HOME AUTOMATION USING INTERNET OF THINGS

ABSTRACT

Internet of things is a growing network of everyday object (from industrial machine to consumer home appliances) that can share information and complete tasks while you are busy with other activities. The IoT aims to unify everything in our world under a common infrastructure, giving us not only control of things around us, but also keeping us informed of the state of the things. Home automation with the proliferation of IoT is becoming a reality now, and a variety of players like, Apple, Amazon, Google, Samsung, are all converging into this space to provide the platform and solutions for smart homes. Considering this, we present a Term project to incorporate the powerful features of IoT and design a system which takes control of home appliances and security on the go. The main objective of our project is to provide a Home Automation System, implementation, technologies used and their usage in our daily life.

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INTRODUCTION

Today's life rolls around the concept of automation. In the recent times the usage of home automation system is tremendously increasing. These systems help in providing control over the appliances which will in turn result in reduced overall cost and significant saving in energy. Security can be enhanced by implementing the concept of home automation. Home automation helps to monitor the house from anywhere around the globe.

Addition of intelligence to the home atmosphere improves the quality of life. Home automation can be implemented in various technologies like ZigBee, GSM, wireless fidelity and Bluetooth. Internet of Things (IoT) helps in building connection with devices like sensors, smart phones, actuators etc. This linkage with devices helps in enabling communication between humans and devices and also among the devices. Home automation system technology is unique from other systems which give ability to the user to control the appliances in the house remotely with the help of Internet (Wi-Fi).
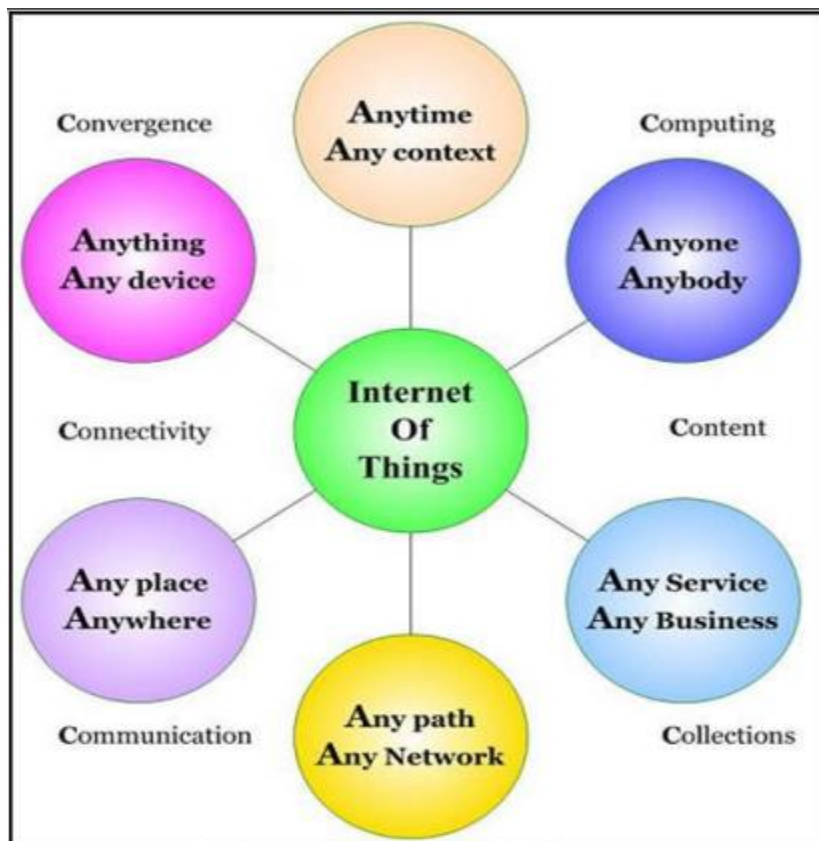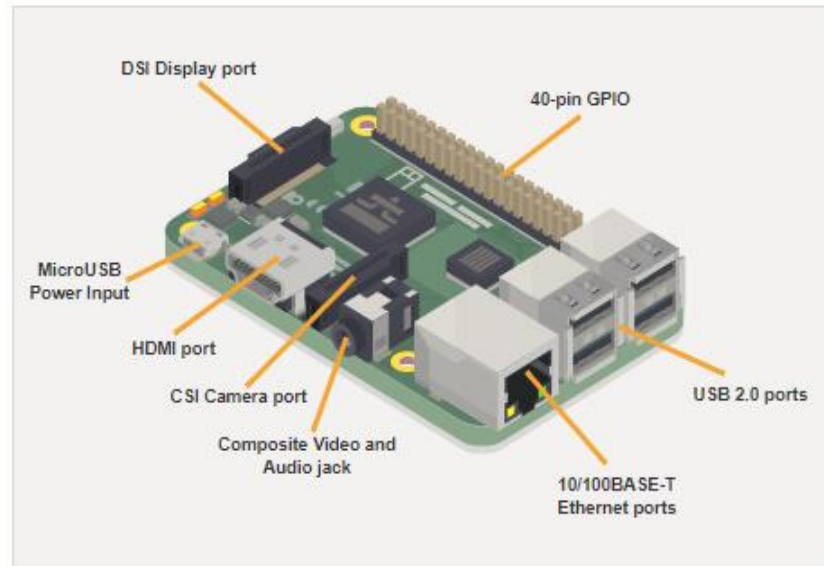

Hardware and Software Used

1. Raspberry Pi-3
2. Temperature Sensor
3. PIR Sensor
4. Four- channel electronic relay- LED lights
5. Python and PHP for developing the webpage

Raspberry Pi-3

The Raspberry Pi-3 Model is the advanced version of Raspberry Pi. It is a computer having a size of a credit card. Keyboard, power supply, mouse and display can be connected externally to it. Raspberry Pi-3 has Broadcom BCM2837 system on chip which contains ARMv8 1.2 GHz processor. It has 1 GB RAM. It has in built Wi-Fi, Bluetooth and Ethernet module system.

Pin Model of Raspberry Pi- 3

It has GPIO pins, 5V pins and ground pins. These pins are used to connect the sensors to raspberry pi and to the sensor.

Temperature Sensor

The Qunqi DHT11 Analog Temperature & Humidity Sensor is connected to Raspberry Pi-3. It is used to sense the temperature of the surrounding environment. It can measure temperatures ranging from 0-50°C with an error of approximately ±2°C. It can operate at 5V and 2.5mA max current.
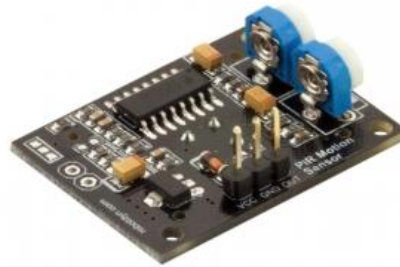
PIR Sensor

The RobotDyn - PIR Motion Sensor which is compatible for Raspberry Pi-3 is used to detect the motion. It is a simple motion sensor which has adjustable time delay and adjustable sensitive and operates at a voltage of 5V.

Front View PIR Sensor

Back View PIR Sensor

Four- channel electronic relay

The 5V 4-Channel Relay interface board is used. It provides a simple and efficient way of interfacing 4 relays for switching application. It can be controlled directly by Raspberry Pi-3.

SOFTWARE DESIGN

Major coding is done in Python, which is used for client-server application, interfaced with Raspberry Pi 3. Python provides a wide variety of built-in libraries for Raspberry Pi which makes it easier to use and implement it. Once, the scripts were ready, PHP was used to execute the scripts upon click. This is used because we needed a Front-End web page where you may login and directly control all the appliances. HTML 5, CSS was used to create web page, with PHP to execute the python scripts upon incoming request. Some of the many things that were implemented are control status of appliances, monitor temperature of the room and the status of the PIR sensor.

Front End Design

HTML is a format that tells a computer how to display a web page. The documents themselves are plain text files with special "tags" or codes that a web browser uses to interpret and display information on your computer screen. HTML stands for Hyper Text Markup Language; an HTML file is a text file containing small markup tags. The markup tags tell the Web browser how to display the page. An HTML files must have an htm or html file extension.

IMPLEMENTATION

Application Control

The first application is appliance control. User can turn the appliances ON/OFF remotely using the web page and the corresponding buttons. The three appliances we considered were light, AC and dishwasher. LEDs turn ON/OFF based on the user control actions on the web page. Any number of devices can be controlled by the user this way.

Temperature Monitoring

The intention behind this application is to gain control over the room temperature and manipulate accordingly. The function of the temperature sensor is to continuously monitor the room temperature. These values are displayed in centigrade on the web page.


Automatic lights with motion detection

The intention behind this application in simple words is to switch on the lights on detection of an object and turn off automatically. PIR motion sensor is interfaced to the raspberry pi 3 and in this implementation the LEDs are used to demonstrate its functionality. When the PIR sensor is initially on, it takes 1-3sec to observe the static room. In case any motion is detected, the raspberry pi3 turns on the LEDs. When there is no motion, the lights will be automatically turned OFF. This application helps in substantial energy saving. It is shown on the webpage in terms of status of PIR sensor. This application provides enhanced security system.

PROJECT KIT
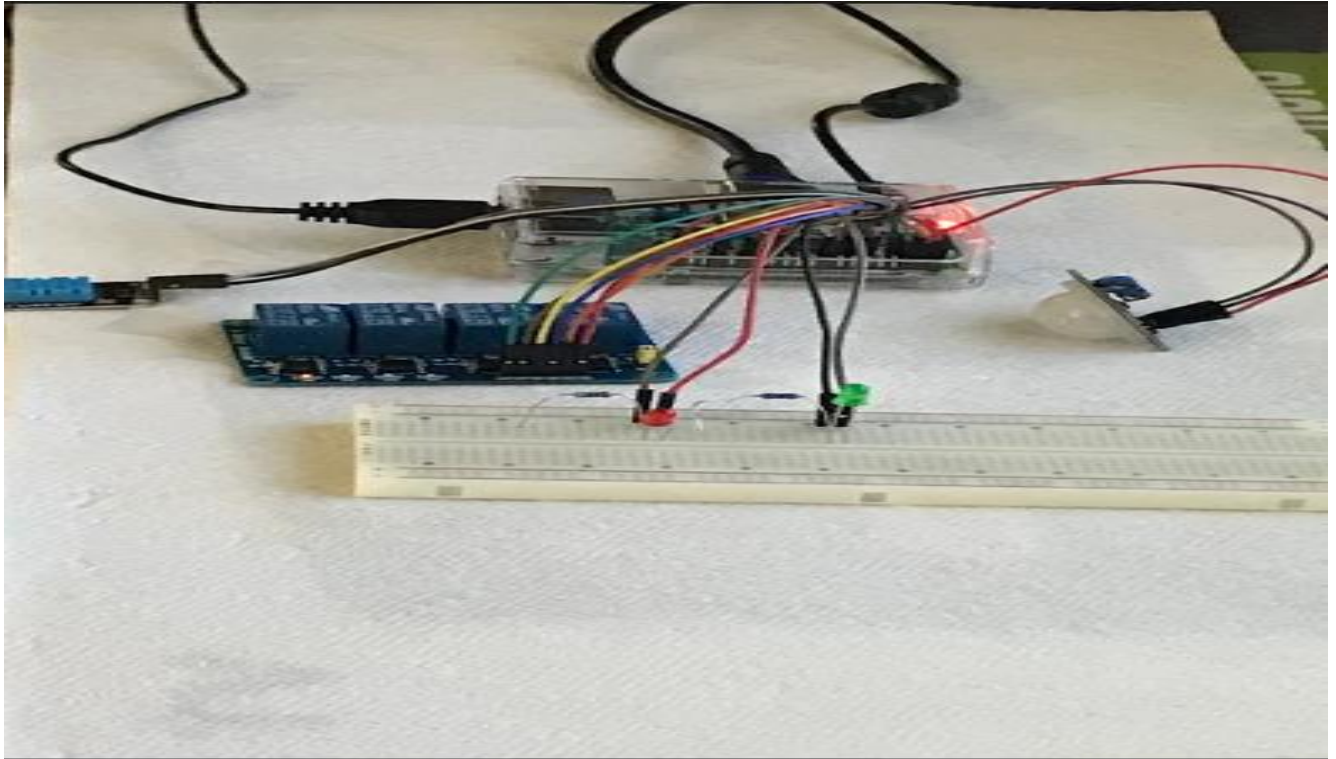
ADVANTAGES

The advantages of implementing a modest home automation system are fare more than the difficulty in implementation such as follows:

High reliability
Enhanced Security
Energy conservation
Remote access and control on devices
Easy Operation
Comfortable usage
Low Cost
Less Maintenance

APPLICATIONS

Light and Devices: The user can check the status of the outside light and turn on and off the light without the need to get out of bed. These devices are also benefitting users with limited mobility that may have a tough time getting to or even reaching their light switch.

Temperature Monitoring and Setting: The user can check the temperature of the house continuously and decide how he/she wants it to feel when they reach home.

Security: The user can check, using the PIR sensors, if there is any motion detected in the house, when they aren't expecting anyone to be in the house. In future development, this can be integrated with a CCTV camera to take snapshots of the room only when there is any movement, thereby removing the necessity for continuously recording a video which requires a lot of storage.

1. Can be implemented in factories, hospitals, hotels etc.
2. On the go management and security of the house.

CONCLUSION AND FUTURE WORKS

The home automation using Internet of Things has been experimentally proven to work satisfactorily by connecting simple appliances to it and the appliances were successfully controlled remotely through internet. The designed system not only monitors the sensor data, like temperature, light, motion sensors, but also actuates a process according to the requirement, for example switching on the AC when it gets hot.

For future development, we can store the sensor parameters in the cloud in a timely manner. This will help the user to analyze the condition of various parameters in the home and use Deep Learning to analyze different patterns for efficiency. As mentioned previously, using our system as framework, the system can be expanded to include various other options which could include home security feature like capturing the photo of a person moving around the house and storing it onto the cloud. This will reduce the data storage than using the CCTV camera which will record all the time and stores it. The system can

be expanded for energy monitoring, or weather stations. This kind of a system with respective changes can be implemented in the hospitals for disable people or in industries where human invasion is impossible or dangerous, and it can also be implemented for environmental monitoring.

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REFERENCES

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