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IOT BASED INTELLIGENT DOMOTIC SYSTEM USING ARDUINO ESP32

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Abstract - This paper presents a low cost and flexible home control and environment monitoring system. It employs an embedded micro-web server in ESP32 for accessing and controlling devices and appliances remotely. To demonstrate the flexibility and effectiveness of this system, devices such as switches, power plug temperature sensor, gas sensor, motion sensor etc., have been integrated with proposed home control system. Therefore this system has been successfully designed and implemented in real time.

1. INTRODUCTION

Since last 4-5 decades, the concept of automation has been there. People's expectations regarding automation and security have changed to large extent during the course of time due to the advancement of technology and services. Different automation systems over the time trial to provide efficient, convenient and safe way for inhabitants to access their work place.

Task of modern security system include identifying any intruders trying to gain access to home, alerting about the intrusion attempt, change in the concept of security in modern home has an impact on the advancement of technology. Today users can access and control their home remotely from anywhere at any time in the world by connecting modern home to internet by using mobile applications and monitor parameters of household appliances and environment by reading sensors data in their smart phones.

Automation is very popular and also there is reduction in power consumption cost and size of new electronic devices due to an increase in processing power of newly designed processors and considerably enables people to know and control every aspect of their home can be aware of differential factors inside and outside their work place (home) like temperature, humidity, light intensity etc. In a wireless sensor actuator network, sensors gather information about environment around them or the physical world. Actuators perform appropriate actions on the environment as directed by the user.

2. LITERATURE SURVEY

H. Singh, IOT based smart home automation using sensor node.
Conclusion: The Arduino is connected to the Bluetooth module, all the appliances can be controlled using the Arduino but it needs to be within a small distance for it to connect to the Bluetooth.
Disadvantage: Since Bluetooth module is used, the range at which the home appliances can be controlled is reduced.

P.J.Rani, Voice Controlled home automation system.
Conclusion: The devices connected to the Arduino board can be controlled by voice commands, eliminating the need to control using the application interface.
Disadvantage: Since a user defined NLP algorithm is used, there can be times when the assistant is not able to recognize your commands properly.

N. Vikram, A low cost Automation System.
Conclusion: The system can be controlled directly from the Wi-Fi module which eliminates the need of using Arduino board, the command can directly be provided by the user to the module to control the appliances accordingly.
Disadvantage: Since the equipment that is used is low cost, there can be numerous occasions when you are encountered with errors or technical difficulties.

3. EXISTING SYSTEM

Most of the Smart home appliances that exist nowadays only have the provision of turning the machines ON and OFF. There are many systems available that aim to automate using NFC, Blue-tooth and Wi-Fi. The existing system consists of a procedure to interact with the appliances, which usually includes pressing a button at some location within the application on your smart device. While some also have the provision to do so with the help of specific command. Many existing systems still uses Bluetooth module instead of the Wi-Fi module so the area of operation is greatly reduced. Many smart home appliances are available nowadays, which includes Amazon Echo, Google Home and Apple Home Kit, this is in order to bring home automation to every household appliance.

4. PROBLEM STATEMENT

A Common property of successful inventions is the abilities to make life easier. There is a great energy crisis in our country. Moreover, we often forget to switch-offour home appliances due to hectic schedule which results high energy bills. Home automation is all about the management of your home and daily life. You can remotely control lights and other home appliances by turning off them when not in use. It can axe your energy bills.

Nowadays, security is a major concern of all, tragedies happen such as thefts especially at late night when the users are not at home, thieves are becoming smart and using modern technology to break in, people have largely opted for integrated smart sensors gives alert on your phone in case any person enters the home.

5. BLOCK DIAGRAM

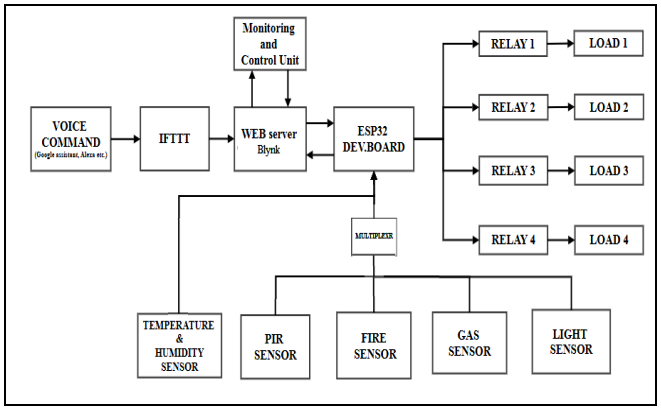

Fig.01

6. METHODOLOGY

Design methodology of the system has two major parts software design and hardware design. Hardware is designed by arranging micro-controller, sensors relays, where as software design includes programming that is written and uploaded in microcontroller. Appliances are controlled using relays via internet and also by manual switching operation. The user is given option to send a voice command or click of the buttons present on the app interface.

The command given by the user will be processed by IFTTT and accordingly actions will be performed on BLYNK server side. The application acts as a central means through which user can communicate with the appliances. The application sends signals to ESP-32 kit which in turn sends appropriate command to relay which in turn controls the appliances Thus, automating of the appliances reduces the power consumption.

There are various sensors interfaced in the ESP-32 kit. The sensors provide readings to ESP-32 kit from the surrounding. The sensors connected to ESP-32 device are temperature/humidity sensor for monitoring the room temperature. PIR sensor is commonly used for motion detection and automatic lightning applications. It turns on light for particular time on detecting the motion and automatically turns off after a particular determined period. Gas sensor detects the presence of gases in an area, often used as a part of safety system. Fire sensor detects one or more products or phenomena resulting from fire such as smoke, heat etc., thus input from the sensors are given to ESP-32 device which notifies the user. Three LED's are provided on the ESP-32 board indicates whether the appliances are controlled manually by switching operation or by Wi-Fi connectivity if one led is light's up, it indicates that the appliances are controlled by switching operation and if 3 LED's light up, it indicates controlling of appliances by using internet (Wi-Fi).Even if the appliances are operated manually, the user will get notification about each manual operation.

7. PROCESS DIAGRAM

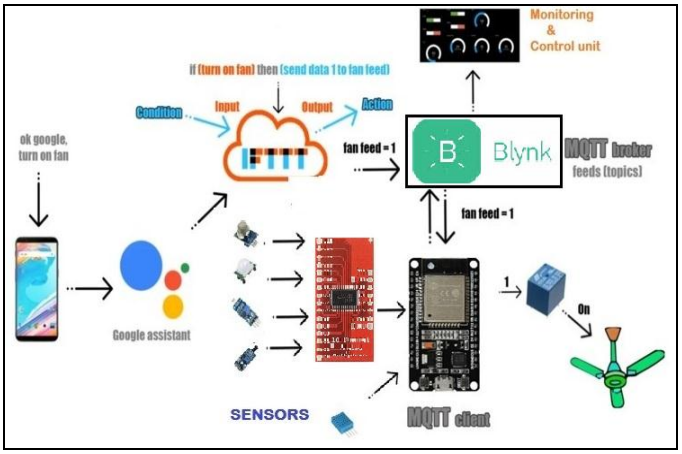

Fig.02

8. HARDWARE REQUIREMENTS

- ESP-32 development board
- Multiplexer
- DHT11 Temperature and Humidity sensor
- MQ35 sensor
- Flame Sensor
- Light Sensor
- PIR motion sensor
- Hi-Link 5 volts Power Supply
- 5 volts Non-latching Relay
- BC547 transistor
- 1N4007 diodes
- Couple of resistors – 10kohms & 330 ohms
- Buzzer
- LED's and Push button

ESP32-DevKitC: Esp32 is dual core, this means it has 2 processors. It has Wi-Fi and blue-tooth built in. It runs 32 bits programs, it has 30 pins. Clock frequency can go up to 240Mhz and it has a 512kb Ram. It also has wide variety of peripherals available like capacitive touch, ADC's, DAC's, UART, SPI, 12c and much more. It comes with built in Hall effect sensor and built in temperature sensor. It is an open source micro controller which can be programmed using Arduino IDE to perform various functions. The board is equipped with various digital and Analog Input and Output pins. It is an open source IOT platform that has the ability to connect to the Wi-Fi and also act as a micro controller to send and receive signal through which the user is able to send command needed to be performed by the Relay.

Multiplexer: It is also known as data selector. It is a device that selects between several analog or digital signals and forwards it to a single output line.

Temperature and humidity sensor (DHT11): It measure temperature and humidity. It detects water vapour by measuring the electrical resistance between two electrodes. The humidity sensing components is a moisture holding substrate with electrodes applied to the surface. When vapour is absorbed by the substrate ions are released by the substrate, which increases the conductivity between the electrodes. The change in resistance between the two electrodes is proportional to the relative humidity. DHT11 measures temperature with a thermistor built into the unit.

Gas sensor: It is a device which detects the presence or concentration of gases in the atmosphere. Based on the concentration of gas the sensor produces a corresponding potential difference by changing the resistance of the material inside the sensor, which can be measured as output voltage. Based on this voltage value the type and concentration of the gas can be estimated and do needful operation like triggering a buzzer.

Fire sensor: Flame sensor detects the presence of fire based on infrared wavelength emitted by the flame and triggers the buzzer.

Light sensor: The light sensors are used for gauging and responding to the light level. They belong to a gaggle know as photo resistors. Photo resistor is made of high resistance semiconductor. In the dark, a photo resistor can have a resistance as high as several ohms while in the light, it can have a resistance as high as few hundred ohms. Light sensor is integrated with motion sensor it is working on movement of person in around the sensor area.

PIR motion sensor: Passive infrared sensor is an electronic sensor that measure infrared light radiating from the objects in its field of view. It detects changes in the amount of infrared radiation impinging upon it. This varies depending on the temperature and surface characteristics of the objects in front of the sensor. Sensors convert the resulting change in the incoming infrared radiation into a change in the output voltage and this triggers the detection and perform certain actions.

Hi link 5V power supply: It converts the AC to DC. It can supply 5V DC from 120 AC – 230AC and has a power rating of 3 watts.

4-CH Relay: Relays are simply switches that are close and terminate electrical connections mechanically. That means it can control an electrical devices in a circuit by closing and breaking connections in that circuit. It is an electrically operated switch which can be used to control the appliances according to the command received by the user.

9. SOFTWARE REQUIREMWNTS

- Arduino IDE
- IFTTT
- Blynk App

10. RESULT

The proposed system of using Voice commands to control household appliances was successfully developed. The application is connected to the same IP as the ESP32-DevKit so that it can be controlled using any device that is connected to a network. No unwanted traffic can enter as the application is protected with the password on your phone and your Wi-Fi. The developed system helps us in achieving our goal of home automation since it was successful in controlling the appliances using either the application on your smart device or through voice commands. The appliances were also be able to be controlled automatically trough the different type of input provided by the sensors.

11. CONCLUSION

This work can further be upgraded by using different sensors and different home appliances. Since smart phones are widely used nowadays, this user-friendly system can be used for benefiting the mass. The cost of the system is also in reach. Many advantages can be added like automatic turn off and sending emergency notification can be extended to devices like motors, geyser and air conditioners. Mobile application development companies with dedicated teams are working extensively on IOT based applications that are connected to the cloud. Not only old aged or physically challenged people can be benefitted using this, but any person with a smart phone can monitor and control the electronic devices without much difficulty. As awareness grows, the adoption rate is likely to increase for IOT based mobility solutions that will automate business operations and end to end process

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