

Digital home using Sensor and Internet of Things

Swapnil Khairnar^{#1}, Sanket Pol^{#2}, Nikita Chaudhari^{#3}, Rameshwar Biradar^{#4}, Prof. Ratan Deokar

**MET's Bhujbal Knowledge City, Institute of Engineering, Adgaon, Nashik, India*

ABSTRACT

Technology development is a paving approach for automation to be made to the present machines resulting in the new technology referred to as the Internet of Things. Things get connected over the web that reduces human workload. The house is constructed with electrical devices for a comfy living style. But, the devices are operated manually within the home. Home devices are still turned on even person leaving the home with not knowing of devices' status. Hence, users ought to come to the home to prevent the devices. It ends up in wastage of human energy, power, and devices lifetime. This paper is projected to implement the digitally and smartly controllable home that controls the devices from remotely situated locations all over the network. The experiments are conducted to implement the automation by using Arduino Uno controller with node MCU and operates the devices using android applications through mobile phones. This analysis work is proposed to cut back human employment and reduce electricity consumption.

Keyword: - Smart Home automation, IoT, Sensors, Arduino, Blynk App, NodeMCU

I. INTRODUCTION

The fast increase within the range of person of the internet over the last decade has created the internet a neighborhood and parcel of lifestyles, and IOT is that the modern and growing internet era. IoT can be a growing network of connectivity betwixt everyone's everyday life—from large machines to trade goods which will share data and complete tasks whereas you're busy with different activities. The internet of Things (IoT) is an Associate in Nursing interconnected network of devices, vehicles, Homes, and different things embedded with electronics, software system package sensors, and network connections that allows these objects to assemble and exchange data. With the rise in consumption of energy and population, there's a desire to conserve energy in each manner possible. The lack of access and management of the appliances from remote locations is one in each one of the key reasons for energy loss.

An application is used by the users to give instructions to these systems. Electronic and electric surroundings with appreciation to this context are any surroundings that include home equipment including fans, TVs, ACs, etc. The predominant idea of IoT is that it can create a digital connection among a hub or a community and digital and electric objects. This digital connection enables to control, locate, and track down those linked objects. The idea of device-to-device connectivity has shown the improvement of smart sensors collectively with conversation technology including Wi-Fi, Bluetooth, etc., and supported by cloud computing technologies, IoT has become reality and its goal is to form devices an additional aware, interactive, and economical for a higher and safer world. A remotely available surrounding is a surrounding wherein every equipment may be remotely accessed and managed the use of software program as an interface, which incorporates Android software and Web software. Wireless Home safety and Home automation are the twin factors of this project. Using Node MCU, we can control the devices remotely or from the android mobile applications.

To control home appliances automatically using the Blynk application, we are going to use the NodeMCU microcontroller which has in-built Wi-Fi Technology. There will be the provision of touch switches and timers in the Blynk android app. Using touch-switches and timers, we will be able to control all the appliances as per our need and according to the period to ON and OFF Fans, Lights, and Partymode lights. CT module and PT module are used to sense the current and voltage respectively from the system to calculate the total power consumption. LCD 16X2 is used to display the status of the appliances i.e. ON and OFF as well as Voltage, current, and power consumption. Using the Motion Sensor, the presence of humans will be sensed automatically and the respective device will get ON. LDR is also used which will ON the lights only when there is no sunlight or any sort of

brightness in the room. Thus, the project helps in minimizing the consumption of electricity which in turn helps in saving electricity bills. The project mainly focuses on reducing the efforts of human beings to control the devices manually, especially for aged people or handicapped or paralyzed people. Also, continuous monitoring of the Voltage, Current, and Power parameters is possible using LCD 16x2 and on the Android app as well with help of continuous tracking graph.

II. LITERATURE SURVEY

In [1], Home Automation is undeniably a resource that may build a home setting automated. Folks can manage their electrical devices via these Home Automation devices and find the dominant factions within the computer. We expect this product features a high potential for promotion in the future. At the instant, the parts are a touch high to be ready to turn out these devices for a motivating price. Home Automation might be developed additionally by creating it more stable and place more effort into the visual style of the product. Plenty of enhancements could be wiped out of the pc program as well. It ought to be a lot customizable for an end-user and it should have some word protection for security reasons. it might be conjointly fine to form it internet based totally so customers will manage their homes remotely.

In [2], There are 2 sorts of high-priority user preferences available: essential amount and device activity time. Critical amount defines the precise period within the day once the device should be turned on or off. Usually, the essential amount is connected to the electrical grid peak hours, and it's the best priority among all user preferences. Device activity time is given as AN quantity of active time throughout the day per device. This quantity is used either regularly or in fragments, counting on the current system state at the particular period. It ought to be mentioned that the system permits the user to manually set the state of any device within the household.

In [3], to assist maintain snug living conditions within a home, home observation and automations are utilized. The standards of human comfort in homes are classified into many types. Among these categories, the foremost important ones are thermal comfort, which is said to temperature and humidity, followed by visual comfort, concerning colors and light, and healthful comfort, related to air quality. The chosen platform is extremely versatile and user-friendly. The sensing of various variables inside the home is conducted victimization the NodeMCU-ESP8266 microcontroller board, which permits a period of information sensing, process, and uploading/downloading to/from the CMS cloud server.

In [4], The motion sensing element is connected to a digital In-out pin of the TX board. The board is power-driven up b an external 12V battery or 12V adapter. The house appliances are connected to mains through a relay that successively is connected to a different digital pin of the board. The board is programmed to own access to the native Wi-Fi. To have a large vary for detection a straightforward lens is used. Sensors may additionally be graduated in such some way so on ignore domestic pets by setting the next sensitivity threshold, or by guaranteeing that the floor remains out of focus.

In [5], supported all the systems surveyed and their benefits and drawbacks, this paper presents the options to be possessed by a perfect system for domestic automation with remote access. An ideal system ought to be obtainable from everywhere the globe to a user and in real-time. This can bring about a regular access technique for the house appliances using the web protocol. The computer program ought to be an online application that has an associated mobile application so the user of all types will access the system. Such a system ought to even have the feature of being simple to install. Solely then will machine-controlled homes become commercially viable. There ought to be plenty of thought place into the look of the computer program for these apps.

In [6], The IOT devices controls and monitors the electronic electrical, and also mechanical systems utilized in varied sorts of buildings. The devices connected to the cloud server are controlled by one admin that facilitates a variety of users to that variety of sensing elements and management nodes are connected. The platform uses the IoT technology to make a network between the most server and also the other electrical and electronic appliances creating home a wiser place to measure in. The complete network consists of one admin that makes our model a secure one because the admin solely has the authority to access all the nodes gift below each user. The model is kind of economical as if there's solely one admin but the number of users below the admin could increase creating an outsized complicated network however a secure one.

In [7], IoT could be a machine that makes use of computer systems or cellular devices to manage primary home functions and alternatives automatically through the net from anywhere around the world, an automated home is normally called a practical home. it's meant to keep away from losing the electric strength and human strength. The house automation machine differs from

an alternative system by permitting the person to work the system from anywhere around the world via an internet connection. the house automation victimization net of Things has been experimentally tested to determine satisfactorily through connecting straightforward home equipment to it and also the appliances have been with success managed remotely via the internet. The designed device now not totally monitors the sensing detail records, like temperature, gasoline, light, movement sensors, but conjointly actuates in a way consistent with the requirement, parenthetically turn on the light as soon as it receives dark. It conjointly stores the sensing detail parameters inside the cloud (Gmail) in a well-timed way. This may help the person to analyze the circumstances of various parameters inside the home anytime anywhere.

III. PROPOSED METHODOLOGY

In a smart home, we are using the latest microcontroller that is Node MCU which has in-built Wi-Fi technology. This system works with the help of Internet android applications. With the help of LDR and Ultrasonic sensors, the presence of humans in the room will be sensed and it will automatically turn ON and OFF the fans and lights. We can note the voltage with the help of a potential transformer and current using a current transformer. The output of CT and PT is given to the analog channel of Node MCU so that we can continuously monitor the values of voltage and current and thus can calculate the power also. Power consumption will be monitored using the mobile app itself. On LCD 16X2, current (A), Voltage (V) and Power (W) will be continuously displayed after every 10 seconds to improve the monitoring on a real-time basis. Home automation has excessive capacity for sharing records among own circle of relative participants or depended on people for private safety and will result in electricity saving measures with a high-quality environmental effect within-side the future.

A. System Design

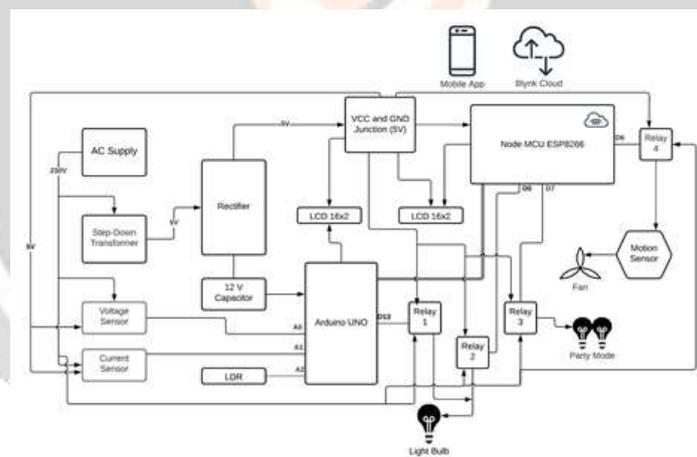


Fig.1 System Architecture

In this project we are using Arduino Uno microcontroller for sensing AC voltage and AC current because the main objective is calculating the power so voltage and current is required for this second microcontroller is a Node MCU. It is used for interfacing Android application and upload data like voltage current and power who are the cloud. Node MCU have inbuilt Wi-Fi module for security purpose it will connect to internet after verifying SSID and password. With the help of Blynk Android application, we can control the various appliances it is connected to the relay for automation purpose we are interfacing LDR sensor. The main purpose of the system architecture to save the energy electricity and control appliances from anywhere distance doesn't matter when we are creating a project is IoT based this is a very new trend in the digital world.

To operate the devices smartly, the proposed solution uses tools and technologies that are already available, or will be available soon, and uses them in a new way.

The hardware used in this system consists, the NodeMCU with cp2102 Wi-Fi Board is an all-in-one microcontroller + Wi-Fi platform that is very easy to use to create projects with Wi-Fi and IoT applications. The board is primarily based totally on the surprisingly famous ESP8266 Wi-Fi Module chip with the ESP-12 SMD footprint. This Wi-Fi improvement board already embeds in its board all of the essential additives for the ESP8266 (ESP-12E) to software and add code. It has an integrated USB to serial chip add codes, 3.3V regulator, and commonsense stage converter circuit so that you can right away add codes and join your circuits.

LCD may be configured to force a dot-matrix liquid crystal show beneath the management of a four or eight Bit microprocessor. Since all of the options comprehensive of show RAM, individual generator, and 9 liquid crystal drivers, needed for employing a dot-matrix liquid crystal show are internally equipped on one chip, a minimum device may be interfaced with this controller/driver. LDRs or Light Dependent Resistors are very beneficial mainly in mild/darkish sensor circuits. As the quantity of Light falling in this LDR increases, its resistance decreases. Light Dependent Resistor is suitable for use in projects which require a device or circuit to be automatically switched on or off in darkness or light.

Relays are output gadgets that might be used to govern or perform a few outside gadgets. This is a 5V Isolated relay module which means that that there may be an Opto-coupler utilized in between your manipulation circuit and the relay therefore defensive your circuit in case of any brief circuit troubles at the relay side. The relay is driven safely by the BC547 transistor which is triggered via an Opto-coupler IC which serves as an isolator between your microcontroller and the relay.

IV. IMPLEMENTATION SETUP

A. Creating a Project in Blynk App

As our project is based on IoT technology, we need to develop a project in Blynk App. It is available on Play Store. After downloading the Blynk app, we can create a project dashboard and arrange buttons, sliders, graphs, and other widgets onto the screen. To create a project, user first need to create an account using email ID and password into it.

This Figure shows the opening window and creating a project in the Blynk App.

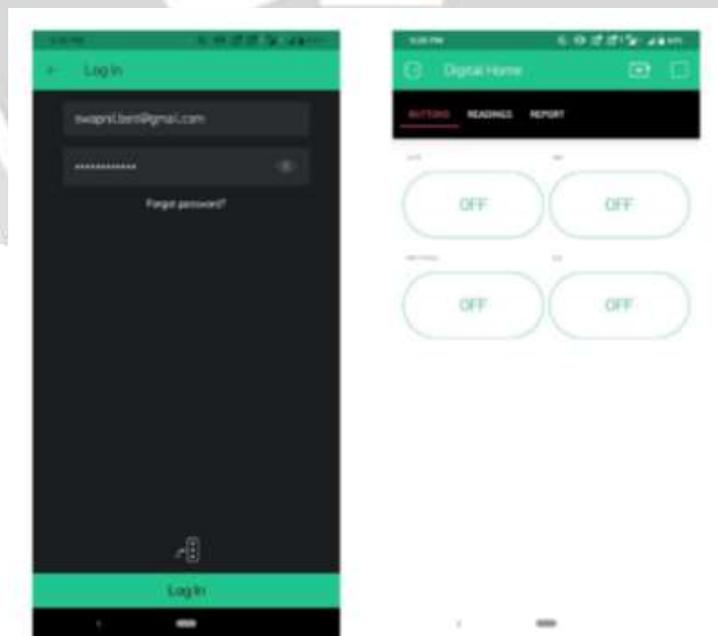


Fig.2 Blynk App

B. Hardware Assembly



Fig 3 Hardware Setup

C. Algorithm Developed

Step 1: Start

Step 2: Enter Credentials

If Credentials == True, then

Go to Step 3

Else,

Go to Step 2

Step 3: Initialize Microcontrollers, Relays, etc. and connect to network

Step 4: Button Mode selection of LDR

If LB == 1, then

LDR ON

Else,

Go to Step 9

Step 5: Check LDR

If LDR == 1, then

If Night, then

Lights ON (for fixed pulse delay 10 sec)

Else,

Lights OFF

Step 6: Check Motion Sensor

If MS == 1, then

Go to Step 8

Else,

Go to Step 10

Step 7: Check Festival Mode

If PB == 1, then // Party-mode Button

Festival Mode Lights ON

Else,

Festival Mode Lights OFF

Step 8: If detects motion, then

Fan ON

Else,

Fan OFF

Step 9: If L == 1, then //Light Button

Lights ON

Else,

Lights OFF

Step 10: If F == 1, then // Fan Button

Fan ON

Else,

Fan OFF

Step 11: Logout Process

If logout == 1, then

 If re-login, then

 Go to Step 2

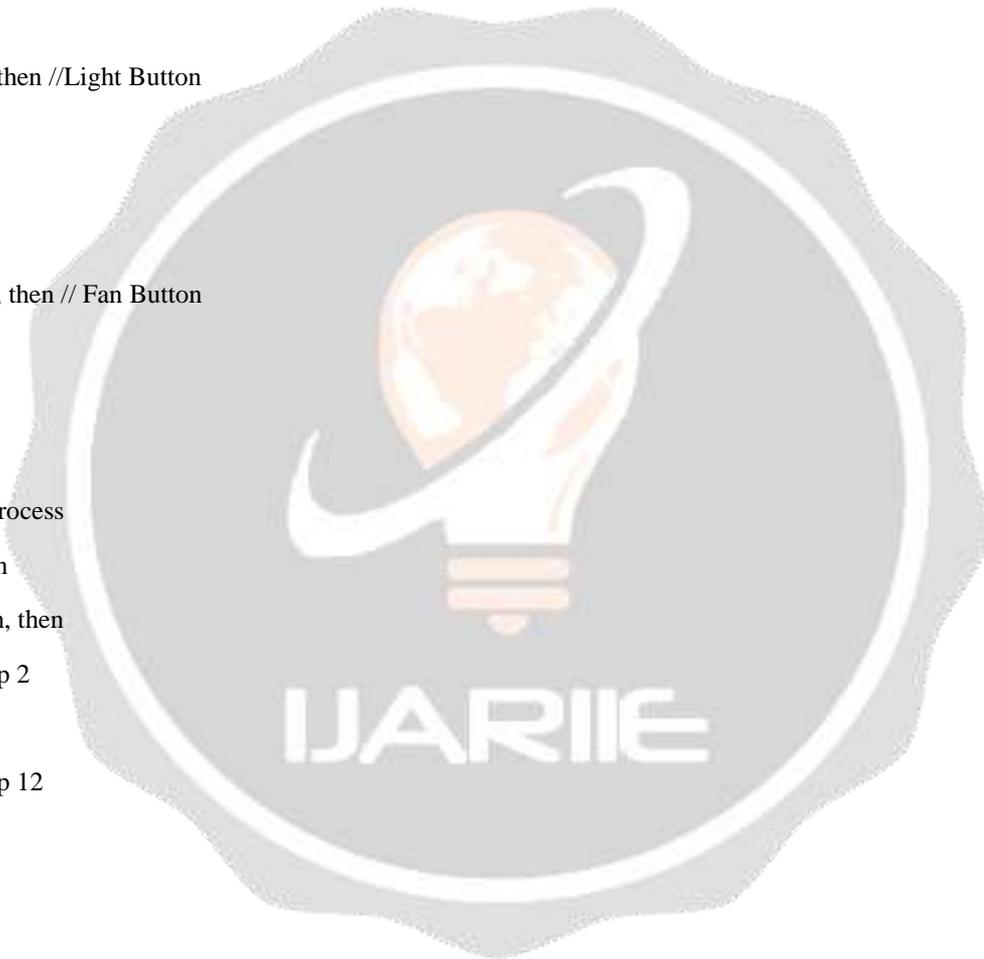
 Else

 Go to Step 12

Else,

Go to Step 4

Step 12: Stop



V. RESULTS

Snapshots of Proposed System Implementation

A. *Blynk App Power Monitoring*



Fig.4 Power Monitoring in Blynk App

B. Exported CSV File to Gmail

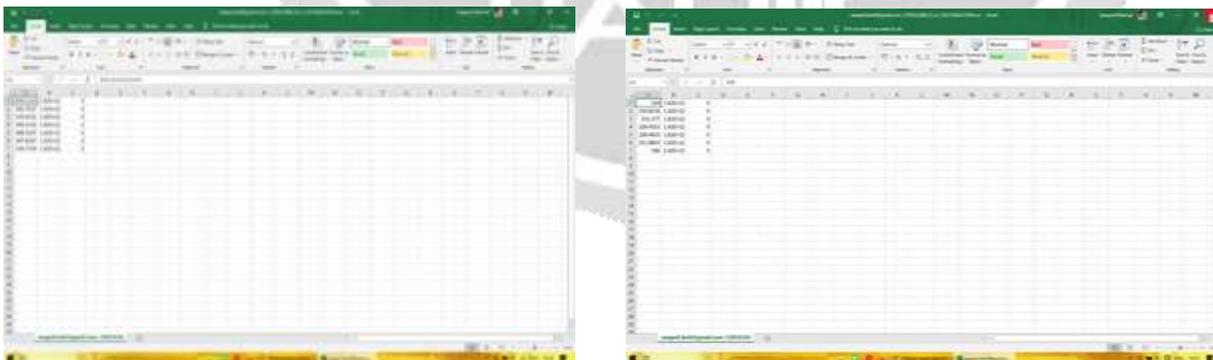


Fig.5 CSV Files of Power Usage

VI. CONCLUSION

Through this paper, we have presented an approach for Digital homes using sensors. Based on the system surveyed and their advantages and drawbacks, the proposed work presents the feature to be possessed by a perfect system for home automation with remote access. The programs are going to be a mobile application. Therefore, the user will access the system. Thus with the various improvements in this system, will be liable for flexibility.

Using IoT technology, electrical devices in our home can automatically ON and OFF as per the human presence and from android app as well. It provides ease solution for the users to have monitoring and controlling of the electrical power simply through the Android App. For this project, we successfully interfaced current sensor, voltage sensor, motion sensor and LDR with the microcontroller.

VII. FUTURE SCOPE

We can add Google assistance for more effectiveness.

We can add solar panel so as to reduce power dependency on the grids

We can add more sensors for other appliances in the home as well which make the home fully automatic.

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