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Home Automation Using NodeMCU

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ABSTRACT: Advancements in technologies have developed more interest in automation therefore leading it to be a topic of attraction. Typically, a home network not only consists of devices like laptops, smartphones and tablets but also consists of Home Automation devices which could make human life much easier. One of the central drivers of automation system developments are IoT. IoT has become a great help for the new generation technologies such as Smart Home (SH) and, Embedded Systems.

A simulative example of Home Automation is demonstrated in this project. A home-automated model has been created to give a realistic view of a smart home. The softwares required to build this model are Cisco Packet Tracer (Packet Tracer 8.2.1 Windows 64) and Blender (3.6). To provide reliable services automation of the home should be adaptable, analytical, and user-friendly. The project states how IoT can help provide a reliable, low-cost, and effective Home Automation System. The main function of the Home Automation System is to collect the sensor data and send it to the currently connected device(s) of the client. Different sensors are being used for achieving various functions of the Smart Home.

The system connects various sensors including NodeMCU and updates their data to the client's logged-in device. This results into a great help for building a system that is automated, cost-effective, user-friendly, and effective power consumption.

KEYWORDS: Smart Home (SH), IoT, NodeMCU, Home Automation, Embedded Systems, sensors, network.

I. INTRODUCTION

A home is one's dwelling or where one lives, who would not like to have a perfect home? Adding automation to a home can bring you one step closer to a perfect home.

The developed home automation system is now capable to satisfy the basic needs of user in the fast-upcoming life by providing features such as automatic fans, lights, sprinkler systems in gardens, motion detection and many more.

The system has successfully achieved the goal of developing a smart home with multiple strengths that is cost effective, user-friendly and helps to achieve effective power consumption. By using this system, we can overcome basic problems such as decrease in work-life productivity, inappropriate use of time, and unnecessary energy consumption.

It feels much pleasant and convenient to have home automation system in affordable costs that can improve our lives. Numerous chores that would ordinarily need to be done by hand, such as turning on and off lights and fans, modifying thermostats, and locking and unlocking doors, can be automated.

II. RELATED WORK

"Artificial intelligence and IoT technology provide a tremendous amount of insights to improve the lives inside of buildings," said Srijnan Sanyal, Leader, Global Watson IoT Industry Lab. "This includes personalization, energy management, digital assistants, security, and more." [1]

Future scope for the home automation systems involves making homes even smarter. Homes can be interfaced with sensors including motion sensors, light sensors and temperature sensors and provide automated toggling of devices based on conditions. More energy can be conserved by ensuring occupation of the house before turning on devices and checking brightness and turning off lights if not necessary. The system can be integrated closely with home security

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solutions to allow greater control and safety for home owners. The next step would be to extend this system to automate a large-scale environment, such as offices and factories. [2]

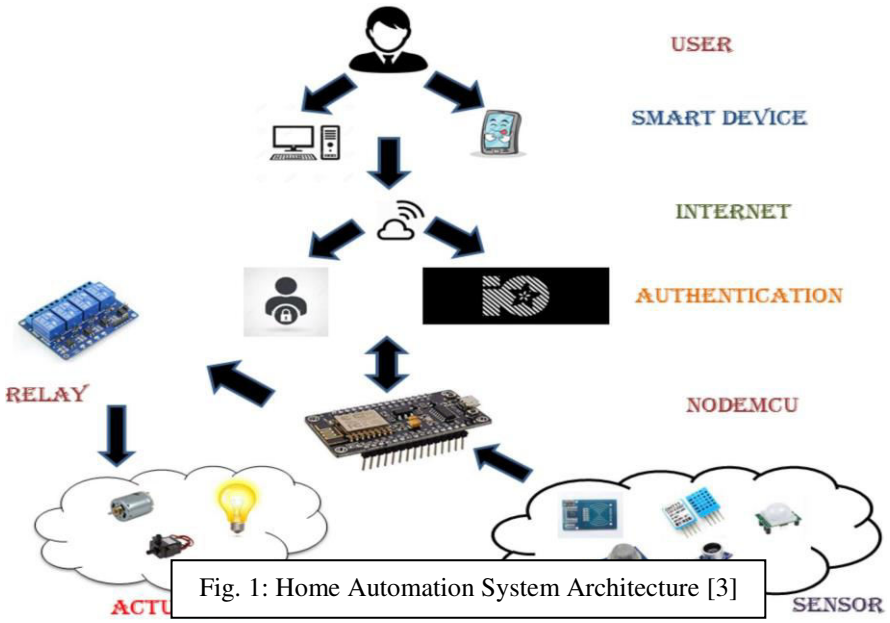

Fig. 1: Home Automation System Architecture [3]

A motion sensor a non-user-controlled feature of the home automation system. It detects motion and movement in an area. These sensors stand guard when you are not home; they can alert you if there is movement within your home, or if your doors or windows have been opened or closed.
Motion sensors become an extra pair of eyes for you, alerting you to unwanted activity in your home such as a teen sneaking out (or in), or if a child enters a restricted area in the home such as a medicine cabinet. [4]

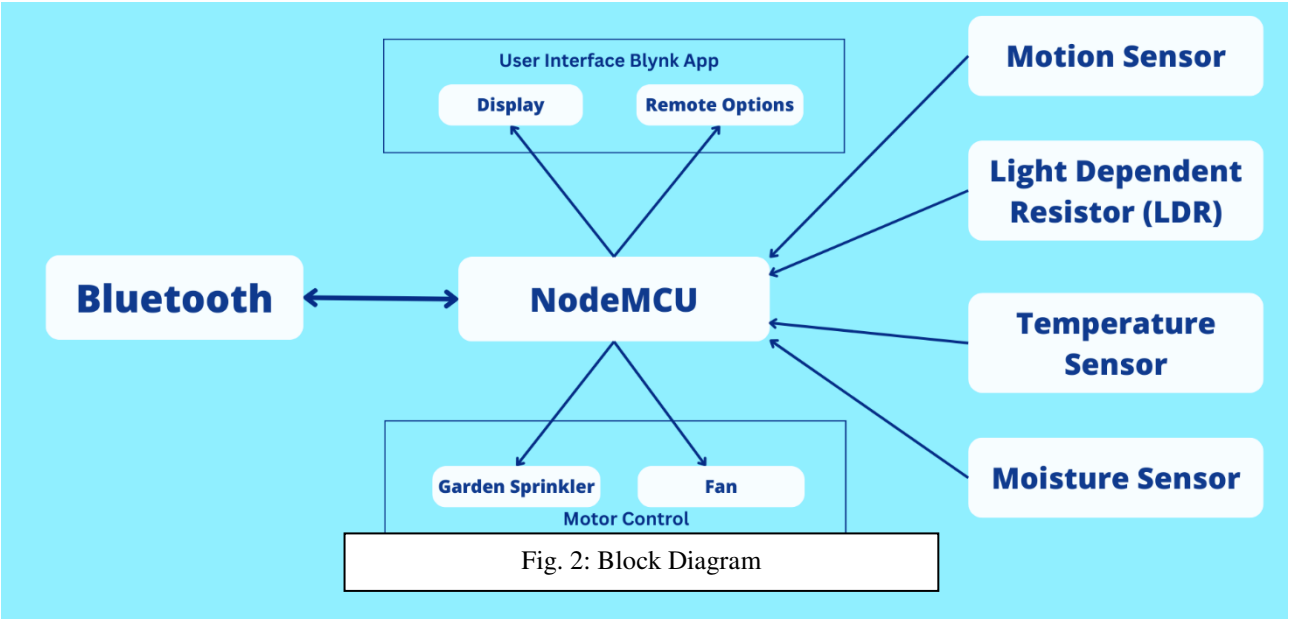

Fig. 2: Block Diagram

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III. PROPOSED ALGORITHM

A. *Hardware Prototype Designed:*

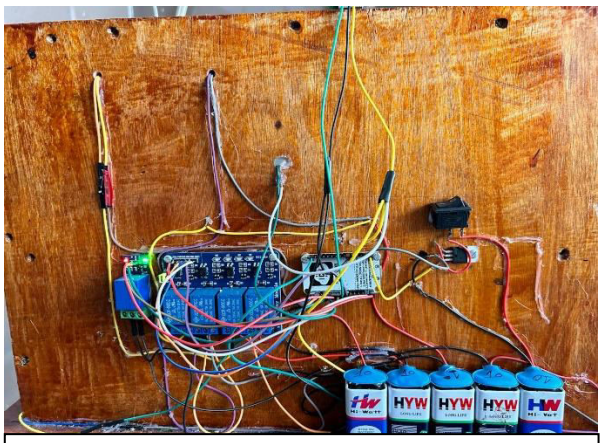

Fig. 3: Supporting wires of the module

Fig. 4: Wooden Home Design with appliances

B. *NodeMCU Working Algorithm:*

Step 1: Include necessary libraries:
- ESP8266WiFi.h
- BlynkSimpleEsp8266.h

Step 2: Define Blynk template ID, name, and authentication token.
Step 3: Define variables for authentication token, WiFi SSID, and password.
Step 4: Define Blynk write functions for controlling devices:
- V0: Fan
- V1: Home Light
- V3: Sprinkler

Step 5: Setup function:
- Set pin modes for various devices:
  D0: Fan
  D1: Home Light
  D3: Sprinkler
  D4: Buzzer
  D5, D6: Ground lights (D5 as input for LDR, D6 as output)
- Begin serial communication at 9600 baud.
- Initialize Blynk with authentication token, WiFi SSID, password, and Blynk server address.

Step 6: Loop function:
- Run Blynk.
- Check the LDR sensor connected to pin A0:
  if (digitalRead(D5) == HIGH)
    turn off the ground lights
  else
    turn on the ground lights.
  end
- Read the analog input from the motion detector (connected to pin A0).
  - Print the analog value to the serial monitor.
  if (analog < 50)
    Activate the buzzer connected to pin D4.
  else
    turn off the buzzer.
  end

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IV. WORKING PROGRAM

```
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>

#define BLYNK_TEMPLATE_ID "TMPL36OEUqqXm"
#define BLYNK_TEMPLATE_NAME "Home Automation Using Node MCU"
#define BLYNK_AUTH_TOKEN "QDQ2bZp6sXMIlJjkWmcQu8i4P-23ZIas"

char auth[] = BLYNK_AUTH_TOKEN;
char wifi[] = "Prem 1";
char pass[] = "12345678";

BLYNK_WRITE(V0) //For Fan
{
  digitalWrite(D0, !param.asInt());
}
BLYNK_WRITE(V1)// For home Light
{
  digitalWrite(D1, !param.asInt());
}
BLYNK_WRITE(V3)//For Sprinklar
{
  digitalWrite(D3, !param.asInt());
}

void setup()
{
  //D0 Fan
  pinMode(D0, OUTPUT);

  //D1 Home Light
  pinMode(D1, OUTPUT);

  //D3 Sprinklar
  pinMode(D3, OUTPUT);

  //D4 Buzzer
  pinMode(D4, OUTPUT);

  //D5, D6 Ground lights
  pinMode(D5, INPUT);
  pinMode(D6, OUTPUT);

  Serial.begin(9600);
```

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```
  Blynk.begin(auth, wifi, pass, "blynk.cloud", 80);  // Corrected typo in Blynk.begin
}
void loop()
{
  //Initaite Blynk Software
  Blynk.run();

  //Ground light controlled by LDR
  if(digitalRead(D5) == HIGH)
   {
     digitalWrite(D6, LOW);
   }
   else
   {
     digitalWrite(D6, HIGH);
   }

   //Motion Detector
   int analog = analogRead(A0);
   Serial.println(analog);
   delay(100);
   if(analog < 50)
   {
      //delay(5000);
      digitalWrite(D4, HIGH);
   }
   else
   {
      digitalWrite(D4, LOW);
   }
}
```

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V. SIMULATION RESULTS

After successful execution of the program on the NodeMCU with the Bluetooth Connectivity the results are as per the proposed model in the planning stage.

Fig. 5: Working Fan

Fig. 6: Working LDR

Fig. 7: Working Lights & Sprinkler

VI. CONCLUSION AND FUTURE WORK

As a whole, the study demonstrated user-friendly functioning, real-time working, and the fundamental principle of the Home Automation System. The recommended techniques increased the system's features. The developed IoT Home system enabled real-time monitoring of interior conditions and appliance management, and it was straightforward to install in an actual home.

Related work helped to clarify many issues and points of view that needed to be considered while designing a Home Automation System. Using data and context from several study publications simplified other themes. The created system might potentially be improved in preparation for future marketing.

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