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Wireless Domotics using IoT

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***Abstract*:** With advancement of automation technology, life is getting simpler and easier in all aspects. In today's world automatic systems are being preferred over manual system. The rapid increase in the number of users utilizing internet over the past decade has made internet a part and parcel of life, and IoT is the latest and emerging internet technology. Internet of things is a growing network of everyday object-from industrial machine to consumer goods that can share information and complete tasks while you are busy with other activities.

Problem Statement:

Automation at the home level has made living comfortable and easy for many. But the elderly and physically challenged people still need the help of another person to control the household appliances. When people are on vacation, they mull over thoughts like have they turned off allthe lights.Messages get lost if the person is not home when an unexpected visitor arrives. If a fire breaks out when no one is at home, we are helpless.

Existing Model:

One of the existing models of low cost home automation systems, control home appliances using bluetooth. The drawback to this system is that control can be exerted only within a small range. Another model is based on voice recognition using Arduino microcontroller but it fails to work efficiently in noisy environments. Another approach to home automation involves controlling home appliances through text messages. The drawback of this system is that the memory of the GSM module is limited and hence, only a few commands could be created.

Proposed System:

The proposed system is a wireless control of the home automation system through IoT and GSM technologies.The control of the appliances is implementedthrough speech commands with the help of google assistant in the user's phone. Various home parameters like temperature, illumination, humidity can be monitored and viewed remotely in a webpage. Upon the arrival of a visitor, an autogenerated email with an attached image of the visitor is sent across to the intended recipient.

Keywords: Home Automation, IoT, Wireless automation.

I. LITERATURE SURVEY

Amrutha Patil et al. [1] have presented an SMS based home automation system utilizes Bluetooth and GSM to control home appliances. Praveen Kumar and Umesh Chandra Pati [2] have proposed a home automation system to control the appliances through a TFT touchscreen and establish communication between the visitor and the owner of the house. A web camera is used to capture the image of the visitor and display it on an LCD screen inside the house. Further, the visitor can leave a voice message which is recorded by the microphone. Dhiraj Sunehra and Vemula Tejaswi [3] have proposed an SMS based home automation system. Text messages from a smartphone control the status of the appliances. The GSM receives the text messages and sends it to the microcontroller to change the status of the appliance accordingly. The LCD displays the status of the appliances. The system uses GSM to remotely monitor and control the house.Vikram.N et al. [4]have proposed a low-cost home automation system incorporating Internet of Things (IoT). An android application is used to control the appliances. The application communicates with the server over Wi-Fi.

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II. DESIGN AND IMPLEMENTATION

The proposed project is a wireless home automation system which can be monitored and controlled through the internet or text messages.

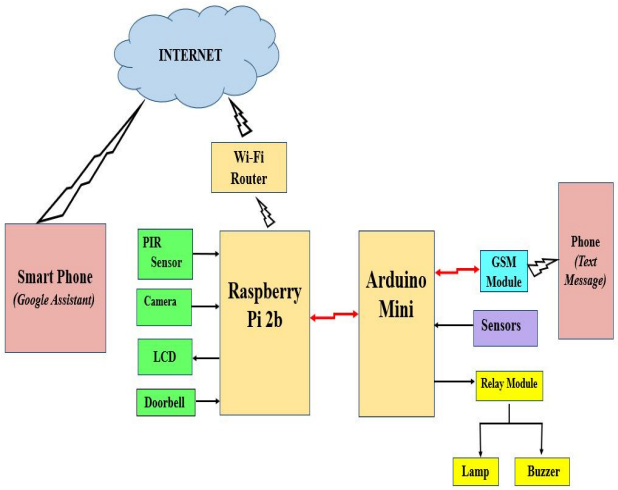

Fig 1. Block Diagram

The main objective is to remotely control and monitor the household appliances with the help of a smart phone. Sensors are utilized to monitor the household environment and in case of a fire breakout or a gas leakage, the house owner is notified through a text message. The main features of this project are:

- Control the status of appliances through voice commands over the internet.
- Schedule the time during which the household device will be in the on state.
- View the status of the sensors and the appliances in a website.
- Notify the user when there is a fire breakout or a gas leakage.
- Provide a way for the user to know who has visited their house and if required a short message can be sent across to the visitor.
- The controlling and monitoring of the household can also be achieved through text messages.

The concept of Internet of Things (IoT) and GSM are deployed in this home automation system. The block diagram, Figure 1, shows the various components and their interconnection

The two integral hardware components are the Raspberry Pi 2b and the Arduino mini. The raspberry pi 2b has an ethernet port which makes it ideal for connecting to the internet. Due to the ease of coding in case of Arduino mini, it is utilized to interface with the sensors, GSM and relay module. A smart phone with the google assistant app is used to voice control the status of the lamp, buzzer and other appliances connected to the relay. The various sensors, such as the temperature sensor, gas sensor, LDR are connected to the Arduino. The values of the sensor output can be viewed on a website with the help of a smart phone. When a visitor presses the doorbell, an SMS is autogenerated and sent to the intended recipient. The SMS notifies the user that a visitor has pressed their door bell. The PIR sensor is a motion sensor which detects human movement near the entrance of the house. The Raspberry Pi camera which is placed in front of the door is used to capture the image of the visitor. Once motion is detected near the doorway, the PIR enablesthe Raspberry Pi camera to send an

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image of the visitor to the required email address. Thereby the house owner would be able to know who had visited their house. If needed, a message from the house owner can be displayed in front of the door by using a LCD. When there is an abnormality in the sensor value, in case of a fire breakout the following events take place:

i. A buzzer is automatically turned on.

ii. An autogenerated SMS is sent to a predefined emergency number.

GSM deals with multiple functionalities such as

- Control of appliances
- View the status of sensors
- Schedule the time during which a device will be turned on
- Set an emergency number to receive alerts

By this automation is achieved through internet as well as normal SMS from a smart phone.

III. HARDWARE DESCRIPTION

Arduino Pro Mini is an ATmega328 based Microcontroller board that comes with built-in Arduino bootloader. It has 14 digital pins and 8 analog pins.

The analog sensors LDR and MQ-2 and the digital temperature sensor DHT-11 are utilized to monitor the household environment.

Raspberry Pi 2b is a low-cost microcomputer that plays a major role in making the remote controllingof appliances, over the internet, feasible.

A wireless adapter is a hardware which is connected to a computer to allow it to connect to a wireless network. In this project, a USB wireless adapter is used to connect the Raspberry Pi to the Wi-Fi.

SIM800C is a quad-band GSM/GPRS Module. It can transmit Voice, SMS and data information with low power consumption. In this project, GSM module is utilized to control the appliances through SMS, view the status of sensors and to get alerts.

A relay is an electromagnetic switchused to interface an electronic circuit, which works at a low voltage, to control an electric circuit which works at a very high voltage. In this project, a 4 channel 5V relay, which is controlled by a microcontroller, is used to turn on or off a load.

Raspberry Pi camera can be directly connected to the camera serial interface of the raspberry pi. The Pi camera is used to capture the image of a person who comes near the doorway.

PIR sensor is a motion detector. This detects the presence of a person near the door way and enables the pi camera to capture the picture of that person.

A Liquid Crystal Display (LCD) is a flat panel display which uses the light modulating properties of the liquid crystals. In this project, an LCD is used to display a message to the visitor.

LM2596 is an adjustable step-down (buck) switching regulator. This module has a potentiometer by which the output voltage can be adjusted to the required value. A buck converter provides a regulated voltage without dissipating much energy as in the case of a linear regulator. In this project, LM2596 is used to produce a regulated voltage to GSM Module(+4v).

Figure 2 shows the hardware and their interconnections.

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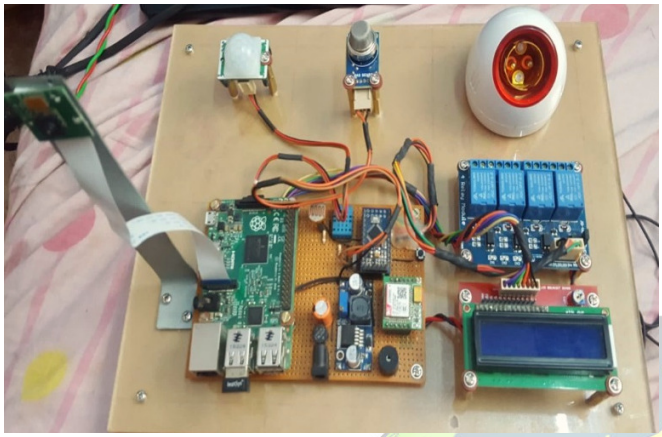

Fig 2. Hardware Connections

III. SOFTWARE DESCRIPTION

Arduino consists of a physical programmable circuit board, a Microcontroller and a software known as IDE (Integrated Development Environment). Arduino IDE is a software which is used to compile and upload the code to the Arduino board using USB to UART converter. The version of Arduino IDE used is 1.8.5.

Geany is a compiler which is pre-installed in the Raspbian OS. Geany is a lightweight IDE which runs well in the Raspberry Pi and supports python programming.

IP Scan-32 is used to scan IP addresses and other information of the devices on our network. This software is used to obtain the IP address associated with the raspberry pi.

Virtual Network Computing(VNC) Viewer is a remote-control software that makes possible to control another computer over internet connection. Remote login of raspberry pi by utilizing the IP address obtained from IP Scan.

Google Assistant is a virtual personal assistant available in the mobile which engages in atwo-way conversation. The voice commands are processed with the help of google assistant.

IFTTT is a web service used to establish a link between google assistant and the server. The voice commands are mapped to a particular response and these are reflected in the server which in turn changes the state of the relay.

The relay status and the sensor values are viewed on a webpage. A private cloud is used to store the data. Each user is given a unique id to ensure security. Fig 3, shows the layout of the webpage.

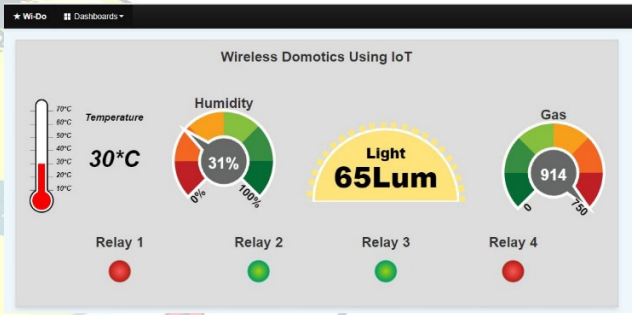

Fig 3 Webpage Layout

IV. CONCLUSION AND FUTURE SCOPE

The proposed project promotes the usage of latest technologies in our day to day activities. Remote monitoring and controlling of the household are achieved with the help of internet. This system also comes in handy for the elderly and physically challenged as they are solely dependent on someone else to even switch on the TV. Now, with the help of their smartphone, they would be able to achieve this without the need of another person's assistance. Alerts are received when there is a situation to be looked upon and this acts as a safety measure.Home automation improves the

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efficient usage of the household appliances thereby conserving energy.

The growth of Artificial Intelligence (AI) could further increase the security of home automation and improve the ease of usage. Smart Locks and robotic appliances could be implemented. Videos could be used to monitor the house using live streaming. Simultaneous controlling through SMS and internet application could be implemented using digital logic.

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