Home Automation Using Node MCU, Firebase & IOT

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ABSTRACT

This paper presents a low cost and flexible home control and environmental monitoring system. In today's world advancement of technology in the fields of automation is getting simpler and better in all aspects. There is a rapid increase in number of internet users. Smart phones have played a very important role in helping users with a much better internet service and different online applications. The concept of home automation is applied using internet of things [1]. This paper can be explaining the idea of home automation using node MCU, firebase and IOT (Internet of Things) only in online mode with the help of a data service provider. Home automation can include all home appliances to be managed and controlled by using mobile application [2].The rate at which more people are adapting to the home automation options is high. This is an approach that provides the users more comfort in their homes. These are features that include, ventilation, air conditioning, lighting and heating among others. Our main motive is to provide an easy control over appliances for disabled persons, That will provide convenience to their daily life and they can control appliances even when they are away from home. This system is implemented using "Android Things" and "Firebase" by Google, the latest technology in the field of IOT (Internet of Things) [3]. Home automation develops the lifestyle by automating the appliances. This project aims to achieving the home automation using wireless technology. This paper focuses on flexible, cost friendly wireless smart home system, which would be based on an Android App. [4]

Key words: Internet of Things (IOT), Home Automation, Mobile Application, Node MCU, Firebase, MIT App Inverter.

I. INTRODUCTION:

As rapid change in technology always aim to serve the mankind, the expectation for living a simple yet advance life keeps on increasing [1]. Internet has become an important part of human's social life and educational life without which they are just helpless. The Internet of things (IOT) devices not only controls but also monitors the electronic, electrical and various mechanical systems which are used in various types of infrastructures. Internet of things (IOT) is expressed as the different computers [6].

Home automation using IOT is one of the best technologies to improve our home and making economically improve country. This paper provides the information about home automation using IOT and mobile application. Home automation can be defined as it is the removal of human interaction [5]. Using the concept of IOT we make sensors to communicate with each other which are powerful in automation [7]. The efficient use of electric energy is highly dependent on energy metering. presents an idea or a concept for smart home. Smart home or home automation can be said as the residential extension, it also involves the automation and controlling of lightings, ACs and security, which includes other home appliances. Data is collected with the help of node MCU ESP8266 and Firebase [4]. Home automation is providing home safety for dwellers. It automatically switches on appliances

in closets, stairways, and other dark places. Thus accidentally tripping or running into thing is decreased. Home automation system using IOT is a way through which one can explore and control home appliances or devices with the help of internet connection. Internet has become the basic need for everyone and thus internet can be used for controlling the basic devices or appliances like TV, lights, fans, Air conditioners and much more.

This technology is operated with the help of smart phone and sensor (The only thing which is needed is the automation system should be connected to the cell phone).The main purpose of home automation system is to "SAVE ELECTRICITY" when not is used an as it is the important part of our daily life it should be save for further purpose when not in used. This system can control the settings of lights (brightness, dimming, switch (ON/OFF), use of fans (speed high or low) as per the people present in a particular room as shown in fig1.

Fig 1: Home automation prototype.

II. APPLICATIONS OF HOME AUTOMATION:

Home automation led IOT-enabled connectivity are as given below:

- Lighting control
- HVAC
- Lawn/Gardening management
- Smart Home Appliances
- Improved home safety and security
- Smart switches
- Smart locks
- Smart energy meters.

III. HOME AUTOMATION COMPONENTS:

These automation components help you to build a realistic model of what major components are involved in building a smart home. The major components can be broken into several IOT elements which are given below:

1) IOT sensors
2) IOT gateways
3) IOT protocols
4) IOT firmware
5) IOT cloud and database
6) IOT middleware

A. Home Automation Sensors :

There are probably thousands of such sensors out there that can be part of this list, for to make the home automation perfect and clean we are using the IOT sensors as the must, based on the sensors we are making home automation, these are having capabilities. Whish are as follows:

- Home Automation using IOT and Mobile Application
- LUX sensors
- Water level sensors
- Air composition sensors
- Video cameras for surveillance
- Voice/Sound sensors
- Pressure sensors
- Humidity sensors
- Accelerometer etc

IV. METHODOLOGY:

Fig 2: Overview home automation of system.

Controlling devices or brain for the automation of the project is Node MCU. The data sent from mobile over internet real time database (Firebase) as shown in fig 2.This will receive by Wi-Fi module connected to Node MCU. Node MCU reads the data and decides the switching action of electrical devices connected to it through Relays.

V. WORKING PRINCIPLE:

The Firebase Real time Database is hosted in the cloud. Your data is stored as JSON and synchronized in real time to all connected clients. The Firebase Real time Database lets you share your database across Android, IOS and Web apps. Firebase data is also available offline, so your app always has access to your data. The data is automatically synced once the app comes back online.

Real time – it means that data is synchronized with all connected devices within milliseconds of changes being made to the data

Offline - the Firebase Real time Database persists your data on your device so the data is always available, even offline. The data is synced with the cloud on reconnection

Accessible from client devices - the Firebase Real time Database can be accessed from a mobile device (Android or IOS) or Web app.

Security – we can define your security rules which controls who has what access to our **Firebase database**. You can also integrate Firebase Authentication to control access to your data.

Fig 3. Firebase basic working operation.

The Real time Database provides a flexible, expression-based rules language, called Firebase Real time Database Security Rules, to define how your data should be structured and when data can be read from or written to. When integrated with Firebase Authentication, developers can define who has access to what data, and how they can access it. Because of this, it is important to think about how users need to access your data and then structure it accordingly as shown in Fig3**.**

VI. SOFTWARE REQUIREMENTS:

i) MIT Application inventor for mobile app design.

ii) Arduino IDE platform for Node MCU.

A. MIT App Inverter:

App Inventor for Android is an open-source web application originally provided by Google, and now maintained by the Massachusetts Institute of Technology (MIT).   It allows newcomers to computer programming to create software applications for the Android operating system (OS). It uses a graphical interface, very similar to Scratch and the Star Logo TNG user interface, which allows users to drag-and-drop visual objects to create an application that can run on Android devices.

B. Feature of MIT App Inventor:

i) Using for creation of mobile base application.

ii) Simple picks and drop programming.

1st quarter of 2012, MIT Center for Mobile Learning launched App Inventor service for general public access Open Source.
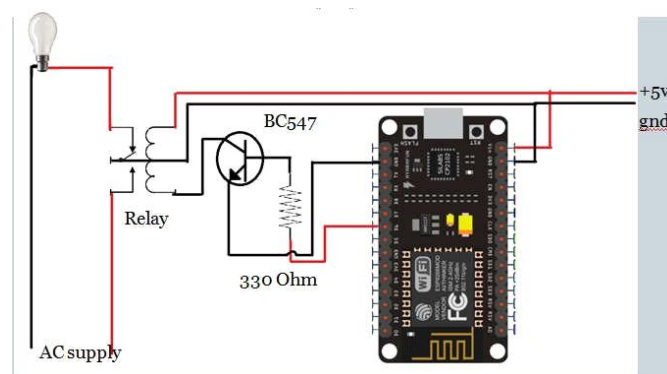

Fig 4: Basic Circuit diagram of Node MCU connection.

VII. Circuit Diagram of Home Automation System Using NODE MCU:

Basic circuit diagram of this project is shown in fig 4. Output port is simply connected to transistor. Here transistor is work as a switch i.e. if base of transistor is receive +5v then collector and emitter is shorted and relay is On.
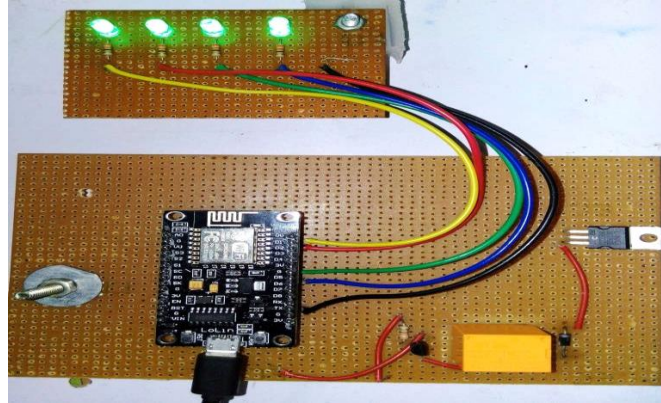

Fig 5. Hardware of home automation using Node MCU.

VIII. Hardware Design of Project Prototype:

Hardware of the prototype consists of various components such as Resistor, LED, Node MCU' Arduino. This is shown in fig 5.

IX. CONCLUSIONS:

It is evident from this project work that an individual control home automation system can be cheaply made from low-cost locally available components and can be used to control multifarious home appliances ranging from the security lamps, the television to the air conditioning system and even the entire house lighting system. In this paper, Home automation system that can be controlled remotely upon user authentication is proposed and implementation is going to be take place. The objective of this system is to provide a convenient way to control home appliances by using the MIT app inverter and save energy as well as time. In the help of this project we are control all the home appliances through the IOT.

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