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ABSTRACT

This project presents the overall design of Home Automation System (HAS) with low cost and wireless system. This system is designed to assist and provide support in order to fulfill the needs of elderly and disabled in home. Also, the smart home concept in the system improves the standard living at home. . The switch mode and voice mode are used to control the home appliances. The main control system implements wireless technology to provide remote access from smart phone. The design remains the existing electrical switches and provides more safety control on the switches with low voltage activating method. The switches status is synchronized in all the control system whereby every user interface indicates the real time existing switches status. The system intended to control electrical appliances and devices in house with relatively low cost design, user-friendly interface and ease of installation.

ACKNOWLEDGEMENT

We have found this rare opportunity to evince a word of thanks to all those who played a key role in the successful completion of our project. We sincerely thank our Head of Department Dr**.** Parth Shah Sir for giving the chance as well as support for all the time being. And his able guidance and continuous encouragement made us work in all the challenges during project development. We express deep gratitude to assistant Prof. Hemant Yadav internal project guide from Faculty of Engineering, CHARUSAT for their valuable suggestions, help and moral support. We also thank to all those who could not find a separate name but have helped directly and indirectly.

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CHAPTER 1

INTRODUCTION

1.1 Project Overview

Nowadays, people have smart phones with them all the time. So it makes sense to use these to control home appliances. Presented here is a IOT based home automation system using a ESP-32 module, which you can use to control electrical appliances with simple clicks or voice commands through smart phones. Commands send via smart phones through Wi-Fi (for local web server) or internet (for long distance) and are received by ESP-32 module. So you need not get up to switch on or switch off the device while watching a movie or doing some work.

1.2 Scope

The project aims at designing a prototype for controlling the home appliances that can be controlled wirelessly via an application that provides the features of speech recognition and switch mode. An application is run on android device. The system can be used in wide range of areas. The system integrated with different features can be applied in the following fields.

- **The system can be used in home, small offices to the big malls**

  The system can be used from home to offices to control the electrical appliances.

- **For remote access of appliances in internet or intranet.**

  The home/office appliances can be controlled in intra-network or can be accessed via internet.

- **For the development of technology friendly environment**

  The system incorporates the use of technology and making smart home automation. By the use of day to day gadgets we can utilize them for different prospective.

1.3 Objective

The basic aim of Home automation is to control or monitor signals from different appliances, or basic services. A smart phone or web browser can be used to control or monitor the home automation system. The growth of thermostats enables automated control of heating and cooling at a later stage.

CHAPTER 2

SYSTEM ANALYSIS

2.1 User Characteristics

- User should have access to Bluetooth and Wifi.
- It should also have android phone to run the application.

2.2 Tools and Technology

ESP-32:

ESP32 can perform as a complete standalone system or as a slave device to a host MCU, reducing communication stack overhead on the main application processor. ESP32 can interface with other systems to provide Wi-Fi and Bluetooth functionality through its SPI / SDIO or I2C / UART interfaces.

ESP32 is highly-integrated with in-built antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power management modules. ESP32 adds priceless functionality and versatility to your applications with minimal Printed Circuit Board (PCB) requirements.

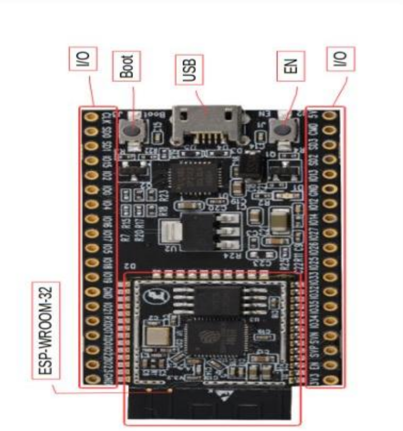


Figure :1 ESP32-DevKitC

2. Wi-Fi technology:

Wi-Fi - Summary. WiFi is a universal wireless networking technology that utilizes radio frequencies to transfer data. WiFi allows high-speed Internet connections without the use of cables. ... WiFi networks operate in the unlicensed 2.4 radio bands, with an 11 Mbps (802.11b) or 54 Mbps (802.11a) data rate, respectively.

Software Require:

Arduino IDE:

Arduino IDE works on the three most popular operating systems: Windows, Mac OS, and Linux. Aside from that, the application is also accessible from the cloud. These options provide programmers with the choice of creating and saving their sketches on the cloud or building their programs locally and upload it directly to the board.

In this project the basic software requirement is the **Aurdino IDE** must be installed , also the drivers for the ESP32-DevKitC development board must also be installed in the system so the port is recognized when the board is interfaced. Other than that the system works on the basics of PHP, HTML .FLASK is a micro web application framework. That means it is basically a set of tools and libraries that make it easier to build web applications in Python. Flask does however include a web server that can be used for testing and development. So here in our system this Flask web framework will act as an offline server so that it can process the request of the client and serve them on the webpage using AJAX**.**

Android Studio:

Android Studio is the official IDE for Android application development, based on IntelliJ IDEA. On top of the capabilities you expect from IntelliJ, Android Studio offers:

- Flexible Gradle-based build system
- Build variants and multiple apk file generation
- Code templates to help you build common app features
- Rich layout editor with support for drag and drop theme editing
- Lint tools to catch performance, usability, version compatibility, and other problems
- ProGuard and app-signing capabilities
- Built-in support for Google Cloud Platform, making it easy to integrate Google Cloud Messaging and App Engine
- And much more

CHAPTER 3

SYSTEM DESIGN

3.1 Flow of System

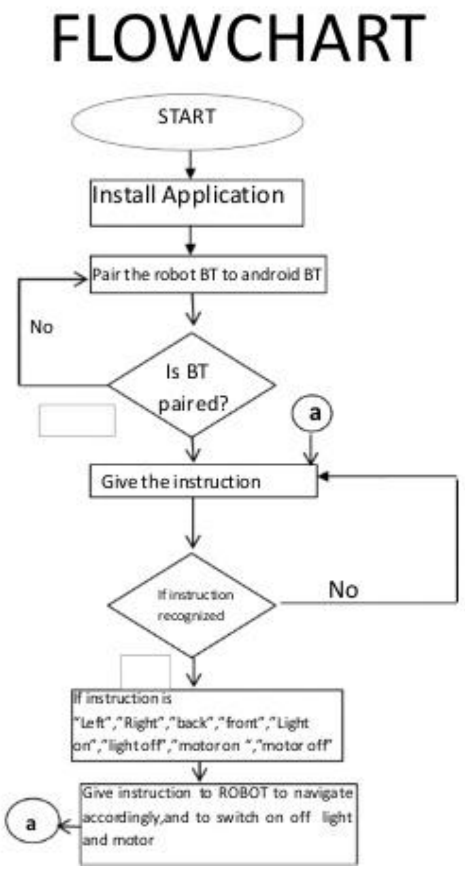

FLOWCHART
START
Install Application
Pair the robot BT to android BT
No
Is BT paired?
a
Give the instruction
If instruction recognized
No
If instruction is "Left","Right","back","front","Light on","light off","motor on ","motor off"
Give instruction to ROBOT to navigate accordingly,and to switch on off light and motor
a

Figure 2: Flow chart

Technology is a never ending process. To be able to design a product using the current technology that will be beneficial to the lives of others is a huge contribution to the community. This paper presents the design and implementation of a low cost but yet flexible and secure cell phone based home automation system. The design is based on a stand alone Arduino BT board and the home appliances are connected to the input/ output ports of this board via relays. The communication between the cell phone and the Arduino BT board is wireless. This system is designed to be low cost and scalable allowing variety of devices to be controlled with minimum changes to its core. Password protection is being used to only allow authorised users from accessing the appliances at home.

3.2 Major Functionality

- ESP32 is already integrated antenna and RF balun, power amplifier, low-noise amplifiers, filters, and power management module. The entire solution takes up the least amount of printed circuit board area.
- This board is used with 2.4 GHz dual-mode Wi-Fi and Bluetooth chips by TSMC 40nm low power technology, power and RF properties best, which is safe, reliable, and scalable to a variety of applications.

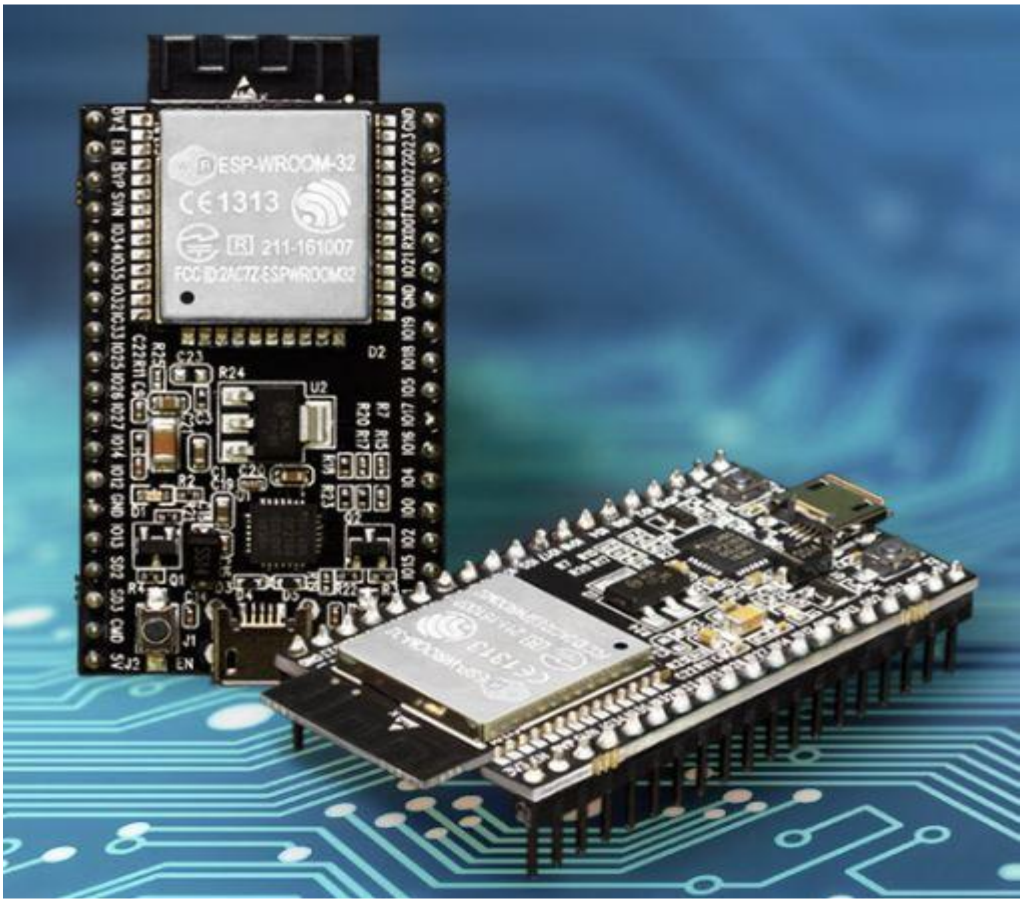


Figure 3: ESP-32

CHAPTER 4

IMPLEMENTATION

4.1 Implementation Environment

Our project is automation using ESP-32. Here, we will be handling the Input-Output pins and switching relays. We can connect our home appliances with the Relay Module that will be driven by ESP-32. For this we need following material.

1. ESP-32 module.

2. USB type C cable – which is needed to program the ESP 32 from our Laptop or PC. Most of the android phones use this type of cable only.

3. Relay Module – Relay is a switching Module. In a relay, we can control switching AC or DC appliances digitally by providing input to relay input pins.

4. Connecting Wires – To connect ESP 32 Pins from the Relay Module Pins.

5. Power Supply for ESP-32(5 Volts or can be powered from Laptop or PC directly via the USB Type C cable) and for Relay 5 Volts.

6. Breadboard or PCB – to have a platform for the prototype.

4.2 Coding Standards

```
#define BLYNK_PRINT Serial

int LED= 2;
int Fan= 22;
#include <WiFi.h>
#include <WiFiClient.h>
#include <BlynkSimpleEsp32.h>

char auth[] = "9bee19a520f9452e81291a31fd5b266b";

char ssid[] = "Raghav";
char pass[] = "12345678";

void setup() {
    pinMode(LED, OUTPUT);
    pinMode(LED, HIGH);
    pinMode(Fan, OUTPUT);
    pinMode(Fan, HIGH);

  Serial.begin(115200);
```

```
    delay(10);
    Serial.print("Connecting to ");
    Serial.println(ssid);

    WiFi.begin(ssid, pass);
    int wifi_ctr = 0;
    while (WiFi.status() != WL_CONNECTED) {
      delay(500);
      Serial.print(".");
    }

    Serial.println("WiFi connected");

    Blynk.begin("9bee19a520f9452e81291a31fd5b266b", ssid, pass);

  }

void loop(){
    Blynk.run();
}
```

4.3 Snapshots of project

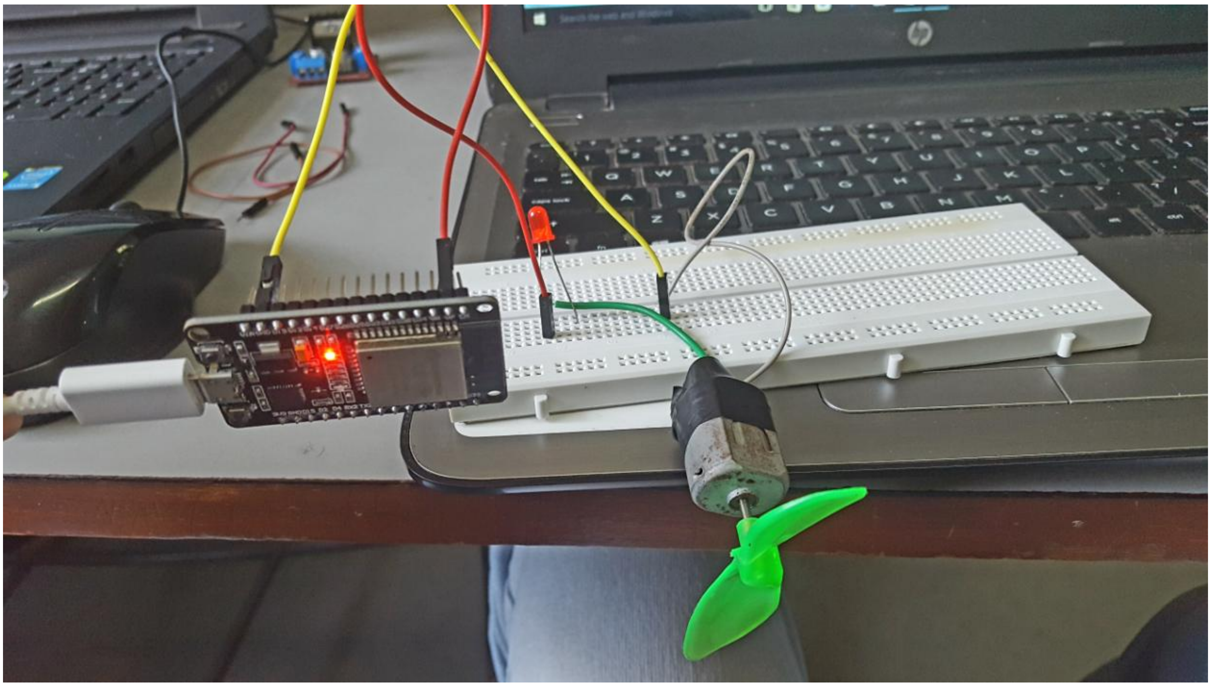
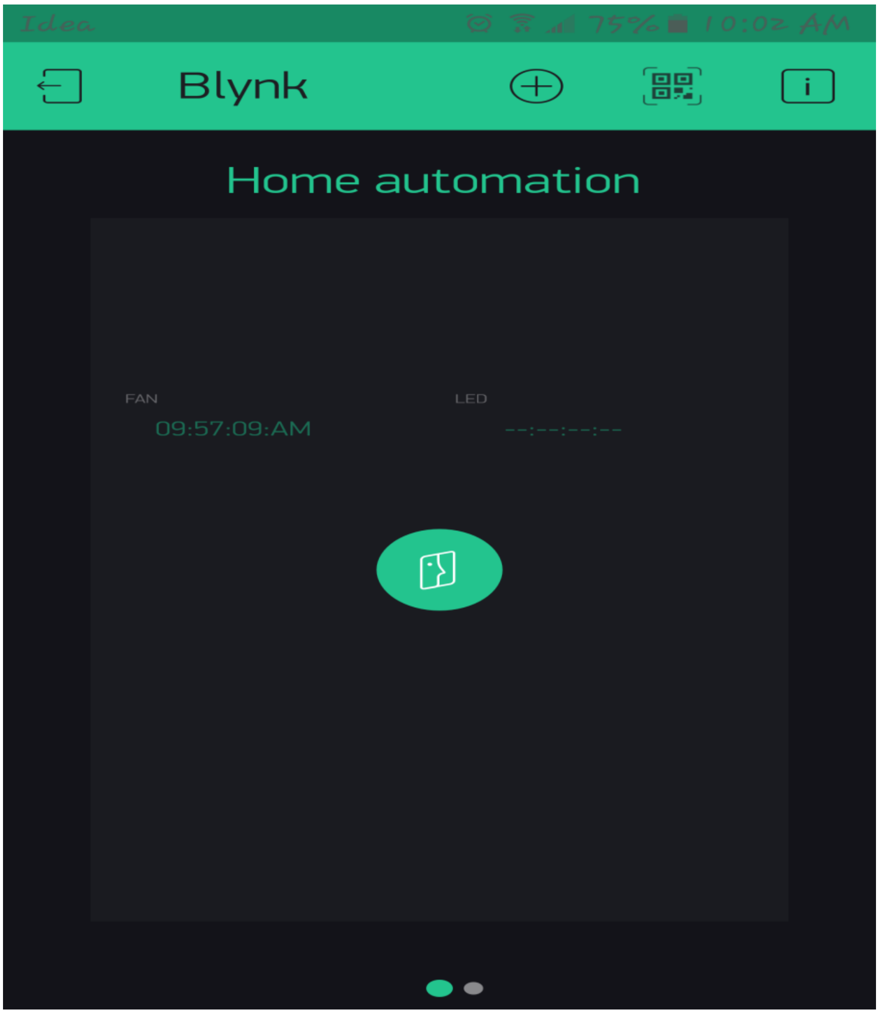


Figure 4: Project



Home automation

FAN
09:57:09:AM

LED
--:--:--:--

Figure 5: Application

CHAPTER 5

CONSTRAINTS

- The major problem was which device should be used for this system raspberry pi or ESP-32.
- Seeing the cost, size and compatibility we used ESP-32.
- Basically ESP-32 is a series of low-cost and low-power system-on-chip (SoC) microcontrollers with integrated Wi-Fi and dual-mode Bluetooth.
- The microcontroller is cheap with low-power consumption and a great number of pins. Evidently, with its varied features, IoT becomes easier when it comes to ESP-32.

- Home Automation System enhances mobility and supports monitoring and control of devices from any remote location within Wi-Fi range.
- Being a simple and user friendly application it serves as an application of great help to the old aged or physically disabled people.

CHAPTER 6

Conclusion

The prime objective of our project is to use the Smartphone to control the home appliances effectively. The switch mode and voice mode are used to control the home appliances. User can easily interact with the android phone/tablet. The user can send commands via the switch mode or speech mode. The data are being analyzed by the application and are sent over a network. The ESP-32 acts as a server, analyses the data and activates the GPIO (General Purpose Input Output) Pins. The GPIO Pins are connected to the relays switch which activated the required home appliances. In this way, automation process is carried out. This is a simple prototype. Using this as a reference further it can be expanded to many other programs.

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