Smart Classroom using Raspberry Pi

Manjunath H
ECE department
NIE-IT Mysuru,India

Prathosh T S
ECE department
NIE-IT Mysuru,India

Phalguni Nagendra
ECE department
NIE-IT Mysuru,India

Raghvendra M Prasad
ECE department
NIE-IT Mysuru,India

***ABSTRACT* - Presently automation using IOT has become the major attraction and is thriving everywhere, here we are trying to control the home appliances and entertainment systems using internet and the google assistant. The main peep of this project along with automation is the usage of Google Assistant, where we are inducing the technology into the simple voice mechanism. The backbone of this project is Raspberry pi.Smart classroom using Raspberry pi is very simple and an effective user interface. It eases the user to control the device effortlessly and successfully. The project will reach most of the people expectation as it is controlled only via voice where we don't even have to touch it. And coming to the class room automation it is everyone's favourite. We found designing and developing this interactive project very interesting and a good learning experience**

Keywords—Automation, Internet, Google Assistant, Raspberry pi,

I. INTRODUCTION

There is always an eye on and use of Automation in various fields. It gives a very flatten control on electronic devices. Virtual Assistant is often coming into picture, and is taking the technology to different level. We find Virtual Assistant in most of the electronic applications like smartphones, computers, TV etc. Internet of Things is the idea of commonplace objects – from engineering machines to wearable devices – using in-built sensors to accumulate data and take action on that data across a network. To put it in simple words, "Internet of Things" is the upcoming technology that can make our lives more effective. Devices that were utilized on a grander scale for decades, but it's only been in the past several years that we've seen the IoT's true potential. As concept grew wireless Internet became more universal, embedded sensors grew in superiority and people began accepting that technology could be a personal tool as well as a professional one. The main inspiration behind this project is to bring out the new ways of interaction between the individual andthe technologyimplemented in the classroom. It will make learning striking and easier.

II. SYSTEM DESIGN

Smart classroom is composed of two controller, L293D motor driver IC, stepper motor,relay,DHT11.The system block diagram is shown in figure 1.

A. Controllermodule

The controller is the "brain" of the smart classroom ,which ensures the normal operation of the smart classroom parts.

Raspberry pi- It encompasses of 1.2GHz Broadcom BCM2837 64bit processing unit,RAM of 1GB, wireless LAN- BCM43438 and Low EnergyBluetoothon board, Ethernet base 100, GPIO pins-40, 4 USB 2 ports and micro port for loading your operating system and storing data.

Arduino – A microcontroller board built on the ATmega328. It is an open-source, prototyping stage . The Arduino Uno consists of 14 digital input/output pins in which 6 can be used as PWM pins, 6 analog inputs pins, one crystal oscillator of 16 MHz, one USB connection, jack for power supply, ICSP header, and a button for reset.

B. Stepper Motor(NEMA17)

This bipolar four wired stepper has 1.8 degree rotation per step for smooth motion and aadequate holding torque. Motor has a capabilityto hold maximum current of350mA so that it could be driven smoothly with an L293D driver component for Arduino and a wall adapter or lead-acid battery [4]. Few details include a ready-to-go cable and a machined drive shaft .

C. Google Assistant API

Google Assistant software development kitallow you to add hotword detection, voice control,natural language understanding and Google's smarts to your thoughts [1]. Project identifies a note, directs it to the Google Assistant, and accepts a spoken audio response in addition to the text of the spoken word [2]. The library revels a high level, event-based API that is easy to extend. It provides the following features out of the box:

Hands-free activation[3] - activate by saying "Hi Google" or "Ok Google", just like with Google Home!, Audio capture and playback, Conversation state management, Timer and alarm management.

D. Motor driver module(L293d)

L293D holds two intrinsic H-bridge driver circuits. Action in its common mode, concurrently two DC motors can be driven, in clockwise as well as inanticlockwise trend. The actions of two motors can be owned by input logic atpins two, ten, sevenand fifteen. Input logic 11 or 00 will stopthe relative motor. Logic 10 and 01 will rotate it in anticlockwise and clockwise directions, independently. Pin diagram is shown in figure 2.

E. IFTTT

All theservices has its own actions with a particular set of triggers. Triggers are "this" part in an applet [8]. They are used to trigger the action. Actions are "that" part in an applet. They are the output for the given input trigger.

F.Particle IDE

Particle is a stage for interacting with physical devices. In addition to development tools, particle offers a distributed operating system for the Internet Of Things and also a web IDE that allows us to access the devices wirelessly that brings the power of the cloud to low cost connected hardware.

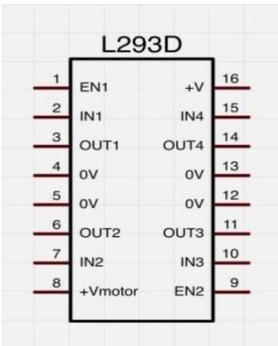

Fig. 1. Figure 2 L293D pin diagram

G. Data Acquisition Module Circuit

Data acquisition module uses smoke sensor, carbon monoxide sensor to detect the environment and transmits the collected info to the microcontroller [5]. Figure 3 is the circuit design of the data acquisition module. Ionization-type smoke alarms have a slight amount of radioactive material between two electrically charged plates, that ionizes the air and causes current to flow between two plates. When smoke enters the chamber, it disturbs the flow of ions, thus decreasing the flow of current and triggering the alarm.

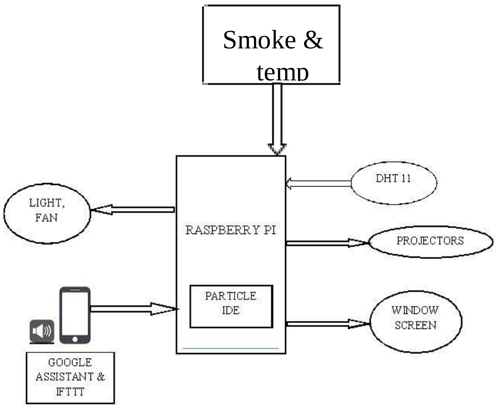

Fig. 2. Block Diagram of System

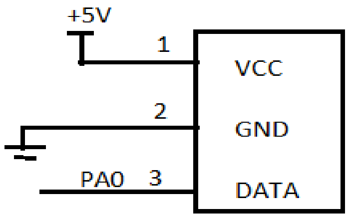

Fig. 3. Figure 3 Data acquisition module

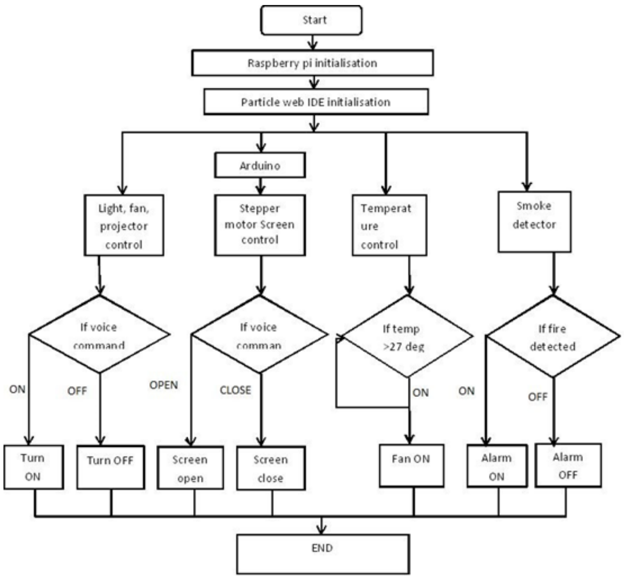

Fig. 4. Figure 4 Flow diagram of main program

III. DESIGN OF SYSTEM SOFTWARE

Installation of stretch to Raspberry pi

Step 1: Download the stretch image
Step 2: Put your SD card into your computer
Step 3: Use Etcher to burn OS to the SD card
Step 4: Format the SD card
Step 5: Download and launch the Win32 disk manager.
Step 6: Flash the SD card
Step 7: Boot your pi
Step 8: Update and upgrade pi using sudo apt-get update and sudo apt-get dist-upgrade

Raspberry pi program design

Raspberry pi main program is written using C-language, C-language can invoke various Linux operating system software based on network, can get online sharing. Raspberry pi main program flow diagram is shown in figure 5.

Algorithm:

Step 1: Raspberry pi booting up the essential software.

Step 2: Starting the particle software packet in raspberry pi

Step 3: Take voice command form mobile through Google assistant

Step 4: Google assistant will match with the library of input that we have created in Ifttt API

Step 5: Ifttt call the Handel to access the particle API

Step 6: Particle API will Handel the request and will send instructions to raspberry pi through Internet

Step 7: Raspberry pi will execute the instructions and control the specific hardware based on the voice command input

Step 8: Return to step 3 for new input commands

Step 9: Stop when completed and shutdown

Code for Raspberry pi and Arduino

Particle code:

```
int relay = D0; //pin to which relay is connected
int stepper = D8;
bool vin = LOW;
bool v1 = LOW;//a virtual boolean variable

void setup()
 {
pinMode(relay,OUTPUT); // relay pin is set as output
digitalWrite(relay,HIGH);
    pinMode(stepper,OUTPUT);
digitalWrite(stepper,LOW);
    // Subscribe to events published by IFTTT using
Particle.subscribe
    Particle.subscribe("Unique_Event_Name",myHandler);
    Particle.subscribe("Unique_Event_Name2",
thisHandler);
    Particle.subscribe("Unique_Event_Name3", tHandler);
    Particle.subscribe("Unique_Event_Name4", sHandler);
    }
void loop()
 {
    if (vin==HIGH)
    {
    digitalWrite(relay,HIGH);
    }
    if (vin==LOW)
    {
    digitalWrite(relay,LOW);
    }
    if (v1==HIGH)
    {
    digitalWrite(stepper,HIGH);
    }
    if (v1==LOW)
    {
    digitalWrite(stepper,LOW);
    }
    }
//our events are called when IFTTT applets are triggered
    void myHandler(const char *event, const char *data)
    {
    vin = HIGH;
    }
    void thisHandler(const char *event, const char *data)
    {
    vin = LOW;
    }
    void tHandler(const char *event, const char *data)
    {
    v1 = HIGH;
    }
    void sHandler(const char *event, const char *data)
```

```
{
v1 = LOW;
}
```

Arduino code:

```
#include <Stepper.h>
const int stepsPerRevolution = 400;
int che=2;
Stepper myStepper(stepsPerRevolution, 12, 11, 10, 9 );
void setup()
{
pinMode(che,INPUT);
myStepper.setSpeed(60);
Serial.begin(9600);
}
void loop()
{
int qwt=digitalRead(2);
Serial.println(qwt);
if(qwt==HIGH)
{
Serial.println("clockwise");
myStepper.step(stepsPerRevolution);
delay(500);
}
else if (qwt==LOW)
{
Serial.println("counterclockwise");
myStepper.step(-stepsPerRevolution);
delay(500);
}
}
```

IV. SYSTEM DESIGN IMPLIMENTATION

The acute perseverance of implementing this project is to convey out the new ways of collaboration among the individual and the technology. The development will reach most of the anticipation as it is controlled via voice where we don't even have to touch, so which is easy and saves energy [6]. The appliances and other systems generally used in households and organization will be able to manage. Households and organizations are consuming much power today than industries and businesses. Figure 4 shows the basic working of the project, here the backbone is Raspberry Pi which acts as a regulator in which the Particle API is been installed, which inturn helps the Raspberry Pi to control appliances like lighting, fan, projectors through voice commands. Initially, voice commands are given through cell phone using Google assistance, Google assistance evokes the IFTTT applets then certain conditional statements is sent to particle IDE, particle IDE uses c programming language to flash raspberry pi wirelessly via web IDE.The lights,fansand projectors are controlled using the commands like "TURN ON LIGHTS", "TURN OFF LIGHTS", thesecommands are verified by particle IDE and corresponding actions are carried by relay. Commands such as "SCREENS OPEN", "SCREEN CLOSE" ", these commands are verified by particle IDE and corresponding actions are controlled by Raspberry pi and Arduino through Stepper motor [7], stepper will be loaded with particular set of rotations via code. When the projector "TURN ON or OFF" function is performed simultaneously there will be multiple actions taking place like switching off the lights, closing of window screens and opening of projector screen. The DHT11 sensor senses the temperature and if the room temperature is greater than 27 degree fans will automatically turns on. Smoke sensor detects the smoke and automatically turns on the fan and open the window.

V. CONCLUSION

It has a very simple and an effective user interface. It eases the user to control the device effortlessly and effectively. As mentioned in the beginning the focus is on classroom automation , a classroom automation is what future technology should look like. The project will reach most of the people expectation as it is controlled only via voice where we don't even have to touch things. We found designing and developing this interactive project very interesting and a good learning experience. Here we are integrating Google assistance SDK(Software Development Kit) with using any third party application by manipulating source code. Voice control of GPIOs with IFTTT, API.AI, Actions SDK. Voice control of servo, connected to Raspberry Pi. Safe shutdown of Raspberry Pi using voice command. Remote class monitoring system using camera, Attendance statistics report using raspberry pi

ACKNOWLEDGMENT

This project is supported by the NIE Institute of Technology and the development program department of the NIE Institute of Technology and by the electronics and communication department of NIE Institute of Technology.

REFERENCES

[1] "Design of Smart Mirror based on Raspberry Pi" by Sun Yong, GengLiqing, Dan Ke Tianjin Key Laboratory of information Sensing & Intelligent Control, Tianjin University of Technology and Education, Tianjin,China.

[2] "Google Assistant Controlled Home Automation" Manish Prakash Gupta, MTech.Maharishi Dayanand University, Rohtak, Haryana, India.

[3] "Interactive Home Automation System With Google Assistant" MummakaSaiSrinath, Manepalli Nanda Kishore,M.D. AntoPraveena, Sathyabama institute of science and technology, Chennai, India

ISSN: 2278-0181

[4] "Design Of Stepper Motor Control Interface With Embedded Systems"ErayYılmazlar, Volkan Erdemir, HilmiKuşçu, AydınGüllü (Kırklareli University, Technical Sciences Vocational School, Kırklareli, TURKEY) International Journal Of Engineering Research And Development .

[5] "Iot Based Automated Temperature and Humidity Monitoring and Control"M.Lavanya*, P. Muthukannan, Y.S.S. Bhargav, V. Suresh, Saveetha University, Chennai, Journal of Chemical and Pharmaceutical SciencesISSN: 0974-2115

[6] "Arduino and Raspberry Pi based Smart Communication and Control of Home Appliance System" Praveen Kumar and Umesh Chandra Pati, National Institute of Technology, Rourkela, Odisha 769008. 2016 OnlineIC-GET.

[7] "IoT based Monitoring and Control System for Home Automation"Pavithra.D Ranjith Balakrishnan 2015 Global Conference on Communication Technologies(GCCT 2015)

[8] "AI Controlled Home Appliance Control System Using Iot" Luis Gomes UG student Don Bosco College of Engineering, Goa, India.