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Remotely Controlled Smart Home System Using Voice and IoT

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Abstract

The Internet of Things (IoT) is formulated to remotely connect, access, monitor, and control the existent world entities through the Internet. When the IoT is conceptualized for the home, it converts a simple home to a smart home which is safer and automated. In this paper, a Voice/Text controlled Home Application is developed where the users can remotely access the home appliances. The users can merely provide voice commands or text messages through which they will be able to turn the appliances ON or OFF depending upon the necessity. The users can schedule the status of the appliances when they are not physically present in the environment. They will also be provided with information regarding the previous schedules, and they can also turn on the appliances for a specific period of time. The Node-RED Technology is used for the functions of the application which is embedded with an IoT device (NodeMCU). This developed application is deployed in the Dialog Flow Account. The NodeMCU is connected to regular home appliances. As per the parameters fetched from the cloud the NodeMCU operates the Home Appliances. The implementation cost of this application is very cheaper since high-performance and least-cost equipment are used. This application is greatly consistent and proficient for elderly people and differently-abled people who cannot reach the switch, for switching ON/OFF the device.

Keywords: smart system; smart home; voice user interface; speech command recognition; natural language processing; natural language understanding; under-resourced languages.

INTRODUCTION

Smart home automation is a home it gives its residents the consolation, amenity, and ease of operation of the system at, randomly of where the operation actually is in the home. A smart house usually has electrical instruments such as air conditioners, lighting, fans, room heaters, aircoolers and microwave ovens, T.V., etc.; and electronic gadgets such as personal computers, music systems, laptops, audio systems, mobile phones, etc. These all gadgets and appliances can be controlled and connected as remotely, using a secure channel net with a software application, from anywhere in the house. A smart house having of three things: (i) a home network internally, (ii) intelligent controlling, and (iii) Automation with wireless or wired. These frameworks methods and gadgets inside a home can likewise be overseen either from inside home, or can be connected to administrations and frameworks from outside the home. These apparatuses and devices are for the most part associated with specific sensors, in order to make these naturally adjusted to specific circumstances and thus influence the tenants to feel good. A versatile savvy home would be one that uses machine learning strategies to find designs in the occupants' day-by-day exercises and create robotization decisions and activities that copy these activities. The figure below shows us the basic concept of the smart home. From here its known as automated homes, intelligent buildings, and integrated home systems are a recent design development. Smart homes incorporate common devices that control features of the home. Originally, smart home technology was used to control environmental systems such as lighting and heating, but recently the use of

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smart technology has developed so that almost any electrical component within the house can be included in the system . Moreover, smart home technology does not simply turn devices on and off; it can monitor the internal environment and the activities that are being undertaken whilst the house is occupied.

Internet of Things (IoT) is formulated to remotely connect, access, monitor and control the existent world entities through the Internet. When the IoT is conceptualized towards home, it converts simple home to smart home which is safer and automated. In this paper a Voice/Text controlled Home Application is developed where the users can remotely access the home appliances. The users can merely provide voice commands or text messages through which they will be able to turn the appliances ON or OFF depending upon the necessity. The users can schedule the status of the appliances when they are not physically present in the environment. They will also be provided with the information regarding the previous schedules, and they can also turn on the appliances for specific period of time. The Node-RED Technology is used for the functions of the application which is embedded with IoT device (NodeMCU). This developed application is deployed in the Dialog Flow Account. The NodeMCU is connected with regular home appliances. As per the parameters fetched from the cloud the NodeMCU operates the Home Appliances. The implementation cost of this application is very cheaper since high performance and least cost equipment's are used. This application is greatly consistent and proficient for the elderly people and differently abled person who cannot reach the switch, for switching ON/OFF the device.

LITERATURE SURVEY

The recent research topics on smart systems architectures can be categorized in two main areas:

(1) Multi layer frameworks and business processes for decentralized and real-time data processing and

(2) practical implementations of customer electronics systems. Sun et al have formulated the computation offloading and resource allocation in general IoTFC architecture as an energy and time cost minimization problem. Then, they proposed a new algorithm to solve this problem, improving the energy consumption and completion time of application requests. In order to cope with big data and heterogeneity challenges in an IoTFC ecosystem, Chegini et al. designed automatic components for fog resiliency. The advantage of the proposed approach is that it makes the processing of IoT tasks independent of the cloud layer. Kallel et al. modelled and implemented two IoT-aware business processes. The first one monitor's behavior of children with disabilities to guarantee their safety and facilitate their parents' intervention. The second model facilitates and accelerates the detection of persons infected with coronavirus as well as monitors their movements to reduce disease spread. Bhatia et al have employed a Multi-scaled Long Short Term Memory (M-LSTM)-based vulnerability prediction for preventive veterinary healthcare services. Moreover, a fog-assisted real-time alert generation module has been presented in the authors' framework to notify the concerned veterinary doctor in the case of a medical emergency. The overview of existing approaches for the development of multi-layered architectures for smart systems shows that the

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intelligent and coordinated management of the three-layer IoTFC model has been the subject of many studies. In such an ecosystem, if a task requires a large amount of computing resources or data storage space, the processing should be performed in the cloud layer. In the case of a task needing low latency, the sensors and devices should send the data to servers or computing devices in the fog layer.[12]

PROPOSED SYSTEM

In this proposed application uses image processing for security by using ESP32 cam with Arduino micro controller. ESP32 cam allow face ids to be added for the user for the authentication and access control for the door lock and security. Security being the main intent of the project, the most important application of this system is any domestic security. By using this project, a person will be intimidated about any incident likely to be caused by fire, theft, or LPG gas – REMOTELY. The main advantage of this system is that it is fully automated. Once installed, it does not require any kind of human interaction. Also, it is very costeffective.

BLOCK DIAGRAM

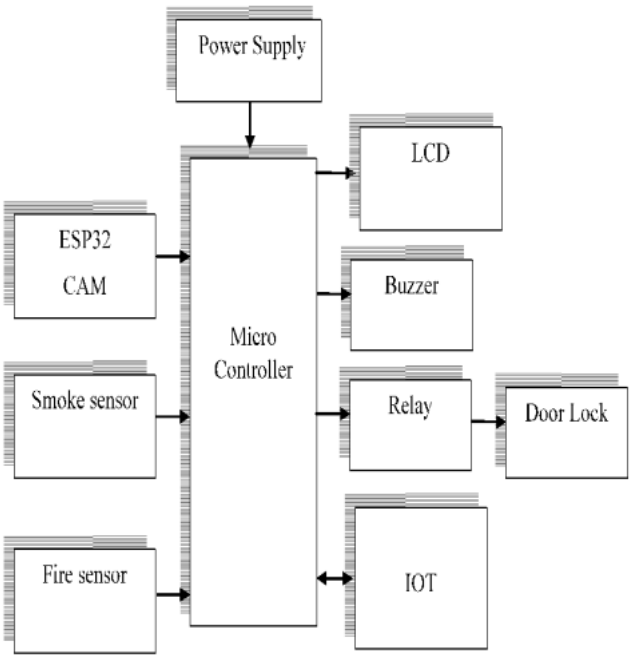

Figure 1: -block diagram of remotely controlled home automation using voice and IOT

HARDWARE COMPONENTS

POWER SUPPLY

The power supply section is the section which provides +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 the 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

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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.

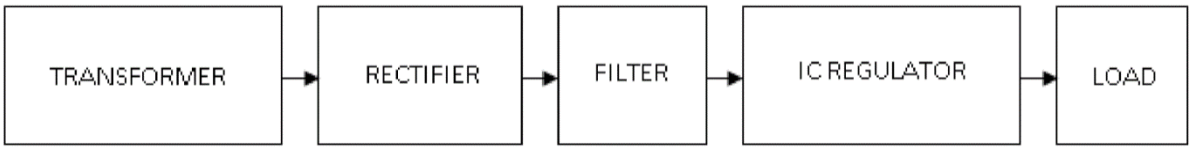

Figure 3.3.1: Block Diagram of Power Supply

ESP32 MODULE

The ESP32 module is a low-cost, low-power system-on-chip (SoC) microcontroller with integrated Wi-Fi and Bluetooth capabilities. It is manufactured by Espressif Systems, and is designed for use in a variety of applications, including Internet of Things (IoT) devices, wearable electronics, and other embedded systems. The ESP32 module features dual-core processors running at up to 240 MHz, as well as a variety of built-in peripherals, including touch sensors, analog-to-digital converters, and pulse width modulation (PWM) controllers. It also includes support for a wide range of communication protocols, including Wi-Fi, Bluetooth, and Ethernet. The ESP32 module is available in a variety of form factors, including modules that can be directly soldered onto printed circuit boards (PCBs), as well as modules that can be used with development boards such as the ESP32 DevKitC. The module can be programmed using a variety of programming languages, including C++, Python, and Lua, and development tools such as the Arduino IDE and ESPIDF (Espressif IoT Development Framework) are available for working with the module. Overall, the ESP32 module offers a powerful and versatile platform for building a wide range of IoT and embedded systems projects.

ARDUINO UNO

Figure 3.10.1: Arduino Uno The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduno, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

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IR Sensor

An IR (Infrared) sensor is a type of electronic device that is used to detect the presence of infrared radiation. Infrared radiation is a form of electromagnetic radiation that is invisible to the human eye, but can be detected by electronic sensors.

IR sensors typically consist of an IR source, such as an LED, and an IR detector, such as a photodiode or phototransistor. The IR source emits a beam of infrared radiation, which is reflected off of objects in its path. The reflected radiation is then detected by the IR detector, which generates an electrical signal that is proportional to the intensity of the reflected radiation.

IR sensors are commonly used in a variety of applications, including motion detection, temperature measurement, and proximity sensing. For example, they can be used in security systems to detect the presence of intruders, in temperature measurement systems to monitor the temperature of a room, and in robotics to detect obstacles in the path of a robot.

IR sensors, as previously mentioned, are devices that can detect infrared radiation. Infrared radiation is a type of electromagnetic radiation that has a wavelength longer than that of visible light, but shorter than that of microwaves. This type of radiation is produced by all objects with a temperature above absolute zero, including humans, animals, and even inanimate objects like walls and floors.

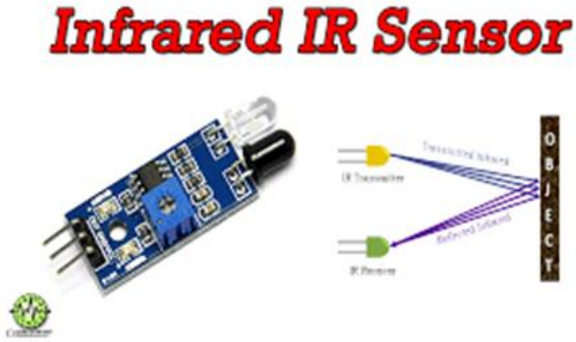

Figure 2: IR sensor

LIQUID CRYSTAL DISPLAY

Introduction

The most commonly used Character based LCDs are based on Hitachi's HD44780 controller or other which are compatible with HD44580. In this tutorial, we will discuss about character based LCDs, their interfacing with various microcontrollers, various interfaces (8-bit/4-bit), programming, special stuff and tricks you can do with these simple looking LCDs which can give a new look to your application.

Pin Description

The most commonly used LCDs found in the market today are 1 Line, 2 Line or 4 Line LCDs which have only 1 controller and support at most of 80 charachers, whereas LCDs supporting more than 80 characters make use of 2 HD44780 controllers.
Most LCDs with 1 controller has 14 Pins and LCDs with 2 controller has 16 Pins (two pins

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are extra in both for back-light LED connections). Pin description is shown in the table below.

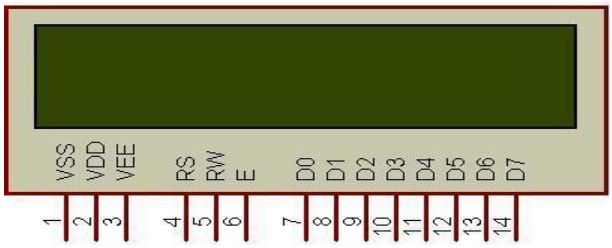

Figure 3:-Character LCD type HD44780 Pin diagram

RELAY

A relay is an electromechanical switch, which perform ON and OFF operations without any human interaction. General representation of double contact relay is shown in fig. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal.

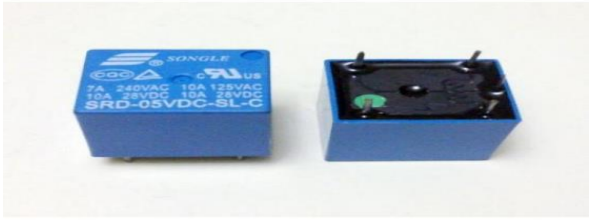

Fig.4:-Relay

SMOKE SENSOR

An ICSD smoke detector is composed of a housing made of polyvinylchloride or poly-styrene plastic, a small electronic alarm horn, a printed circuit board with an assortment of electronic components, and a sensing chamber and reference chamber, each containing a pair of electrodes and the radioactive source material.

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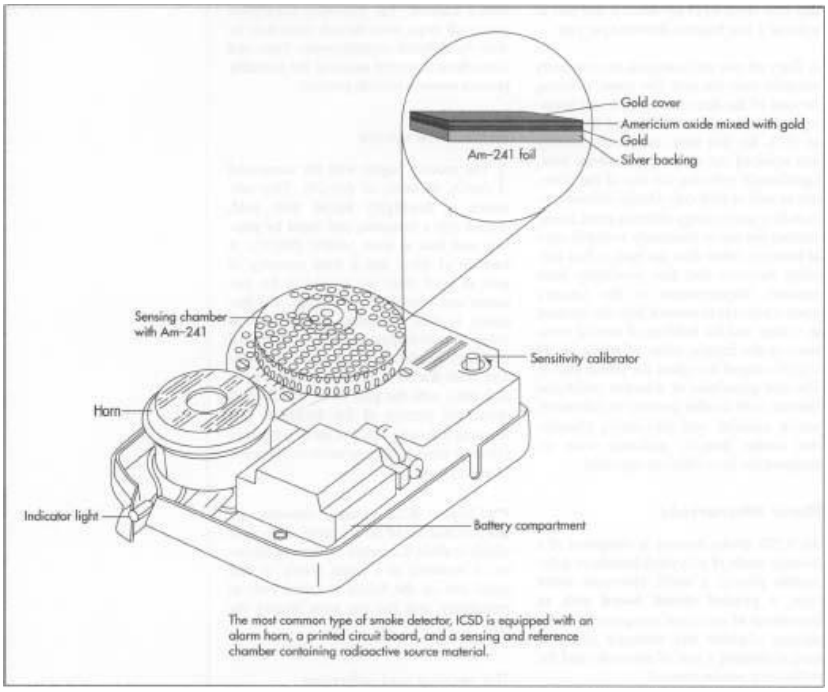

Fig. 5: SMOKE SENSOR

Fire sensor

An automatic fire alarm system is designed to detect the unwanted presence of fire bymonitoring environmental changes associated with combustion. In general, a fire alarm system isclassified as either automatically actuated, manually actuated, or both. Automatic fire alarmsystems are intended to notify the building occupants to evacuate in the event of a fire or other emergency, report the event to an off-premises location in order to summon emergency services,and to prepare the structure and associated systems to control the spread of fire and smoke.

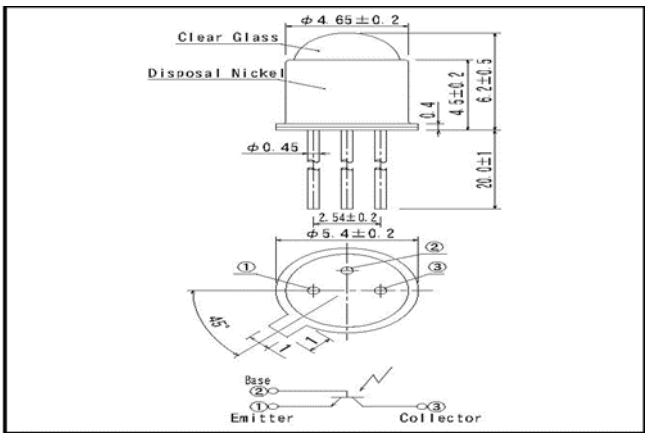

Fig:6:- FIRE SENSOR

Think speak and IOT

Thing Speak is an open-source software written in Ruby which allows users to communicate with internet enabled devices. It facilitates data access, retrieval and logging of data by providing an API to both the devices and social network websites. Thing Speak was originally launched by ioBridge in 2010 as a service in support of IoT applications.

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Thing Speak has integrated support from the numerical computing software from MathWorks, allowing Thing Speak users to analyse and visualize uploaded data using MATLAB without requiring the purchase of a MATLAB license from MathWorks.

What is IoT?

Internet of Things (IoT) describes an emerging trend where a large number of embedded devices (things) are connected to the Internet. These connected devices communicate with people and other things and often provide sensor data to cloud storage and cloud computing resources where the data is processed and analysed to gain important insights. Cheap cloud computing power and increased device connectivity is enabling this trend.

IoT solutions are built for many vertical applications such as environmental monitoring and control, health monitoring, vehicle fleet monitoring, industrial monitoring and control, and home automation.

At a high level, many IoT systems can be described using the diagram below:

On the left, we have the smart devices (the “things” in IoT) that live at the edge of the network. These devices collect data and include things like wearable devices, wireless temperatures sensors, heart rate monitors, and hydraulic pressure sensors, and machines on the factory floor.

In the middle, we have the cloud where data from many sources is aggregated and analyzed in real time, often by an IoT analytics platform designed for this purpose.

The right side of the diagram depicts the algorithm development associated with the IoT application. Here an engineer or data scientist tries to gain insight into the collected data by performing historical analysis on the data. In this case, the data is pulled from the IoT platform into a desktop software environment to enable the engineer or scientist to prototype algorithms that may eventually execute in the cloud or on the smart device itself.

An IoT system includes all these elements. ThingSpeak fits in the cloud part of the diagram and provides a platform to quickly collect and analyze data from internet connected sensors.

RESULT

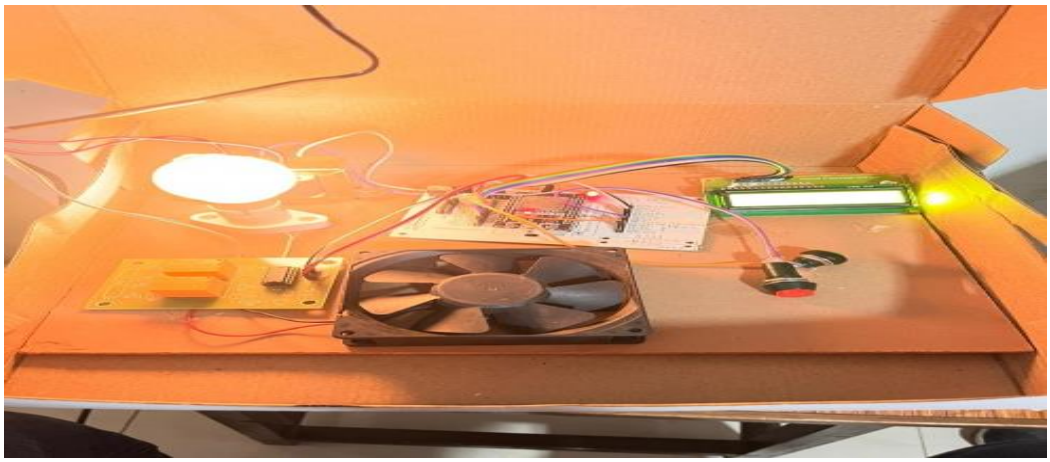

Fig. 7: Picture of implemented system

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CONCLUSION

The project **"IOT BASED HOME SECURITY SYSTEM USING ARDUINO"** has been successfully designed and tested. It has been developed by integrating features of all the hardware components used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly using highly advanced IC's and with the help of growing technology the project has been successfully implemented. Controlling the home utilities via voice is just an amazing step forward towards the development in IoT sector, as this involves totally a wireless medium to create the connection.

FUTURE SCOPE

- Scope in home automation.
- Scope in industrial automation.
- Scope in smart cities.
- Scope in smart buildings.

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