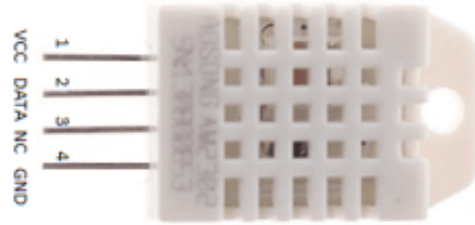

C. PASSIVE INFRARED RESISTOR(PIR):

Passive IR (PIR) sensors are excellent devices for wireless sensor networks (WSN), being low-cost, low-power, and presenting a small form factor. PIR sensors are widely used as a simple, but reliable, presence trigger for alarms, and automatic lighting systems. When the sensor is idle, both slots detect the same amount of IR, the ambient amount radiated from the room or walls or outdoors. When a warm body like a human or animal passes by, it first intercepts one half of the PIR sensor, which causes a positive differential change between the two halves However, the output of a PIR sensor depends on several aspects beyond simple people presence, as, e.g., distance of the body from the sensor, direction of movement, and presence of multiple people. Sensing Motion with Passive Infrared (PIR) Sensors. A passive infrared (PIR) sensor measures infrared emitted from objects that generate heat, and therefore infrared radiation, in its field of view.
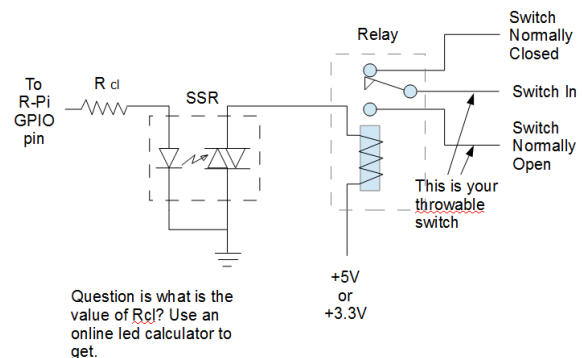

D. DHT22 (Humidity and Temperature sensor):

The DHT22 is a basic, low-cost digital temperature and humidity sensor, which uses a capacitive humidity sensor and a thermistor to measure the surrounding air and output a digital signal on the data pin. Temperature range is from -40 to 125 degree Centigrade with accuracy of $\pm$ 0.5 $^\circ$C. Humidity range is from 0 to 100% with accuracy of $\pm$ 2-5%.
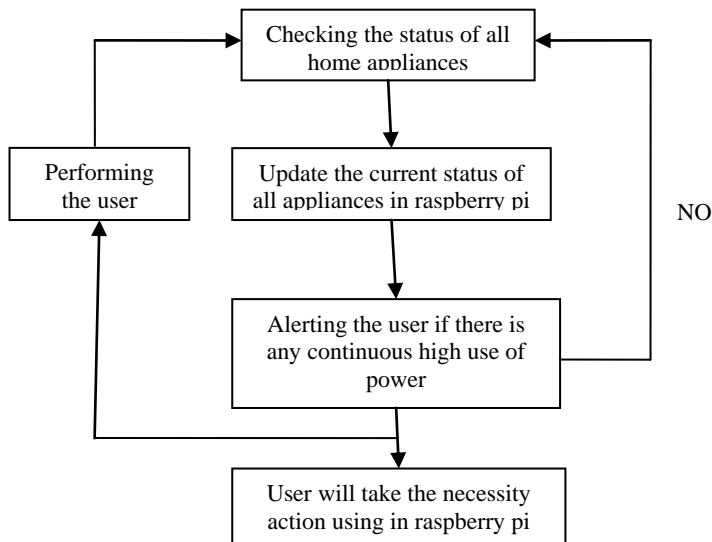

E. Relay Circuit:

A solid-state relay (SSR) is an electronic switching device which switches on or off when a small external voltage is applied across its control terminals. SSRs consist of a sensor which response to an input signal (control signal), a solid-state electronic switching device which switches power to the load circuitry, and a coupling mechanism is there to enable the control signal to activate the switch without consisting of mechanical parts. The relay may be designed to switch either AC or DC to the load.

III. PROPOSED SYSTEM

Our proposed system consists of a microcontroller based circuit that has lights and fan connected to it along with LCD display and Wifi connector interfaced with raspberry pi. Our system interacts with out online IOT system that IOT Gecko free web interface for controlling our home appliances with ease. After linking with IOT Gecko, the user is allowed to send load switching commands over IOT to our circuit. Internet of things is a technology of the future that has already started to touch our homes. Here we propose an IOT based home automation system using raspberry pi that automates home appliances and allows user to control them easily through internet from anywhere over the world. the PIR sensor is used to detect the humanbeing presence and accordingly the fans are turned ON/OFF.The lights and fans can be controlled by creating web server.

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        ┌──────────────────────┐
        │ Checking the status   │ ◄─────────┐
        │ of all home appliances│           │
        └──────────────────────┘           │
                   │                        │
                   ▼                        │
┌─────────────┐  ┌──────────────────────┐  │  NO
│ Performing  │  │ Update the current    │  │
│ the user    │  │ status of all         │  │
└─────────────┘  │ appliances in         │  │
                 │ raspberry pi          │  │
                 └──────────────────────┘  │
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                   ▼                        │
                 ┌──────────────────────┐  │
                 │ Alerting the user if  │──┘
                 │ there is any          │
                 │ continuous high use   │
                 │ of power              │
                 └──────────────────────┘
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                 │ User will take the    │
                 │ necessity action      │
                 │ using in raspberry pi │
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RESULTS

The system allows the user to control the appliances from anywhere in the world using an internet connection. The proposed home automation system is practically implemented and thus the results are obtained.

CONCLUSION

The goal of the paper was to design a home automated system using Raspberry pie. So, as to help people to easily operate the home appliances. This project is based on the Raspberry pi, and the language used for communication of kit is Python. We are implementing smart home ideas interfacing it with the kit and making Home to perform automated Operations. Which help people to easily monitor home appliances without any learning the more number of people can use loT in a smart environment.

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