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Advance IOT Based Home Automation

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ABSTRACT

Traditionally electrical appliances in a home are controlled via switches that regulate the electricity to the devices. As the world gets more and more technologically advanced, we find new technology coming deeper and deeper into our personal lives even at home. Internet of Things (IoT) conceptualizes the idea of remotely connecting and monitoring real-world objects (things) through the Internet. When it comes to our house, this concept can be aptly incorporated to make it smarter, safer and automated. This Advance IoT based home automation paper focuses on building a smart wireless home automation system, in which home appliances can be accessed using mobile app/website through internet connectivity. This system can send alerts to the owner by using the Internet in case of any trespass and raises an alarm optionally. Besides, the same can also be utilized for home automation by making use of the same set of sensors. The advantage obtained by preferring this system over the similar kinds of existing systems is that the alerts and the status sent by the Wi-Fi connected microcontroller managed system can be received by the user on his phone from any distance irrespective of whether his mobile phone is connected to the internet. Apart from these features, this system also allows to check the appliance history and has many more features like recursive mode in a home appliance. The microcontroller used in the current prototype is the At-mega 2560 (Arduino Mega board) with an external Wi-Fi Card ESP8266 making use of which all the electrical appliances inside the home can be controlled and managed.

Keyword: *Internet of Things, Home Automation, Home Security System, Smart Home and Arduino.*

1. INTRODUCTION

Advance IoT Based Home Automation System has the dual aspects of this paper. In this Home Automation System, user can control his home appliances from anywhere in the world by using the website or Android app used to control the system. System connects to the internet through Wi-Fi and then makes a stable feedback connection with server and GUI continuously monitoring the commands send by the user. The user can send various control commands from UI (android app/Website) then the system operates as per command sent by the user. The user can also check the status of all the appliances from the website/app if an appliance is on or off or the previous history of every appliance.

The currently built prototype of the system sends alerts to the owner over voice calls using the Internet if any sort of human movement and emergencies like Fire and other condition is sensed near the entrance or inside the house and raises an alarm optionally upon the user's discretion. The provision for sending alert messages to concerned security personnel in case of a critical situation is also built into the system. The user/owner can make arrangements such as opening the door, switching on various appliances inside the house, which are also connected and controlled by the micro-controller in the system to welcome his guests in case of unavailability. The same can be done when the user himself enters the room and by virtue of the system, he can make arrangements from his doorstep such that as soon as he enters his house he can make himself at full comfort without manually having to switch on the electrical appliances or his favorite T.V. channel for an example. Thus using the same set of sensors the dual problems of home security and home automation can be solved on a complementary basis.

2. RELATED WORK

[1] Sirsath N. S, Dhole P. S, Mohire N. P, Naik S. C & Ratnaparkhi N.S This paper proposes a Home Automation system that employs the integration of multi-touch mobile devices, cloud networking, wireless communication, and power-line communication to provide the user with remote control of various lights and appliances within their home. This system uses a consolidation of a mobile phone application, handheld wireless remote, and PC based program to provide a means of the user interface to the consumer.

[2] Basil Hamed the main objective of this Paper is to design and implement a control and monitor system for the smart house. Smart house system consists of many systems that controlled by LabVIEW software as the main controlling system in this paper. Also, the smart house system was supported by the remote control system as a sub-controlling system. The system also is connected to the internet to monitor and control the house equipment's from anywhere in the world using LabVIEW.

[3] Deepali Javale, Mohd. Mohsin, Shreerang Nandanwar The prime objective of this paper is to assist handicapped/old aged people. It gives a basic idea of how to control various home appliances and provide a security using Android phone/tab. The design consists of home automation website, Raspberry Pi B, ATMEGA8 microcontroller. The user can interact with the website and send a control signal to the Raspberry pi kit which in turn will control other embedded devices/sensors.

3. BLOCK DIAGRAM

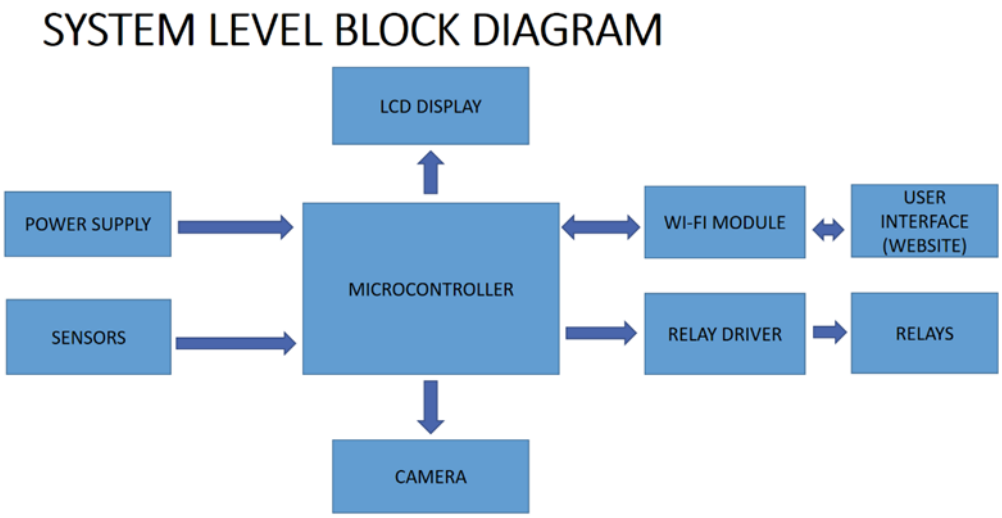

Fig-1: System Level Block Diagram

A block diagram is a diagram of a system in which the principal parts or functions are represented by blocks connected by lines that show the relationships of the blocks. They are heavily used in engineering in hardware design, electronic design, software design, and process flow diagrams. A diagram showing in schematic form the general arrangement of the parts or components of a complex system or process, such as an industrial apparatus or an electronic circuit.

Block diagram of the proposed system diagram is shown in figure 1. The main block of this system is the Arduino microcontroller board. There are relays to serve the purpose of on and off. The power supply provided for Arduino is 5V.It is given through an adapter. Then there are different sensors connected with a microcontroller. Wi-Fi module (ESP-8266) is connected to the microcontroller which acts as a medium between the user interface and data received from the microcontroller. Status of different appliances are also reflected locally on 16x4 LCD display which is interfaced with Arduino MEGA through SPI protocol

4. OPERATIONAL FLOWCHART

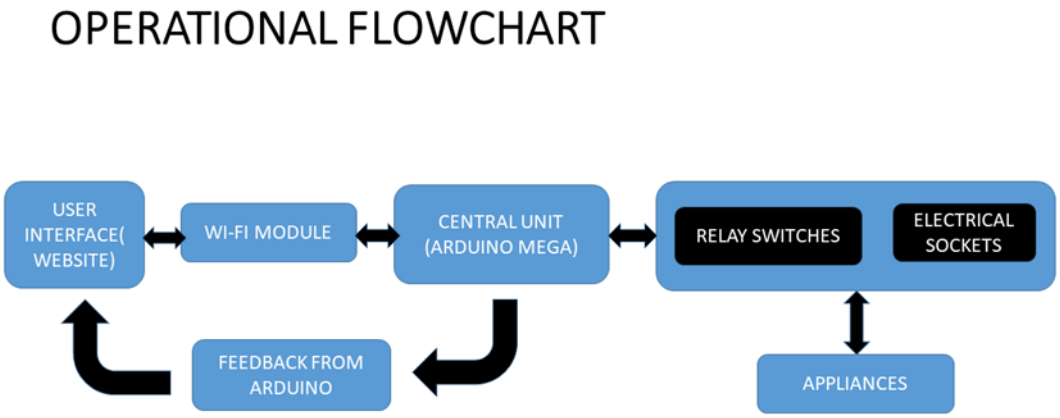

Fig -2: Operational Flowchart

5. SYSTEM PROTOTYPE

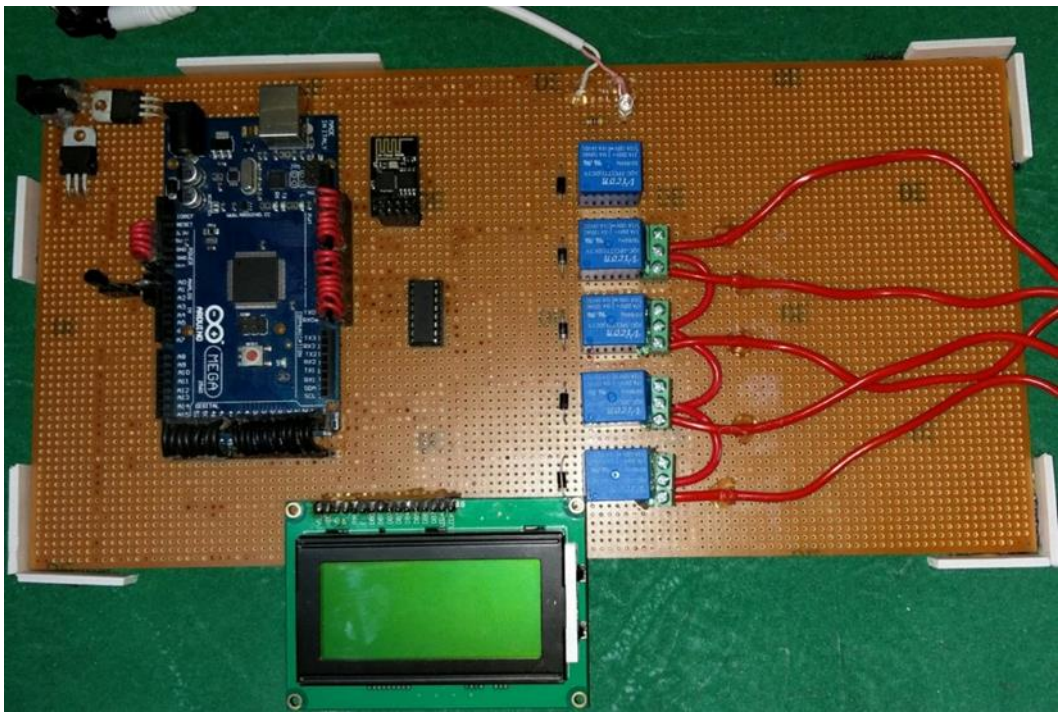

Fig -3: System Prototype

Home automation website or web app has a control panel. It has numerous switches on the appliances to control them. Whenever user switch ON or OFF the button present on the web interface then API will hit the thingspeak server to update that value in its database and after this, the controller i.e. Arduino Mega will hit the server with an API in order the retrieve the status of the different appliances. When Arduino MEGA hit the thingspeak server then thingspeak server sends a response to Arduino in JSON form and then Arduino MEGA will update the status of different appliances connected with it by cracking JSON.

In the same way, system updates the value of different sensors on the thingspeak server and that values get reflected on the website as well as on web app. Arduino MEGA will read the value of different sensors through its analog pins and these values are passed in the API of thingspeak server.

The system remains connected using TCP/IP protocol to the thingspeak server through Wi-Fi module ESP8266ex interfaced with Arduino Mega using USART protocol. So the internet connectivity to our system is provided by ESP8266ex.

When the user turns ON or OFF the appliance by clicking on the button present of the control panel of website or web app then API gets executed and updates this value in thingspeak server, after it Arduino MEGA retrieve this updated value of appliance status from the thingspeak server and after computing and comparison Arduino MEGA turns the output pin of that particular appliance HIGH or LOW respectively which connects to the input pin of ULN2003APG (Darlington Transistor high current gain IC). This ULN2003APG amplifies the signal coming at its input and now amplified signal has enough current to drive the relay to turns ON or OFF the appliance.

The system also has feedback system so when user switches ON or OFF any appliance then above process of is done as well as Arduino hits the server with one more API to updates the status of that appliance on the website in the status bar.

Status of different appliances is also reflected locally on 16x4 LCD display which is interfaced with Arduino MEGA through SPI protocol. Any change in the status of appliances is reflected on this display also.

This system has an alarming system that is whenever any sensor's value crosses the threshold value then another API of Twilio server will be executed and hits the Twilio server and then Twilio server automatically send the warning call as well as SMS on the user's smart phone.

6. CONCLUSION

Today in this century home and offices are equipped with various machinery. Besides, people have various devices for surfing in the web. That's why we have introduced a system that can be accessed from all sorts of devices and database can be updated from anywhere. If the particular device works on, the other means of devices will be easily operated. The database is developed such a way that can be accessed from any sort of device that supports internet. In this regard motion and vibration sensor is brought here because of its high-quality sensing. The system is very easy to install. Home Automation is definitely a resource which is capable of make a home setting automated. People can be in command of their electrical devices via these Home Automation devices and set up the controlling actions in the workstation.

7. FUTURE SCOPE

Using this system as a framework, the system can be expanded to include various other options which could include home security feature like capturing the photo of a person moving around the house and storing it onto the cloud. This will reduce the data storage than using the CCTV camera which will record all the time and stores it. The system can be expanded for energy monitoring or weather stations. This kind of a system with respective changes can be implemented in the hospitals for disable people or in industries where the human invasion is impossible or dangerous, and it can also be implemented for environmental monitoring.

8. REFERENCES

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