

IOT BASED ADVANCED AUTOMATION FOR APPLIANCES CONTROL & MONITORING

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Abstract

IOT is the most recent innovation that permits us to control equipment gadgets through the web to control home machines, in this way we can robotize current homes through the web. This framework numerous heaps to exhibit as house lighting and a fan as our easy-to-use interface permits clients to effortless control these home machines through the web. For this framework we utilize Raspberry pi is the interfaced with a Wi-Fi modern to get client orders over the web. Likewise, we have a LCD show to show framework status. Relax are utilized to switch loads to whole framework is fueled by a 12v transformer. In this wake of accepting client orders over the web. Raspberry pi measures these guidelines to work these heaps as needs to be and show the framework status on LCD show. Hence this framework considers effective home mechanization over the web.

Keywords—, *Raspbian, IoT, .*

I.INTRODUCTION

The proposed model of the automation system is as shown in the figure. The model consists of number of relays to connect various devices. Initially all the devices are connected to the internet through Wi-Fi. When the connection is established in on web page, we provide virtual switches to operate the connected devices. Also, it will start reading the parameters of devices to shows the graph of current verses time for each device. If particular device exceeds the threshold set point, then server will give notification to the user on web page and that device will automatically turned off. If problem found it report to cloud server. Here user can modify some settings and see the devices functionality and working.

2. Existing Model¹

Smart Home Automation System, open-source android platform used Android application from any mobile devices connects to the Bluetooth module HC-06 and controls the home appliance devices such as rooms lighting, water pump motor and garage motor. For the safety purpose of

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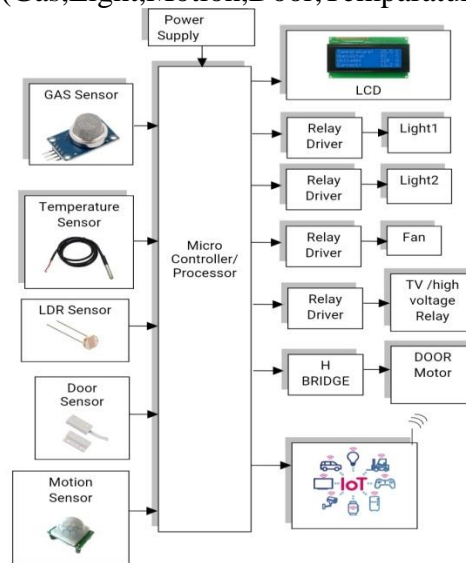
this project, Bluetooth connection of application and Bluetooth device need password when pairing for authorized using. After that confirm message for Bluetooth connection is successful and then list on available devices in android application can control as remote devices. This project also monitor.CO2 content in the house by MQ-2 gas sensor and make alarm sound by speaker when the certain amount of smoke detected in the house. The connection and placement of hardware components has been elaborated with the help of circuit diagram of the system interconnection. The required DC power supply that to run the system can get from 9V battery or computer USB port and feeds the microcontroller and Bluetooth module. The Bluetooth module receives the signal sent from an android smartphone, where the application software made by MIT app inventor is installed.

3. Proposed Model

The system proposed is being implemented with sensors for temperature, light, door and three gas sensors are kept in position for monitoring the appliances. In this system, using IOT all the users are directly monitor and control the devices by mobile phones or laptops using IOT website the devices like fans, light is controlled. In this project we use 8 lights, which can be controlled by IOT command. The command for the system is given by IOT website.

4. Description

The working and the explanation of the proposed model is shown in the following figure (1.0). The components used are AC power supply, Raspberry Pi 3, IOT, Relay switches,DC-Motor,Bulb,Fan,LCD, Sensors(Gas,Light,Motion,Door,Temparature,LDR,H-Bridge).



5. Raspberry pi-3

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. Phils. maintaining the popular board format the Raspberry Pi 3 Model B brings you a more powerful processor, 10x faster than the first-generation Raspberry

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Pi.

The Raspberry Pi 3 Model B+ is the latest product in the Raspberry Pi 3 range boasting a 64-bit quad core processor running at 1.4 GHz, dual-band 2.4 GHz and 5 GHz wireless LAN, Bluetooth 4.2/BLE, faster Ethernet, and PoE capability via a separate PoE. The Raspberry Pi 3 Model B+ maintains the same mechanical footprint as both the Raspberry Pi 2 Model B and the Raspberry Pi 3 Model B.

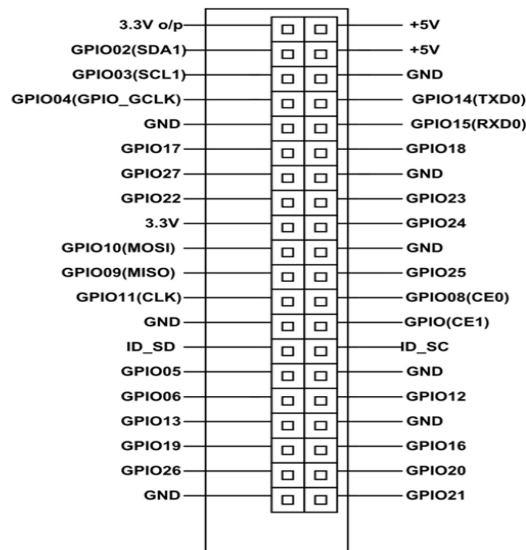
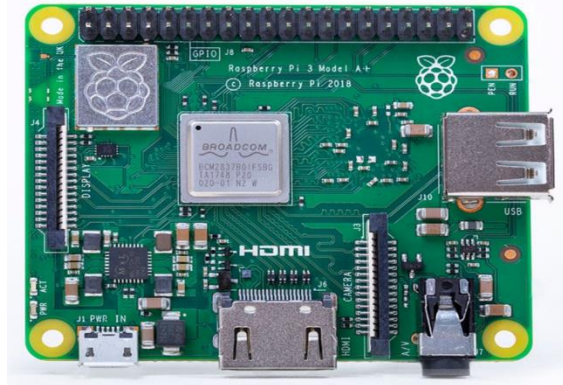


Figure. Pin Diagram

6. Power Supply

The power supply section is the section which provide +5V for the components to work. IC LM7805 is used for providing a constant power of +5V

The ac voltage, typically 220V, is connected to a transformer, which steps down that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting

dc voltage usually has some ripple or ac voltage variation.

A regulator circuit removes the ripples and also retains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

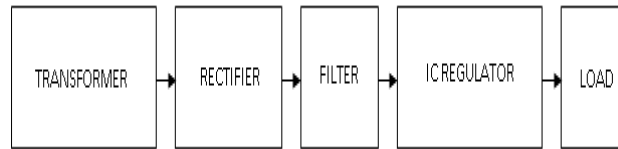


Figure. Block diagram of power supply.

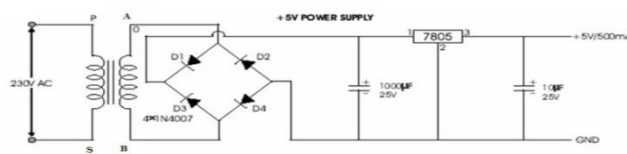


Figure. Circuit diagram of power supply

7. Transformer

Transformers convert AC electricity from one voltage to another with little loss of power. Transformers work only with AC and this is one of the reasons why mains electricity is AC. Step-up transformers increase voltage, step-down transformers reduce voltage. Most power supplies use a step-down transformer to reduce the dangerously high mains voltage (230V in India) to a safer low voltage.

The input coil is called the primary and the output coil is called the secondary. There is no electrical connection between the two coils; instead, they are linked by an alternating magnetic field created in the soft-iron core of the transformer. Transformers waste very little power so the power out is (almost) equal to the power in. Note that as voltage is stepped down current is stepped up.

The transformer will step down the power supply voltage (0-230V) to (0- 6V) level. Then the secondary of the potential transformer will be connected to the bridge rectifier, which is constructed with the help of PN junction diodes. The advantages of using bridge rectifier are it will give peak voltage output as DC

8. LCD- (Liquid crystal display)

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels. LCDs were a big leap in terms of the technology they replaced, which include light-emitting diode (LED) and gas-plasma displays. LCDs allowed displays to be much thinner

than cathode ray tube (CRT) technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it. Where an LED emits light, the liquid crystals in an LCD produces an image using a backlight

The operating voltage of this LCD is 4.7V-5.3V.

- It includes two rows where each row can produce 16-characters.
- The utilization of current is 1mA with no backlight.
- Every character can be built with a 5×8-pixel box.
- The alphanumeric LCDs alphabets & numbers.
- Its display can work on two modes like 4-bit & 8-bit.
- These are obtainable in Blue & Green Backlight.
- It displays a few custom generated character

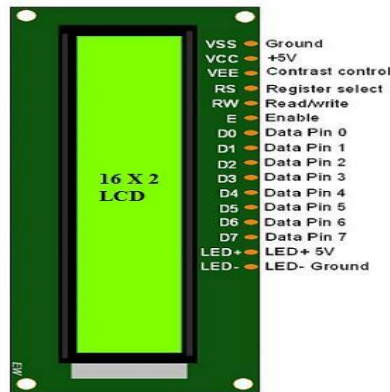


Fig. LCD

9. Relay switch

A **relay** is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof. Relays are used where it is necessary to control a circuit by an independent low-power signal, or where several circuits must be controlled by one signal. Relays were first used in long-distance telegraph circuits as signal repeaters: they refresh the signal coming in from one circuit by transmitting it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations. The traditional form of a relay uses an electromagnet to close or open the contacts, but other operating principles have been invented, such as in solid-state relays which use semiconductor properties for control without relying on moving parts. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called protective relays. Latching relays require only a single pulse of control power to operate the switch persistently. Another pulse applied to a second set of control terminals, or a pulse with opposite polarity, resets the switch, while repeated pulses of the same kind have no effects. Magnetic latching relays are useful in applications when interrupted power should not affect the circuits that the relay is controlling



Figure. Relay switch

10. Temperature Sensor (LM35)

The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in °C). It can measure temperature more accurately than a thermistor. The sensor circuitry is sealed and not subject to oxidation. The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified. The LM35 has an output voltage that is proportional to the Celsius temperature. The scale factor is $.01V/^{\circ}C$.

The LM35 does not require any external calibration or trimming and maintains an accuracy of $\pm 0.4^{\circ}C$ at room temperature and $\pm 0.8^{\circ}C$ over a range of $0^{\circ}C$ to $+100^{\circ}C$. Another important characteristic of the LM35 is that it draws only 60 micro amps from its supply and possesses a low self-heating capability. The LM35 comes in many different packages such as TO-92 plastic.

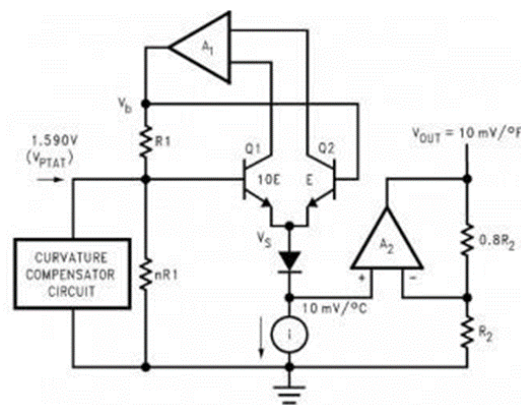


Fig. Circuit diagram of LM315

11. Gas sensor

A gas detector is a device that detects the presence of gases in an area, often as part of a safety system. This type of equipment is used to detect a gas leak or other emissions and can interface with a control system so a process can be automatically shut down. A gas detector can sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to leave. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals. Gas detectors can be used to detect combustible, flammable and toxic gases, and oxygen depletion. This type of device is used widely in industry and can be found in

locations, such as on oil rigs, to monitor manufacture processes and emerging technologies such as photovoltaic. They may be used in firefighting.



Fig. Gas sensor MQ-135

12. LDR SENSOR

The LDR Sensor Module is used to detect the presence of light / measuring the intensity of light. The output of the module goes high in the presence of light and it becomes low in the absence of light. The sensitivity of the signal detection can be adjusted using potentiometer.

Is the linchpin of your security system because it detects when someone is in your home when they shouldn't be. A motion sensor uses one or multiple technologies to detect movement in an area.

13. Motion Sensor

Is the linchpin of your security system because it detects when someone is in your home when they shouldn't be. A motion sensor uses one or multiple technologies to detect movement in an area.



Fig. Motion sensor

14. DC-Motor

Almost every mechanical development that we see around us is accomplished by an electric motor. Electric machines are a method of converting energy. Motors take electrical energy and produce mechanical energy.

Electric motors are utilized to power hundreds of devices we use in everyday life.

Electric motors are broadly classified into two different categories: Direct Current (DC) motor and Alternating Current (AC) motor. In this article we are going to discuss about the DC motor and its

working. And also, how a gear DC motors works.

A DC motor is an electric motor that runs on direct current power. In any electric motor, operation is dependent upon simple electromagnetism. A current carrying conductor generates a magnetic field, when this is then

placed in an external magnetic field, it will encounter a force proportional to the current in the conductor and to the strength of the external magnetic field. It is a device which converts electrical energy to mechanical energy. It works on the fact that a current carrying conductor placed in a magnetic field experiences a force which causes it to rotate with respect to its original position. Practical DC Motor consists of field windings to provide the magnetic flux and armature which acts as the conductor.

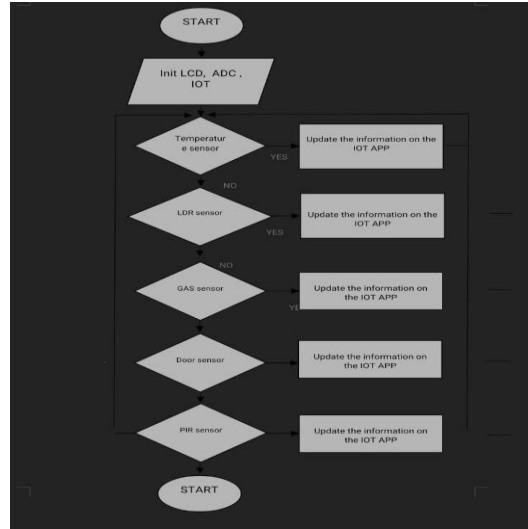


Figure. DC-Motor

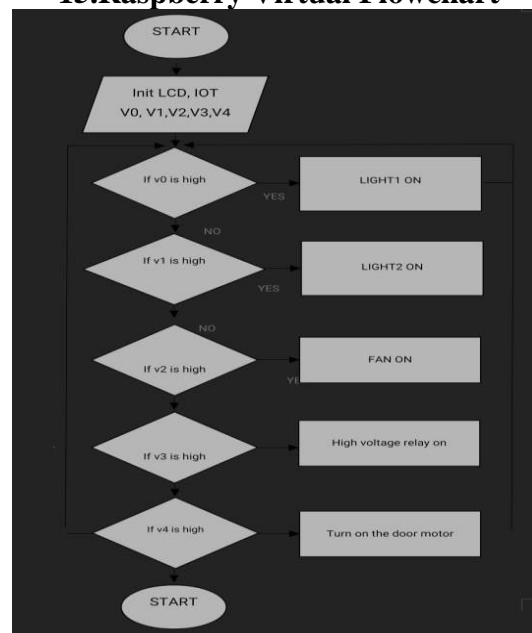
15. ADC

The Microchip Technology Inc. MCP3204/3208 devices are successive approximation 12-bit Analog to-Digital (A/D) Converters with on-board sample and hold circuitry. The MCP3204 is programmable to provide two pseudo-differential input pairs or four single-ended inputs. The MCP3208 is programmable to provide four pseudo-differential input pairs or eight single-ended inputs. Differential Non linearity (DNL) is specified at ± 1 LSB, while Integral Non linearity (INL) is offered in ± 1 LSB (MCP3204/3208-B) and ± 2 LSB (MCP3204/3208-C) versions. Communication with the devices is accomplished using a simple serial interface compatible with the SPI protocol. The devices are capable of conversion rates of up to 100 ksps. The MCP3204/3208 devices operate over a broad voltage range (2.7V - 5.5V). Low current design permits operation with typical standby and active currents of only 500 nA and 320 μ A, respectively. The MCP3204 is offered in 14-pin PDIP, 150 mil SOIC and TSSOP packages. The MCP3208 is offered in 16-pin PDIP and SOIC packages.

15. Sensor Flowchart

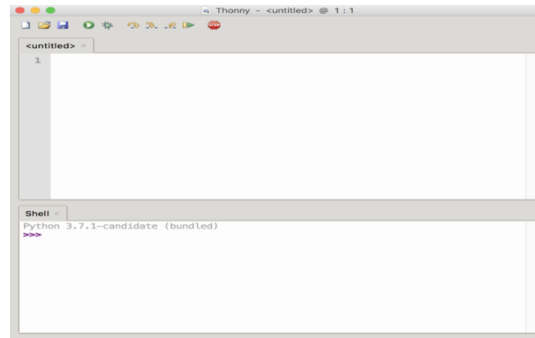


15.Raspberry Virtual Flowchart



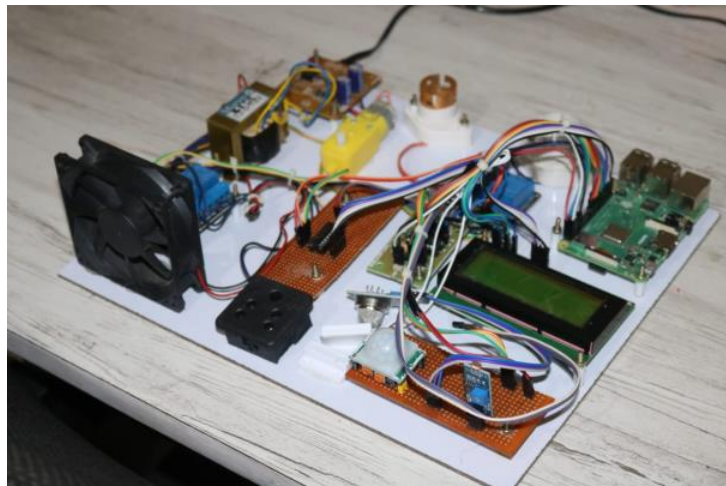
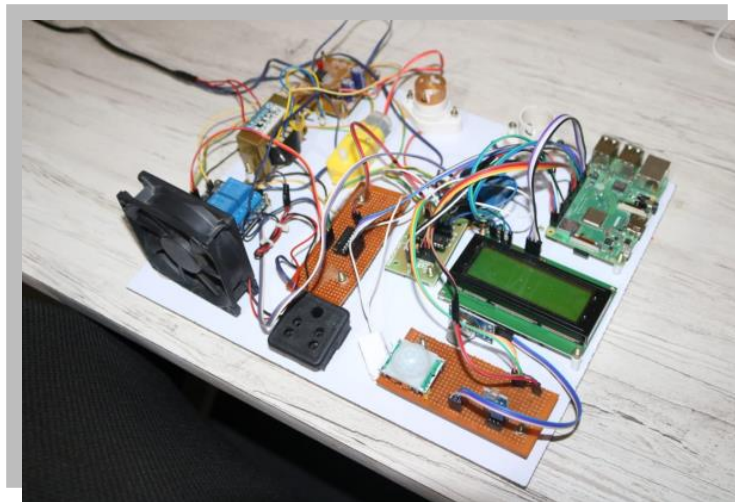
15. Software Description

Thonny is a free Python Integrated Development Environment (IDE) that was especially designed with the beginner Pythonista in mind. Specifically, it has a built-in debugger that can help when you run into nasty bugs, and it offers the ability to do step through expression evaluation, among other really awesome features.

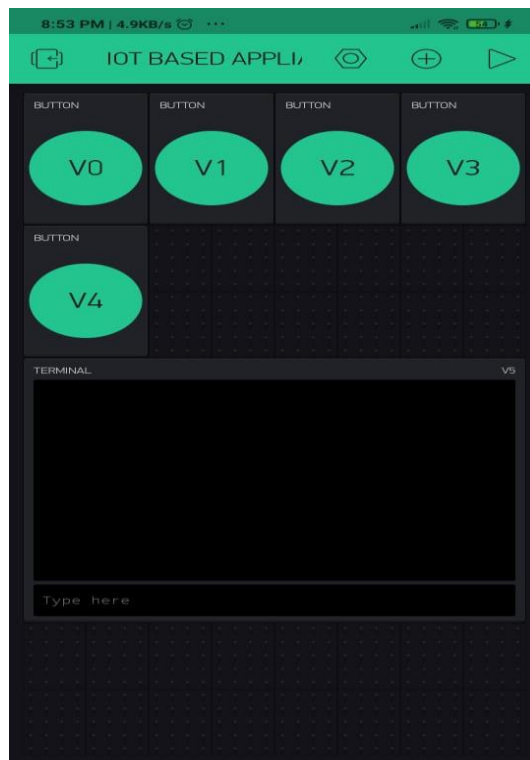
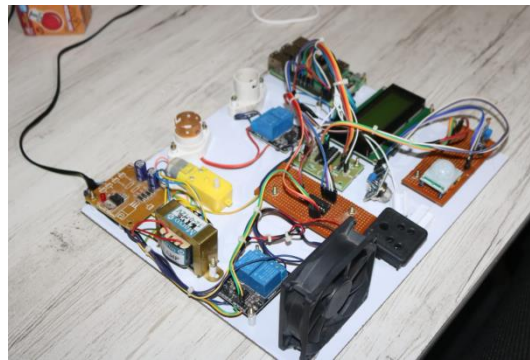
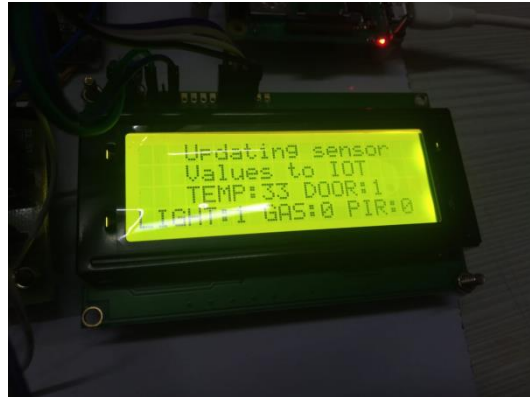


16. Result

With the help of this circuit and the hardware components we used here, we can control both AC & DC devices. With a single command we can make both devices both Turn ON/OFF.



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Advantages

- It is robust and easy to use.
- It will save energy and money.
- Provide security.
- Convenience and comfort.
- Can be used by physically challenged and disabled people.
- Complexity is less as only a single mobile is used for multiple devices.

17. Applications

The project designed is very practical in nature because everything can be controlled with the help of just a mobile phone which is widely available nowadays and also proves to be handy.

Conclusion

In this paper, a prototype smart home automation using IoT is presented. This work will be carried forward by integrating relays to Raspberry pi board for controlling home appliances from a remote location in a real scenario. As an extension, authors propose a generic IoT framework and use cloud computing infrastructure for connecting and managing. Expected to grow in popularity in the near future is the use of smart home products to increase family safety, specifically related to fire protection and carbon monoxide monitoring. Now we are connecting and controlling the few devices in home appliances. In future we are connecting multiple devices in order to control it from all over the world.

Future Scope

These kinds of Home Automation System are required because a human can make mistakes and forget to switch off the appliances when in no use and in this case, they are useful in order to utilize the power effectively and also in a secured manner. Home Automation system is a leading step towards the increase in the technological advancement in the industry of appliances and another method by which the human errors can be avoided and the energy consumption can be reduced. This system can be proved as a future of artificial intelligence and a powerful and a dependable system through which the goal of energy saving and efficient use of the energy resources can be achieved soon. Raspberry Pi being an intelligent platform using which multiple appliances can be connected to each other and can be controlled from a longer range of distance because the connection which is to be used would be through the internet. Due to which appliances, can be accessible easily.

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