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	GIF (Australia)	= **0.564**	**ESJI** (KZ)	= **8.997**	**IBI** (India)	= **4.260**
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IoT BASED: MOBILE CONTROLLED APPLIANCES WITH ONLINE MONITORING SYSTEM

Abstract: *In the age of information and communications technology, life should be enjoyed with comfort and with convenience. In most developed countries across the globe, the necessity to develop automated systems that are capable of reducing human effort is given the priorities. This project was intended to construct a home automation system that used mobile devices to control home appliances. This home automation system is based on IoT (Internet of Things). This paper proposes the design of the Internet of Things (IoT) home-based automation system using Node MCU (Esp8266 12e). Node MCU is a credit card size computer and it supports a large number of peripherals. Node MCU has a built-in WIFI module that is used to connect to the internet that allows controlling the number of home appliances simultaneously.*

Key words: *system, mobile, automation.*

Language: *English*

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Introduction

The advancement of technology is the language of modern society. With the rapid evolution of computers where the Internet of Things, Big Data, Cloud Computing and the like are the universal direction, appraisal and evaluation of human resources, in a similar manner have to cope with such change. Home automation has made huge advances in recent years. With better technology, home appliances can be operated just by using smartphones through automation and can be adopted in individual homes (Asuncion, J. E. & Secretaria, N. M., 2019). Home automation is a modern technology that modifies our home to perform different sets of tasks automatically (Gulati, 2017). With the increase in consumption of energy and population, there is a grave need to conserve energy in every way possible. The inability to access and control the appliances from remote locations is one of the major reasons for energy loss and unexpected fire incidents (Ahjit et al., 2019). Today, home automation technology is gaining more recognition among people not just for home modification but also in industrial and business sectors too (Asadullah, 2016).

Some of the foreign countries have started the Internet of Things (IoT) concept in which people can operate their home appliances even they are not around. In the Philippines, home automation is not that popular with Filipino people because it is not widely used in the said country. The adaptation of the Internet of Things (IoT) in the Philippines remains in the infancy stage hence the Philippines should adopt new technologies like IoT because technology nowadays has been growing fast and it is more getting high (Panth et al., 2013).

Based on the above-mentioned, the researcher decided to make or invent the IoT Based: Mobile Controlled Appliances with Online Monitoring System where people can easily operate or control their home appliances just by using a smartphone. Isn't a great idea? Yes, with the help of WIFI, node MCU and MQTT dashboard application it is possible.

Methodology

This paper developed an IoT Based: Mobile Controlled Appliances with Online Monitoring system using a design method through node MCU and MQTT dashboard application to control appliances through the internet with online monitoring, this system also can detect motion and send warnings using a buzzer.

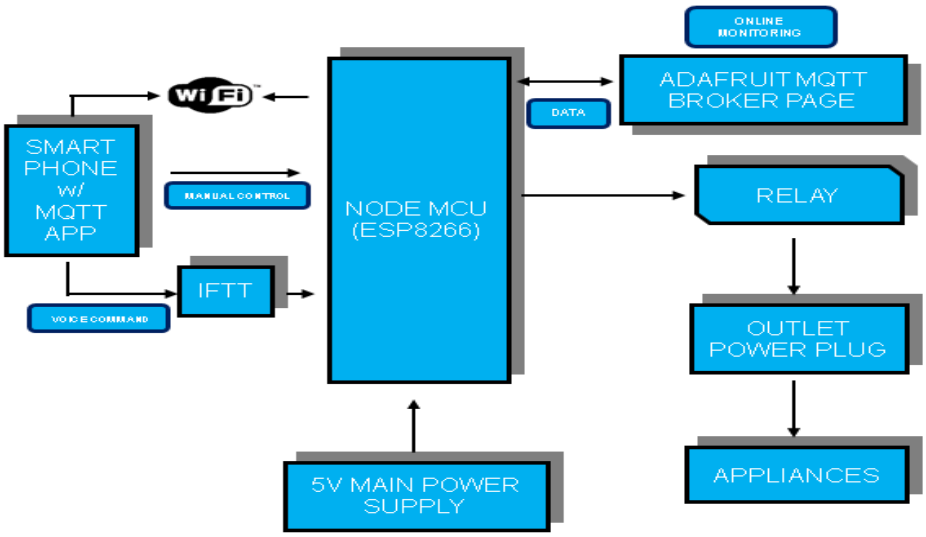

Figure 1. Block Diagram

Figure 1 shows the whole process of the project. The Node MCU is the main microcontroller, it needs to be connected to WIFI, same as the Smartphone with configured MQTT dashboard application on it. Controlling the appliances remotely using manual control will just go directly to the Node MCU and then sends command to the relay on the specified device, if you will use voice command, you command will go to IFTT server, IFTT will convert your command into an input and output so that the Node MCU will understand the command and then it will turn on your specified appliances. ADAFRUIT MQTT BROKER is a server in which all of the data will be gathered and

it will display the collected data on the webpage with the button controls.

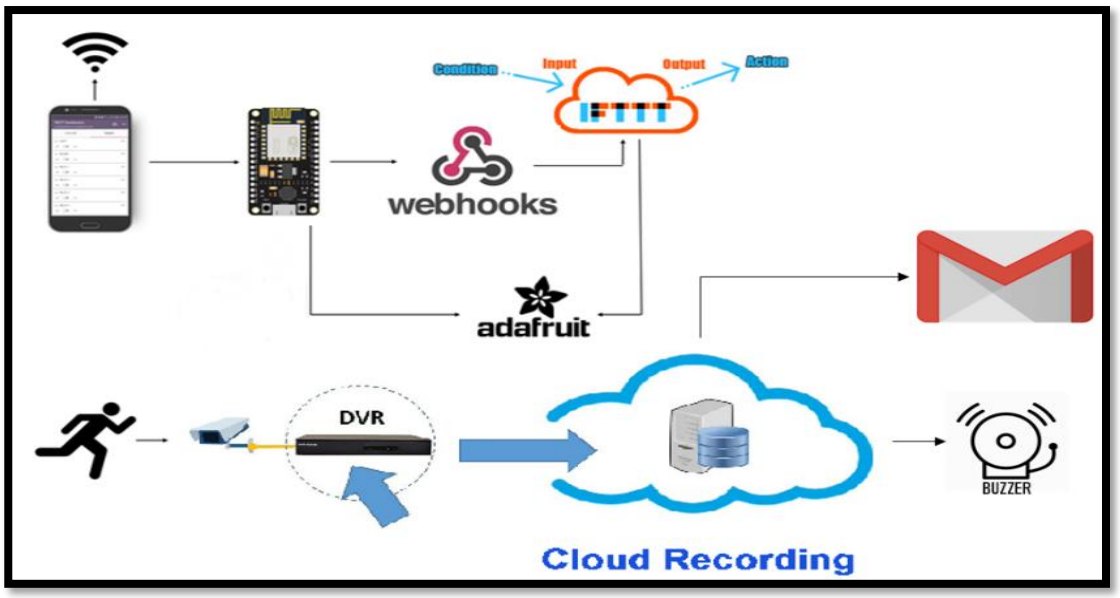

Figure 2. Concept and Overview of the System

Figure 2 presents the Concept and Overview of the System. Since IoT is a network of Internet-connected objects able to collect and exchange data. The illustration above shows the connection between hardware and software and how it is being used in the system. The phone with MQTT dashboard application is connected to the internet to send signals to the microcontroller. The microcontroller will trigger the relays to on/off appliances after the data is recorded, it will be published in the Adafruit MQTT Server. The use of webhooks and IFTTT is to convert the voice command into a signal that a microcontroller will understand to trigger the relays in controlling the appliances. Built-in motion sensors from CCTV is used to detect whether a human has moved in or out of the sensors range. All data is recorded in DVR cloud recording, it will trigger the buzzer if the sensor detects any movement and it will publish a message to the email account of the user with the date, time and IP address of the sender.

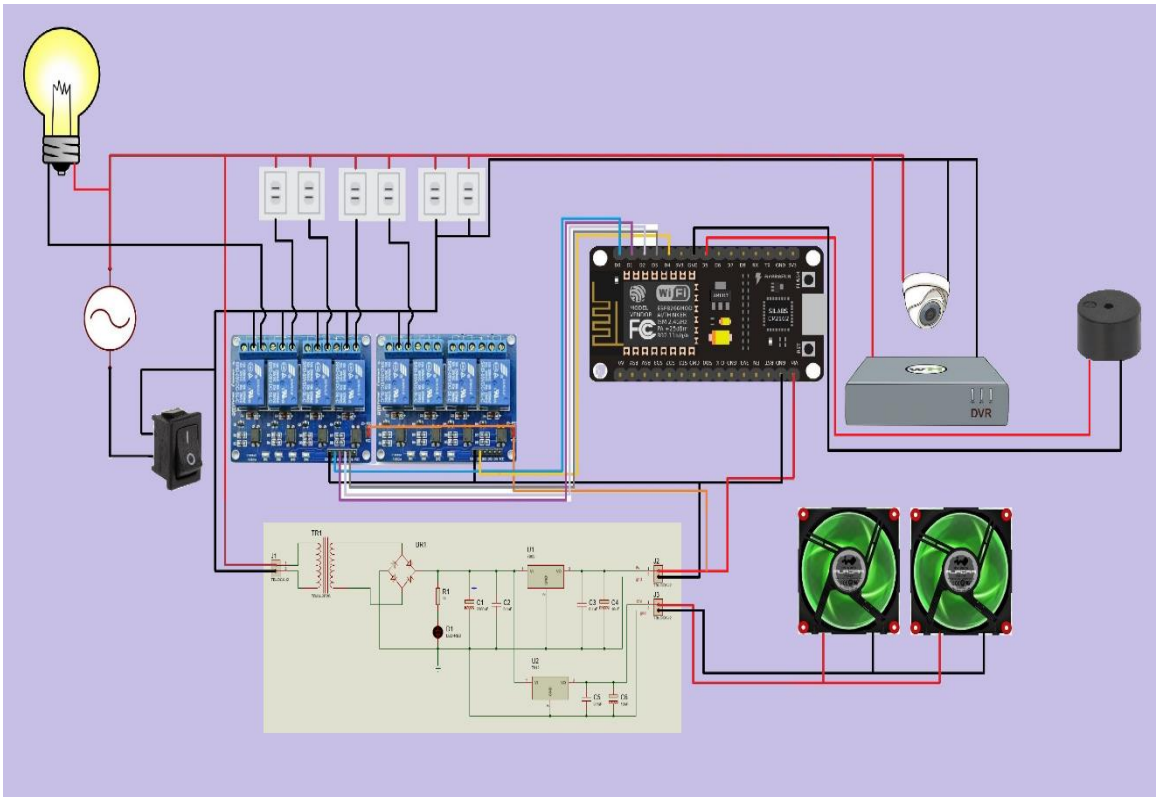

Figure 3. Circuit Design

Figure 3 shows the Circuit Design wherein the Esp8266-12e serves as the microcontroller of the whole system. The relay serves as a switch to on and off appliances with high voltages. Our main power supply that has 5v and 12v output serves as the supply for sensors, node MCU, relay and fans. PIR motion sensor is responsible for sensing motion in the area where the system is located. The two led fans servers as the exhaust fan for cooling the system. The Z-BEN dome-style camera is our main camera for monitoring (if needed) and also motion sensing. The buzzer serves as the alarm if the microcontroller is connected to MQTT server or not. The four electrical sockets are where you will plug the different appliances that you have to switch it on and off. The bulb is directly connected to the system the purpose of the bulb is to check the functionality of the system and also to see if the system is working or not.

The system is controlled by an android application called MQTT dashboard. MQTT dashboard is directly connected to the MQTT server that's why the application and our online monitoring server have simultaneous transferring and publishing of data because it has the same server.

Results and Discussion

Relay Module Test

Performed the test to know how much supply will be used and how it functions properly.

NodeMCU Esp8266 12-E to Wi-fi Connection Test

Performed the test using Arduino IDE by getting the Wi-fi credentials specifically its SSID and password to be inputted in the Esp8266-12e flash memory to ensure the connectivity between the two.

5v and 12v Dual Output Power Supply Test

Performed the test to decide what supply is intended for a certain component.

MQTT Dashboard Mobile Application Test

Performed the test to ensure how efficient its communication to the Adafruit MQTT server and the functionality of the buttons.

IFTTT Test

Performed the test to ensure how efficient its communication to Google's assistant voice commands

CCTV and DVR Test

Performed the test to access through the internet using XMEYE mobile application to be able to monitor the interior of a property.

CCTV built-in Motion Sensor

Performed the test to know how far it can sense motion from CCTV.

Quality Test Results

Table 1. CCTV built-in Motion Sensor

Distance (Feet)	Performance
5	DETECT
10	DETECT
15	DETECT
20	DETECT
25	DETECT
30	DETECT

Table 2. NodeMCU Esp8266 to WiFi Connection Test

No. of Attempts	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Duration of Connectivity in seconds	3	2	2	4	3	3	3	4	3	3

NodeMCU Esp8266 12-E to Wi-fi Connection Test

From the testing and data gathering conducted, the average time duration of the node MCU in connecting to the wifi was computed using the formula.

Connection Duration Time =

$$\frac{t1 + t2 + t3 \ldots + 10}{N}$$

Where:
t = Connection duration time in seconds
n = number of attempts

Using the formula above, the connectivity time duration is equal to the summation of time divided by the total number of attempts that the test had done.

Substituting these values to the equation.

Connectivity time duration in seconds =

$$\frac{t1 + t2 + t3 \ldots + t10}{N}$$

Connectivity time duration in seconds =

$$\frac{3 + 2 + 2 + 4 + 3 + 3 + 3 + 4 + 3 + 3}{10}$$

Connectivity time duration in seconds = 3 s

From the test conducted and doing some computation, the average connection time duration in connecting the Node MCU to the wifi is 3 seconds. This indicates that the Node MCU in the system has a simultaneous connection with wifi and functioning effectively.

Table 3. 5v and 12v Dual Output Power Supply Test

COMPONENT	OPERATED VOLTAGE	
	5V	12V
NodeMCU	YES	YES
FAN	NO	NO

Table 4. Relay module Test

RELAY	Received "ON" test via MQTT Dashboard Mobile Application	Received "OFF" test via MQTT Dashboard Mobile Application	Received "ON" test via MQTT Server	Received "OFF" test via MQTT Server	Performance
RELAY 1	1	1	1	1	DETECT
	2	2	2	2	DETECT
	3	3	3	3	DETECT
	4	4	4	4	DETECT
	5	5	5	5	DETECT
RELAY 2	1	1	1	1	DETECT
	2	2	2	2	DETECT
	3	3	3	3	DETECT
	4	4	4	4	DETECT
	5	5	5	5	DETECT
RELAY 3	1	1	1	1	DETECT
	2	2	2	2	DETECT
	3	3	3	3	DETECT
	4	4	4	4	DETECT
	5	5	5	5	DETECT
RELAY 4	1	1	1	1	DETECT
	2	2	2	2	DETECT
	3	3	3	3	DETECT
	4	4	4	4	DETECT
	5	5	5	5	DETECT
RELAY 5	1	1	1	1	DETECT
	2	2	2	2	DETECT
	3	3	3	3	DETECT
	4	4	4	4	DETECT
	5	5	5	5	DETECT

The IoT Based: Application Controlled Appliances with Online Monitoring System was evaluated through designing and developing features. The test results show that its hardware and software go along based on several examinations and observations. The capability of the system can satisfy the users in controlling and monitoring their appliances wherever they are.

After the series of tests and validation conducted to the system device, it was proven reliable and functional. The tests and examinations conducted on the IoT Based: Application Controlled Appliances with Online Monitoring System was proven functional and reliable. It has the capability of controlling and monitoring appliances anywhere in the world as long as there is an available internet connection, the users can control and monitor any appliances or devices that is/are attached to the system.

Conclusion

This research has presented a technological manual and a prototype device of IoT Based: Application Controlled Appliances with Online Monitoring System for homes, schools, companies and other establishments. The conclusion of IoT Based: Application Controlled Appliances with Online Monitoring System for homes and different establishments is to control and monitor the appliances even though they are miles away, as long as they have internet connection, using the mobile application or the MQTT server, they can manually and easily control the devices attached to the system. The system will also send emails to the users/owners' emails if there is a motion detected from the CCTV camera.

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