Home Automation using Arduino

M.Vedaraj   **P.Purna Manikanta Sai**   **Y.Venkata Revanth**   **P.Guru Siva**
                            Sankar Reddy

Associate Professor   Trainee ,   Trainee ,   Final Year Student,
Department of Computer   Wipro Limited   HCL Technologies   RMD
                         Engineering College
                      Science and Engineering

Abstract:
The emergence of the concept of the Internet of Things has provided a great vision for the technological future, with the intention of allowing the extraction and understanding of information from our surrounding environment, utilising the interaction and cooperation of various technological devices. Smart Homes, for example, aims to integrate these devices into homes, allowing the automation of tasks previously performed by humans, in order to simplify their daily lives and create a more comfortable environment. However, many of these devices fail to deliver on their promises because they were not designed with frequent changes in user habits and tastes in mind, necessitating device reprogramming to follow the new behaviours.In light of this issue, this article describes the end-to-end design and implementation of a voice-activated smart home controller for smart devices in a real-world setting. The results of the various evaluation tests validate the functionality and usefulness of the developed system. The main contributions of this work are: I) the design of an architecture for a smart home controller; and II) the end-to-end implementation of a smart home controller and the associated guidelines.

KEYWORDS: Wireless, Smart Home, Internet of Things.

I. INTRODUCTION

Automation plays a key role in human life. Home automation can be used to control home appliances such as light, door, fan, etc. It also helps us to provide home security and emergency system to be activated. Home automation is not only about reducing human effort but also about energy efficiency and time savings. The main objective of home automation and security is to help disabled and elderly people by allowing them to control household appliances and alert them in critical situations.

II. Overview of the System

Home automation is growing rapidly with it's usage and adaptability. Some of these home automation systems are aimed at those looking for luxurious and sophisticated home automation platforms; others target people with special needs, such as the elderly and disabled. The typical wireless home automation system allows home appliances to be controlled from a centralized control unit that is wireless. These devices usually have to be specially designed to be compatible with each other and with the control unit of most home automation systems available on the market [1].

The advanced systems are integrated as a single movable unit and allows wireless control of lights, suckers, air conditioners, boxes, security cameras, electronic doors, computer systems, audio visual outfit,etc. and turn on or turn off any appliance that's plugged into a wall outlet, get the status of different detectors and make the corresponding decision. The system is movable and erected to be easy to install, configure, run, and maintain.The perfect user interface does not yet exist today and building a good interface requires knowledge from the fields of sociology and technology [2].

Voice will be the foremost interface between people and machines in the close to future, in accordance to main corporations energetic in speech consciousness research. The issue arises in the case of aged or disabled people who are unable to walk alone and may require outside assistance.

As a result, it is essential that it be less expensive and easy to set up; if this is provided, humans will be keen to purchase it for their homes, workplaces, and schools. To put it another way, a system change for home automation is required to reduce the cost of implementing it in homes [4] .

As earlier stated, domestic automation affords peace of thought and physique to disabled and/or aged human beings through permitting them to do what they prefer with a single click.Figure 1 depicts a general description of the system (i).
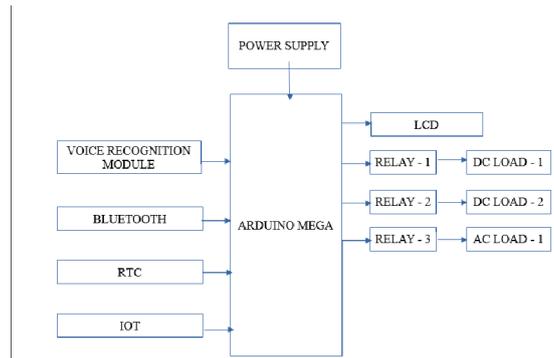
Fig (i) SYSTEM OVERVIEW

In this suggested system, the microcontroller serves as the system's brain. This is used to control any hardware activities that are interfaced with the controller. The speech recognition module serves as the control input for the appliances. Appliances are linked to a relay, which is controlled by the controller based on the user'scommand. Bluetoothisused to operate appliances through mobile voice command. The RTC is used to regulate the appliances in accordance with the time. The IOT monitors all processes that are presented on the LCD. Several appliances can be linked in this manner and controlled by instructions. IOT monitors and manages the commands and switching of the appliances.

II.   Existing System

- Home appliances can be controlled physically by switches only.
- Appliances cannot be controlled by voice commands by the user.

The current system is solely based on the GSM Module. Many devices can now communicate with one another thanks to recent technological advances such as Bluetooth and Wi-Fi.The use of a WIFI protect as a Micro for Arduino net server eliminates the want for bodily connections between the Arduino board and the computer, decreasing expenses and permitting it to feature as a stand-alone device.To function as a gateway for the Arduino to communicate with the Internet, the Wi-Fi Shield requires an Internet connection from a wireless router or wireless access point [5] .

III.   PROPOSED SYSTEM

Remote control systems in home appliances are inconvenient for the elderly and disabled. This is because they may be uneducated and do not grasp the language labelled on the remote control. Furthermore, if someone has a vision impairment, they will be unable to see the little label that is attached to the remote control. Thus, employing a voice controlling system will be the greatest solution for those folks, allowing them to operate their household appliances more effortlessly. The wireless voice controlling system is being utilised due to the physical device's ability to be placed at varied heights or positions.

1. Home appliances may be controlled by the user's voice requests.

2. Because the devices are linked by IOT, their operation may be monitored and managed.

• The user's voice command may be used to turn appliances on and off.

• Regular IoT monitoring of the equipment.

• A mobile voice module for easy appliance control.

IV.   WORKING MODULE

- CONTROL OF APPLIANCES
- TIME BASED CONTROL
- UPDATE IN IOT

CONTROL OF APPLIANCES.

Voice recognition module commands can be used to operate appliances. The LCD displays all of the processes.
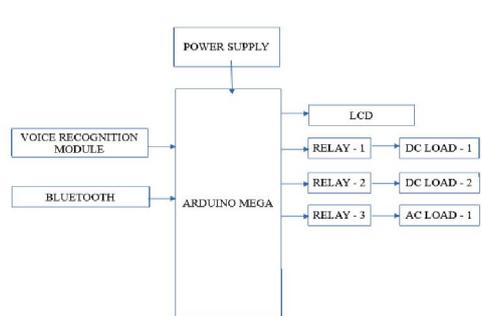
TIME BASED CONTROL
The RTC is used to calculate time depending on the time in the real event when the appliances will automatically turn on/off.

UPDATE IN IOT
The switching of appliances is monitored and managed via IOT.

V. ARDUINO MEGA

The MEGA 2560 is meant for larger, extra state-of-the-art tasks. It is the recommended board for 3D printers and robotics functions due to the fact that it has fifty four digital I/O pins, sixteen analogue inputs, and greater room for your sketch. This gives your initiatives a lot of respiration room and options.

Fig.(ii) Arduino MEGA

The ATmega2560- grounded Arduino Mega 2560 is a microcontroller board. It points fifty four digital I/ O legs (of which 15 are PWM labors), sixteen analogue inputs, four UARTs (handle periodical anchorages), a sixteen MHz demitasse oscillator, a USB connection, a electricity connector, an ICSP title, and a reset button. It comes with the whole lot you want to assist the microcontroller; virtually join it to a laptop via USB or strength it the use of an AC-to-DC motor or battery to get started. Utmost securities created for the Uno and former boards duemilanove or diecimila are well matched with the Mega 2560 board.

| Microcontroller	ATmega2560
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	54 (of which 15 provide PWM output)
Analog Input Pins	16
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	256 KB of which 8 KB used by boot loader
SRAM	8 KB
EEPROM	4 KB
Clock Speed	16 MHz
LED_BUILTIN	13
Length	101.52 mm
Width	53.3 mm
Weight	37 g

VI. RELAY

The 5V Relay Module is ideal for Arduino applications. There are three pins on it: VCC, GND, and Signal. If the provide voltages of the circuit and the load circuit differ, it can feature as a switch.It is typically used when the load circuit has alternating current. It is a switch that connects isolated circuit connections using a circuit signal. It contains a red LED that illuminates whenever the coil is activated when the signal pin receives a high input.

VII. LIQUID CRYSTAL DISPLAY

LCDs are digital show modules that have a large range of uses. A 16x2 LCD show is a pretty easy module that is significantly utilised in a range of bias and circuits. These modules are encouraged overmulti-segment LEDs with seven parts. The motives for this are as follows LCDs are affordable, without difficulty programmable, and have no restrictions for displaying special and certainly bespoke characters (unlike in seven parts), robustness, and so on.
A 16x2 LCD can show sixteen characters per line and has two comparable lines. Each personality is introduced in a 5x7 pixel matrix on this LCD.This LCD consists of data and two register commands.

The command register holds the LCD's command instructions. A command is an order issued to an LCD to do a particular motion comparable as initialising it, clearing its screen, putting the cursor position, managing the display, and so on. The statistics register saves the statistics that will be introduced on the LCD. The ASCII price of the persona to be proven on the LCD is represented by way of the data. Learn in addition about the interior development of an LCD via clicking then.

Pin No.	Name	Description
Pin no. 1	D7	Data bus line 7 (MSB)
Pin no. 2	D6	Data bus line 6
Pin no. 3	D5	Data bus line 5
Pin no. 4	D4	Data bus line 4
Pin no. 5	D3	Data bus line 3
Pin no. 6	D2	Data bus line 2
Pin no. 7	D1	Data bus line 1
Pin no. 8	D0	Data bus line 0 (LSB)
Pin no. 9	EN1	Enable signal for row 0 and 1 (1st controller)
Pin no. 10	R/W	0 = Write to LCD module 1 = Read from LCD module
Pin no. 11	RS	0 = Instruction input 1 = Data input
Pin no. 12	VEE	Contrast adjust
Pin no. 13	VSS	Power supply (GND)
Pin no. 14	VCC	Power supply (+5V)
Pin no. 15	EN2	Enable signal for row 2 and 3 (2nd controller)
Pin no. 16	NC	Not Connected
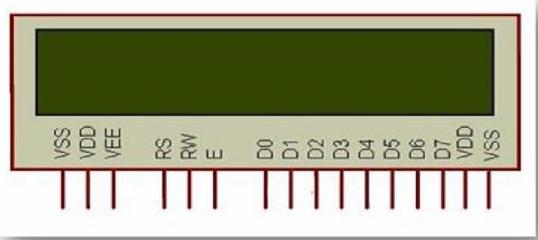
VIII. NODEMCU

The ESP8266 is the name of a Espressif Systems microcontroller. The ESP8266 is a tone- contained Wi-Fi networking system that may additionally act as a floor between being microcontrollers and Wi-Fi, as nicely as execute tone- contained operations.This module has a USB connection and a wide range of leg-outs. You may attach the NodeMCU devkit to your laptop and flash it exactly like an Arduino using a micro USB cord. It's also

incontinently breadboard-compatible.

Ai- thinker Platoon created the ESP-12E Wi-Fi module. Tensilica L106 integrates assiduity- leadingultra-low power 32- bit MCU micro, with the 16- bit short mode, Timepiece speed support 80 MHz, 160 MHz, supports the RTOS, integrated Wifi MAC/ BB/ RF/ PA/ LNA, on-board antenna in lower module sizes.The module supports IEEE802.11 b/ g/ n agreement and a full TCP/ IP protocol mound. Druggies can add networking modules to being bias or design a new network regulator. ESP8266 is a high integration wireless SOC developed for mobile platform makers with little space and power. It offers unexampled inflexibility to incorporate Wi-Fi capabilities into other systems or to serve as a standalone operation at the smallest cost and with the least quantum of space needed.

RTC

The DS1307 periodical real- time timepiece (RTC) is a low- power, entire double- enciphered numeric (BCD) timepiece/ timetable with fifty six bytes of NV SRAM that transfers tackle and facts serially thru an I2C bidirectional ground. The timepiece/ timetable shows seconds, twinkles, hours, days, dates, months, and times. For months with smaller than 31 days, the quit of the month date is mechanically modified, consisting of vault time corrections. The timepiece has a 24-hour or 12-hour structure and an AM/ PM suggestion. The DS1307 consists of a erected-in power- experience circuit that detects strength outages and switches to the backup source. While the thing is powered by using the backup source, the timekeeping operation continues.

IX. BLUETOOTH

Bluetooth is a wi-fi technological know-how trendy for transmitting statistics between constant and cell bias over brief distances with the aid of using short-wavelength UHF radio swells in the artificial, scientific, and scientific radio bands, ranging from2.400 to2.485 GHz, and for setting up unique region networks . It used to be designed to be a wi-fi remedy to RS-232 facts cables at first. Bluetooth is managed by way of the Bluetooth Special Interest Group (SIG), which has over individuals from the telecommunications, computer, networking, and patron electronics diligence. trademarks. The IEEE standardised Bluetooth as IEEE802.15.1, nevertheless the general is no longer maintained. The Bluetooth SIG video display units wellknown development, continues the instrument procedure, and defends

The HC-05 Bluetooth SPP (Periodical Port Protocol) module is designed for obvious wi-fi periodical connection setup. The Bluetooth V2.0 EDR (Enhanced Data Rate) three Mbps Modulation Periodical Port Bluetooth Module comes geared up with a2.4 GHz radio transceiver and baseband. It employs the CSR Bluecore 04-External single chip Bluetooth chipset with CMOS and AFH applied sciences (Adaptive Frequence Hopping Point). It has a footmark of only12.7 mmx27mm.

XI ARDUINO IDE

The Arduino Integrated Development Environment (IDE), sometimes regarded as the Arduino Software (IDE), has a regulation editor, a verbal exchange area, a textbook terminal, a toolbar with buttons for introductory operations, and a collection of menus. It communicates with and uploads programmes to the Aurdino and Genuine address

IX. CONCLUSION

The voice-controlled gadget for domestic home equipment is majorily based on experiences and errors to different researchers' designs. Despite its swiftly growing size, the Arduino mega is efficaciously manufactured and mounted in a bodily device. The manage instructions or guidelines are effectively registered and imported into the Geeetech speech consciousness module, and the Arduino mega acts as a processor that tactics the enter furnished through the Geeetech speech attention module and outputs the bodily machine output.

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