Design And Implementation of An IoT Based Home Automation Framework

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Abstract. These days, automation plays a critical role in meeting both industrial and domestic demands for higher-quality electricity delivery. We can control electrical devices using our voices with the help of a controlling system. Using the proposed system, we can keep the utility up and running to ensure that the needs of the domestic population can be met. Voice messages and the effects of the environment can be used to control the parameters used to monitor the devices. With the sensors installed, the micro-controller will work together. Protecting transformers from overheating from overload, short circuit, over-voltage, and surges is made possible by continuously monitoring electrical parameters like current and voltage against their rated values. When this occurs, the entire system is shut down, including any transfers that detect it, and the electrical switch is immediately stopped. The sensors are capable of transforming messages that can be used to detect current parameters and transmitting signals, information, and receiving commands, as well as transmitting signals. Thus, labour costs can be reduced, and energy consumption can be increased. As a result, the substation's efficiency in terms of monitoring and working will rise significantly.

Keywords: Controlling through voice, Mobile application, Electrical devices like fan, light and air conditioner.

1 Introduction

The Bluetooth device is used to create automation by controlling of electrical devices from their remote location and thus make the measured parameters to calculate whether they are turned ON or OFF. The temperature can be maintained in order they change its parameters automatically by detecting any environmental change. The power quality has been reporting to the mobile application frequently to use the parameters in monitoring and controlling system.

The major cause in the controlling systems are mainly because of power quality which are delivered to the consumer's side. The transportation of power has been lost which makes the decrease in energy efficiency. With a different solution, we can maintain the energy

efficiency to get the measured parameters to the application. Additionally, if a power system's protection, monitoring, and control are insufficient. It's possible that the system will become unstable. As a result, a monitoring system is required that can automatically discover, monitor, and classify existing electrical device restrictions. The project's core premise is to receive messages and process them as needed to execute a variety of actions. Improve energy efficiency with a different solution; familiarity with electrical device measured values is required. Additionally, if a power system's protection, monitoring, and control are insufficient. It's possible that the system will become unstable.

The nature of the measured parameters sent determines the type of operation to be done. The supplied measured parameters are first saved in the Arduino, which then controls the electrical components to make modifications. The mobile application is used to maintain temperature differences as well as turn electrical gadgets on and off. Then, based on the command received in the form of a message, the needed control signal is generated and transferred to the intermediary hardware that we have designed. The messages are transmitted from a collection of mobile applications that contain textual commands that are thenprocessed to complete the desired task. For our project, a micro-controller based system has been proposed.

The main objectives for the monitoring and controlling of electrical devices are:

- To design and develop a wireless communication link

- To monitor and control equipment those are far away from the user

- To develop a high security system to keep a check on them

Mobile phones have become one of the most widely used communication devices among most people throughout the world, and they are popular among mobile phone users as a low-cost and convenient mode of communication. As a result, mobile application technology is a feature that all mobile network service providers have in common. Researchers are attempting to implement application technology in many different sectors that are not currently covered by service providers, because it provides a cheap, convenient, and flexible way of communicating data. A mobile phone may now be used to transmit text messages as well as multimedia communications in addition to voice calls. Among mobile phone users, sending written text messages is very popular. Instant messaging, as it's often known, allows you to send and receive messages quickly. We've taken the concept to create a system that works as a platform for receiving messages, which are actually commands delivered to manage the platform's various appliances and gadgets.
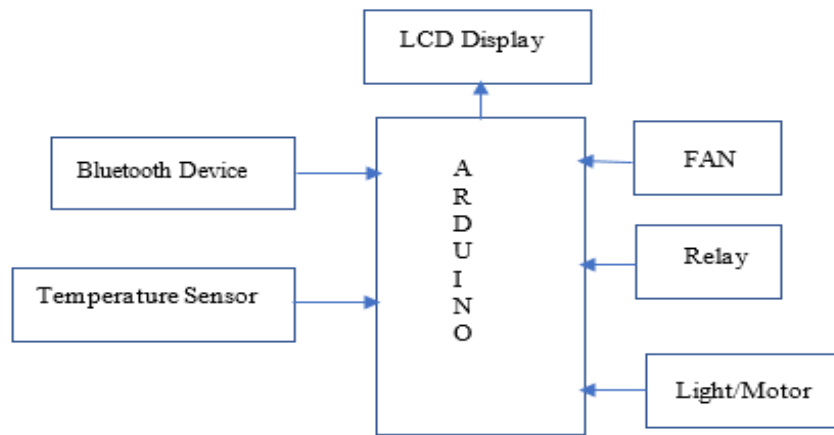
2 Block Diagram

Fig.1. Block diagram

The power supply unit is given to the Arduino which is used to collect the data's from the electrical devices. LCD display is used to measure the temperature and shows whether the electrical device is ON or OFF. The temperature sensor is used to detect the temperature of the environment and sends the messages to the display, which helps to change the speed of the device from one speed to another. The Bluetooth device is connected to the Arduino which makes the mobile application to detect the changes in controlling of devices. The relay is used to connect the electrical devices with the Arduino and make the circuit for monitoring and controlling.

The Bluetooth gadget is used to operate the device via voice commands. The data from the Arduino is sent to a mobile application, which can be used to monitor and control electrical devices from afar, as well as turn them on and off based on temperature and light intensity to increase the circuit's efficiency.

3 Components

The components used in the monitoring and controlling systems are,

- Arduino UNO
- LCD Display
- Relay
- Temperature Sensor
- Fan
- Light/Motor
- Bluetooth Device

3.1 Arduino

Arduino is a firm that develops open- source computer hardware and software. The project is a user community that creates and manufactures single-board microcontrollers and microcontroller kits for use in the creation of digital gadgets and interactive items. These devices have the ability to detect and control items in both the physical and digital worlds. The Arduino serves as the main control unit in the circuit, analyzing data from the current sensor and sending instructions to the Wi-Fi module to switch off which relays.

3.2 LCD Display

Liquid Crystal Display (LCD) is the abbreviation for liquid crystal display. It is a liquid crystal display unit that produces a visible image. When current is passed through this unique type of crystal, it becomes opaque, blocking the backlight from behind the screen. As a result, that area will appear dark in comparison to others. That's how the characters appear on the screen.

3.3 Bluetooth Device

The HC-05 is an interesting module that may be used to bring two-way wireless capabilities to your projects. You can use this module to communicate between two micro-controllers, such as an Arduino, or with any Bluetooth-enabled device, such as a phone or laptop. To turn on lights or activate an alarm system in a structure. It is also capable of detecting heat radiation.

3.4 Relay

Relays are switches that open and close circuits, either electromechanically or electronically. To manage one electrical circuit, relays open and close connections in another circuit. As seen in relay schematics, when a relay contact is generally open, there is an open contact when the relay is not triggered. A low-level triggered control signal operates the relay. When the relay is triggered, the normally open or normally closed contacts are activated. It's typically encountered in circuits that regulate machines. Simply put, it's an automated switch that operates a high-current circuit with a low-current signal.

3.5 Temperature Sensor

The temperature sensor is used to determine how hot and humid a room is. In comparison to linear temperature sensors calibrated in Kelvin, the LM35 has the benefit of not requiring the user to subtract a large constant voltage from the output to obtain convenient Centigrade scaling.

3.6 Fan

Electronic equipment fans are small, enclosed fans with standard dimensions and supply voltages (AC or DC) to make them easier to integrate into a casing. They're employed to get rid of the heat generated by the electronic components inside the shell. They are selected according to:

- Their stature.

- The casing's available supply voltage.

3.7 DC Motor

A DC motor is a type of electrical machine that converts direct current electricity into mechanical energy. The most common varieties rely on magnetic fields to produce forces. Almost all DC motors contain an internal mechanism, either electromechanical or electronic, that changes the direction of current flow in a portion of the motor on a regular basis. The main text should be written using Times New Roman, 10pt, fully justified. Italics can be used for emphasis and bold typeset should be avoided.

4 Hardware Prototype

The hardware interface module and the software module are the key components of the proposed home control system. Devices including light switches, temperature sensors, and motion sensors have been combined with the proposed house control system to demonstrate its effectiveness. The smart phone app offers a graphical user interface (GUI) for accessing and controlling home devices over real-time IP. When the HomePi software is first launched, the user must choose a room, and after selecting a room, the user is presented with a screen with numerous buttons. Each button is linked to a gadget that can be switched on or off by pressing it. The user interface is simple to use; to turn on or off the appliances, simply touch the symbol.
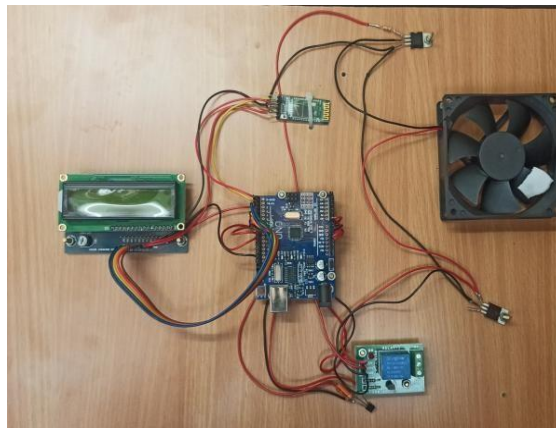

Fig.2.HardwarePrototype

5 Result And Discussion

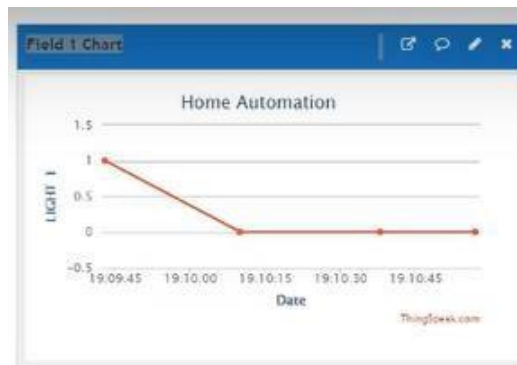The system has been successfully designed and the result is shown below:
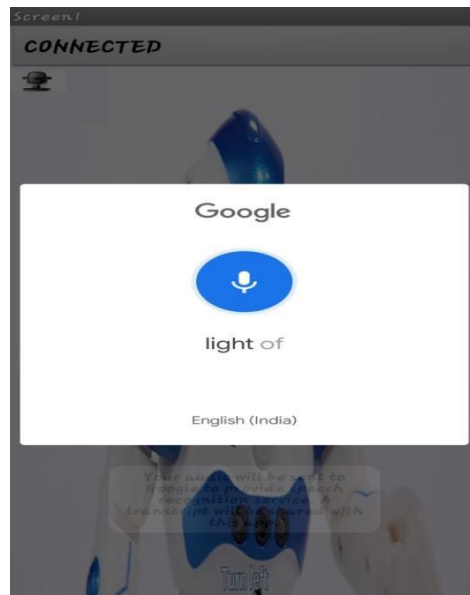
Fig.3. Cloud Result1

The above image shows the mobile application for monitoring and controlling of electrical devices.

Fig.5. Cloud Result2

The details of the temperature and light detection can be viewed in the LCD display.

Fig.6. Hardware Result

6 Conclusion

The suggested system had two scenarios, the first of which was a wireless system that allowed customers to monitor and manage their home appliances from anywhere in the world using a cellular phone and Wi-Fi technology. The second scenario was a wire line-based system that relied on the potrocal of a land-telephone line. There are two operational modes for each scenario: manual and automatic. The suggested system's dependability and effectiveness are demonstrated through simulation and hardware implementation. The system that was implemented was simple, low-cost, and adaptable, with the ability to extend and scale up. Wireless sensor technologies can be used to improve the suggested system in the future. The suggested system is a commercial hardware package that may be created and manufactured. Currently, the device only provides internet security via the Wi-Fi network to which it is linked, but more dedicated security implementation is required. Some potential elements of home automation are given, reminding us that the demand for new automated systems is quite great, and the degree of integration is increasing year after year. As a result,

more and more functions will be crammed into fewer and smaller systems that can handle many tasks at once. Automation is unavoidable, particularly because it can affect energy, time, and housing space efficiency.

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