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IoT based Smart Home Automation using NodeMCU

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Abstract: With the expansion of Automation technology, life is getting simpler and easier altogether aspects. In the present world, Automatic systems are dominant over manual systems. The rapid increase within the number of users of the internet over the past decade has made the Internet a neighborhood and parcel of life, and IoT is that the latest and emerging internet technology. The Internet of things could also be a growing network of everyday object-from industrial machines to a commodity that can share information and complete tasks while you're busy with other activities. Wireless Home Automation system using IoT could also be a system that uses computers or mobile devices to manage standard home functions and its features automatically through the web from anywhere around the globe, an automatic house is sometimes called a sensible home. It is meant to save a plethora of electrical power and human (manual) energy. The home automation system differs from another system by admitting the user to figure the system from anywhere around the world through an online connection (internet). In this paper, we present a Home Automation system using Blynk Community that employs the mixing of cloud networking, wireless communication, to supply the user with a remote of various appliances within their home and storing the data logs in the cloud. This system is meant to be low cost and expandable allowing a spread of devices to be controlled. Keywords: IoT, Home Automation, NodeMCU, Blynk App, Relay Module

I. INTRODUCTION

IoT or the internet of things is an upcoming technology that allows us to command hardware devices through the internet. Here, we propose to use IOT to control home appliances and thus automating modern homes through the internet. This system uses 2-loads to demonstrate as house Appliances Controlling. Our user-friendly app (Third Party App) interface allows users to easily control their home appliances through the internet. For this system, we used a NodeMCU (Node Microcontroller Unit). This microcontroller is allianced with a Relay modem to get user commands over the internet. Relays were used to switch loads. The whole system is powered by a 5V Adaptor/Charger (Micro-type). After receiving user requests over the internet, NodeMCU processes these sets of orders to operate these loads accordingly and display the system status on a Smart Phone Display. Thus, this system provides efficient home automation over the use of the internet.

In this, we have used the Blynk Community Application for controlling home appliances. The Method used for controlling is Swiping the fingers on Smartphone and it will trigger the circuit as it gets input command from the Blynk App itself.

Methodology	Advantages	Future Scope
In this, we have used Raspberry	The biggest advantage of using	Raspberry pi might be one day used as
Pi instead of Arduino and PIR	Raspberry Pi instead of Arduino	it has multiple GPIO pins which can
sensors which are more effective	is the clock speed of Raspberry	be built by or programmed and used to
than normal IR sensors for home	Pi. The PIR sensor is directly	interface various devices in the real
security.	connected to the led array which	world and controlled by python
	will provide a better light	programming language.
	environment for the camera to	
	capture a clear photo	
	Methodology In this, we have used Raspberry Pi instead of Arduino and PIR sensors which are more effective than normal IR sensors for home security.	MethodologyAdvantagesIn this, we have used RaspberryThe biggest advantage of usingPi instead of Arduino and PIRRaspberry Pi instead of Arduinosensors which are more effectiveis the clock speed of Raspberrythan normal IR sensors for homePi. The PIR sensor is directlysecurity.connected to the led array whichwill provide a better lightenvironment for the camera tocapture a clear photoremote

II. LITERATURE SURVEY



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[2]	The basic methodology is signal	This home automation works	The project which is to be
	sent from Android Phone to Wi-	according to the user's needs and	implemented is home automation
	Fi module. The android	demands and also the modes of	using an easy IoT web server and wi-fi
	application consists of GUI	function work as desired during	and has very good future development.
	buttons for each appliance.	the implementation. These smart	
	Eventually, end users can access	switches can be used manually, on	
	appliances over mobile devices.	mobile phones and computers	
		through the internet.	
[3]	Using Raspberry Pi IR Camera	The Pi camera helps in streaming	Using the biometric sensors present on
	to prevent unauthorized people	the live feed and also captures	the mobile of the user, the door can be
	from entering the house.	images at a higher resolution.	locked or unlocked.
[4]	In this project, the lights and	Reduced power consumption;	The use of upgraded sensors increases
	fans are automatically controlled	Cost-efficient; User Friendly;	the precision of the sensor making the
	by the external light as well as	Easy maintenance.	system more efficient.
	Human presence and room		
	temperature respectively.		
[5]	The most basic implementation	This system, rather than making	The project can be scaled by adding
	includes the use of an LDR	people physically go and turn	more control towards household
	sensor for light intensity and an	appliances on or off, makes	components.
	IR sensor to detect human	people control from sitting	
	presence.	anywhere not only in its	
		circumference but from anywhere	
		in the world.	

III. PROPOSED SYSTEM

The Home automation would be controlled by the wi-fi network in Blynk android application. The wi-fi home automation can be used easily to make "ON" and "OFF" by using the command in the Blynk application. We would make the home automation do the various task using Wireless Fidelity (Wi-Fi) network technologies.

These are the major objectives of our project:

- 1) Would be able to control your home appliances such as Tv, Fan, Bulb, LED's, etc. with the help of your smartphone from anywhere around the globe.
- 2) An Esp8266 Module (NodeMCU) will accept the commands from your smartphone wirelessly through the internet.
- 3) The command logs are stored in the Blynk app server.



Figure 1: Working principle of Blynk



IV. SYSTEM DESIGN AND ANALYSIS

A. System Design and Analysis

The system block diagram represents the interface of all major system components to give a brief overview of the overall functionality/working details of the system. It should show all major system components, interfaces to the outside world, and interfaces between subsystems.



B. Hardware Requirements

1) NodeMCU-ESP8266 Wi-Fi Development Board



Figure 3 : NodeMCU

NodeMCU is a low-cost open-source IoT platform, It initially included firmware that runs on the ESP8266 Wi-Fi SoC from Express if Systems, and hardware that was based on the SEP-12 module. Later, support for the ESP32 32, 32-bit MCU was added.

The term NodeMCU stands for the Node Microcontroller unit. It has an open-source hardware and software environment. NodeMCU is also called Devkit 1.0. It is a board system on chips (SoC) called ESP-8266. The ESP8266 is a low-cost microchip full of TCP/IP stack and microcontroller capability. The ESP8266 is the name of a microcontroller designed by Express if Systems. The ESP8266 itself is a self-contained WiFi networking solution offering as a bridge from the existing microcontroller to WiFi and is also capable of running self-contained applications. This module comes with a built-in USB connector and a rich assortment of pinouts. With a micro USB cable, you can connect the NodeMCU devkit to your laptop and flash it without any trouble, just like Arduino. It is also immediately breadboarded friendly.



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Figure 4: Pin Diagram of NodeMCU

2) 2-Channel Relay Module



Figure 5: 2-Channel Relay Module

This is a 5V 2-channel relay interface board, and each channel needs a 15-20 mA driver current. It can be used to control various appliances and equipment with a large current. It is equipped with high-current relays that work under AC250V 10A or DC30V 10A. It has a standard interface that can be controlled directly by the microcontroller.

- 3) Pin Description
- *a*) Input: 0-5 V
- b) VCC: Positive supply voltage
- c) GND: Ground
- d) IN1--IN4: Relay control port
- e) Output: supports various types of loads
- f) Connect a load, DC 30V/10AC, 250V/10A





Figure 6: Schematic Representation

This is the actual circuit diagram/ schematic diagram of the implemented hardware project. A thorough explanation of the working operation of the project will be presented here in different scenarios.

C. Software Requirements

The required software with its version that has been used either for simulation or implementation of the proposed project will be described here with their features. Examples, like the use of Arduino IE and other similar tools. The system requirements for the software to work will also be listed here.

Blynk application and Arduino IDE Preparation and Running:

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4	Button Settings	← Project Settings		Widget Box	
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B		Generate Link		Styled Button	
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	PUSH SWITCH	Add Shortcut		C Timer	
0120FT OFF		Your Launcher app might not support sh	ortcuts	Joystick	
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DESIGN				Ston H	

Figure 7: Blynk App

This project is running by the Blynk application. Download the application to a smartphone from the Google play store and then create a project on it with four switches. Set buttons to be switched on D1, D2. Figure 5 shows screenshots from the Blynk application.



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IMPLEMENTATION

V.

A. NodeMCU Code via Arduino IDE

ketch_jul29a	Auto Format Archive Sketch Fix Encoding & Reload	Cbi+T	
<pre>// You should // Go to the char auth[] = // Your WiFi // Set passwo char pass[] = void setup() { // Debug co Serial.begin // You can // Flynk.begin // Flynk.beg }</pre>	Serial Monitor Board: "NodeMCU 1.0 (ESP-12E Modul Flash Size: "4M (no SPIFFS)" Debug port: "Disabled" Debug Level: "None" IniP Variant: "v2 Lower Memory" SSL Support: "All SSL ciphers (most cor VTables: "Flash" CPU Frequency: "80 MHz" Exceptions: "Disabled" Upload Speed: "115200" Erase Flash: "Only Sketch" Port	ctri+Shift+M	LilyPad Arduino Arduino Pro or Pro Mini Arduino NG or older Arduino Robot Control Arduino Robot Motor Arduino Gemma ESP8266 Boards (2.5.2) Generic ESP8266 Module Generic ESP8285 Module ESPDuino (ESP-13 Module) Adafruit Feather HUZZAH ESP8266 Invent One
	Programmer: "Arduino as ISP" Burn Bootloader	3	XinaBox CW01 ESPresso Lite 1.0 ESPresso Lite 2.0
<pre>i loop() iynk.run(); ' Tou can in ' Check othe ' to avoid d</pre>	ject your own code or combine it r examples on how to communicate elay() function!	with other sketches with Blynk, Remember	Phoenix 1.0 Phoenix 2.0 NodeMCU 0.9 (ESP-12 Module) NodeMCU 1.0 (ESP-12E Module) Olimer MOD-WIFI-ESP8266(-DEV) Sparkfun ESP8266 Thing Sparkfun ESP8266 Thing Dev SweetPea ESP-210 LOLIN(WEMOS) D1 R2 & mini

Figure 8: Arduino IDE - Selecting NodeMCU Board

To code NodeMCU via Arduino IDE, the NodeMCU needs to be added to the Arduino IDE library first by adding this address to Arduino IDE preferences. After this reference is added to Arduino IDE, download NodeMCU to boards manager and then select NodeMCU 1.0 (ESP12E Module). After nodeMCU is added to Arduino IDE library, upload this code with changing hotspot name and password also token code.

sketch_jul29a A File Edit Sketch Te	rduino 1.6.5 ools Help
sketch_jul29a§	
#include <blynk< td=""><td>SimpleEsp8266.h></td></blynk<>	SimpleEsp8266.h>
<pre>// You should g // Go to the Pr char auth[] = "</pre>	et Auth Token in the Blynk App. Sect Settings (nut icon). Your autho token";
<pre>// Your WiFi cr // Set password char ssid[] = " char pass[] = "</pre>	edentials. 1 to "" for open networks. "youretworksad"; 'your network password";
<pre>void setup() { // Debug cons Serial.begin()</pre>	ole (9600);
Blynk.begin (a // You can al //Blynk.begin //Blynk.begin }	uth, ssid, pass); so specify server: ((auth, ssid, pass, "blynk-cloud.com", 8442); ((auth, ssid, pass, IPAddress(192,168,1,100), 8442);
Void loop() Blynk.run(); // You can in // Check othe // to avoid d	ject your own code or combine it with other sketches. r examples on how to communicate with Blynk. Remember Welay() function!

Figure 9: Arduino IDE - Code

The code includes the hotspot name and password match with the android. The code does not need to identify the relay input, as it is included in [Blynk. run();]. When auth (auth token) is given by Blynk application sent as email and SSID is the name of smartphone hotspot.



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VI. SIMULATION

The purpose of the discussion of the results is to communicate what was learned and how the results lead to the conclusions. The results are discussed in terms of what they show about the results and what they mean in the context of the goal of the report.

A. System Flowchart



Figure 10: Flowchart



B. Simulation



Figure 11: Simulation

VII. IMPLEMENTATION



Figure 12: Home Automation System



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Figure 13: After giving ON command to the LED



Figure 14: After giving ON command to Disco Lamp



Figure 15: After switching OFF both the bulbs



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VIII. CONCLUSIONS

While wearing down this struggle, we have grabbed a lot of finding out about various modules being used in this task. We are glad we could build this project as a part of this endeavor and set up new deliberation. We believe the responsibility completes as needed and the data grabbed in the nucleus of this period will be used in our prospective corporate life. Furthermore, we might want to include that home computerization would be the fate of places of the new world. Home automation is a resource that can make the home environment labor-saving. People can control their electrical devices via smartphones. These home automation devices are established controlling action through smartphones. In the future, these outcomes may have tremendous marketing potential.

Future Scope for the home automation system involves:

- 1) Making homes even smarter. Homes can be combined with the sensors including the motion sensors, light sensors, and temperature sensors, and consequently, this may provide the automatic toggling of the devices according to the situations and conditions.
- 2) More energy can be conserved by guaranteeing the occupation of the house before turning ON devices and checking the brightness and turning OFF the light if not required.
- 3) The system can be integrated closely with the home security solutions improving the safety of homeowners.

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