SIMULATION OF HOME AUTOMATION USING ESP32

APPROVAL SHEET

This is to certify that the students of Batch A have developed a working prototype of an embedded system using Arduino with a complete report entitled "**Simulation of Home Automation using ESP32** " in the subject of Embedded Systems, Semester IV, S.E. (I.T.), which is approved by the faculty in-charge of the subject, as a part of the academic curriculum, and is found satisfactory.

EXAMINERS

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Sign: _____

GUIDE

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Date: _____
Place: Farmagudi - Goa

ACKNOWLEGDGEMENT

I would like to thank respected Mrs. Seeya Gude for giving me such a wonderful opportunity to expand my knowledge for my own branch and giving me guidelines to present a seminar report. It helped me a lot to realize of what we study for.

Secondly, I would like to thank my team who helped me to make my work more organized and well-stacked till the end.

Last but clearly not the least, I would thank The Almighty for giving me strength to complete my report on time.

ABSTRACT

The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. An IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors and communication hardware, to collect, send and act on data they acquire from their environments.

ESP32 acts as the brain of the system and processes the data from the sensor. Arduino is an open source hardware platform that is readily available for hobbyists & enthusiasts across the globe to build projects. It comes with an ATMEGA microcontroller that processes the data and facilitates the proper working of the IoT system. And the beauty is that the ESP32 can be programmed ‘n’ number of times making it possible for you to build various types of IoT projects just by changing a simple code.

Smart home systems achieved great popularity in the last decades as they increase the comfort and quality of life. Most smart home systems are controlled by smartphones and microcontrollers. A smartphone application is used to control and monitor home functions using wireless communication techniques. We explore the concept of smart home with the integration of IoT services and cloud computing to it, by embedding intelligence into sensors and actuators, networking of smart things using the corresponding technology, facilitating interactions with smart things using cloud computing for easy access in different locations, increasing computation power, storage space and improving data exchange efficiency.

CONTENTS

CHAPTER 1

INTRODUCTION

PROBLEM DEFINITION

This project aims at developing a system that simulates home automation in IOT.

PURPOSE OF THE PROJECT

The purpose of this project is to allow users to manage their home with their smartphone over Wi-Fi or smart home management platform. The IoT significantly improves the way you can control and monitor all the processes taking place at your home. This helps the user to save time by eliminating the inconveniences caused to them while managing their home manually.

HARDWARE REQUIREMENTS

The Hardware components used for this project are

- ESP32 Module
- LED Bulbs
- RGB Module
- Relay

Additional Peripherals used

- Battery (or any other power source)
- Jumper wires
- Holders
- Breadboard

SOFTWARE REQUIREMENTS

The Software used for this project are

- Android studio (for developing the app)
- Arduino IDE (for coding the ESP32)
- Firebase (database)

CHAPTER 2

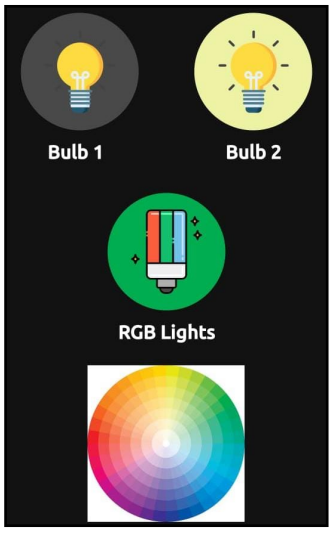
LITERATURE SURVEY

SYSTEM OVERVIEW

This project aims at developing a system that simulates home automation in IOT. This system consists of a controller board -ie- ESP32 module, and Bulbs that are to be controlled using an Android App. We aim to implement digital output (ON/OFF) by turning on/off the bulbs; and analog output (varying the intensity) by changing the colour of RGB LED bulb.

The app and the ESP32 module is connected to an online database (Firebase Database). On click of a button the on the app, the values of different variables change in the database in real-time. The ESP32 reads the value of the variables and accordingly changes the state of the peripheral devices (bulbs).

Firebase

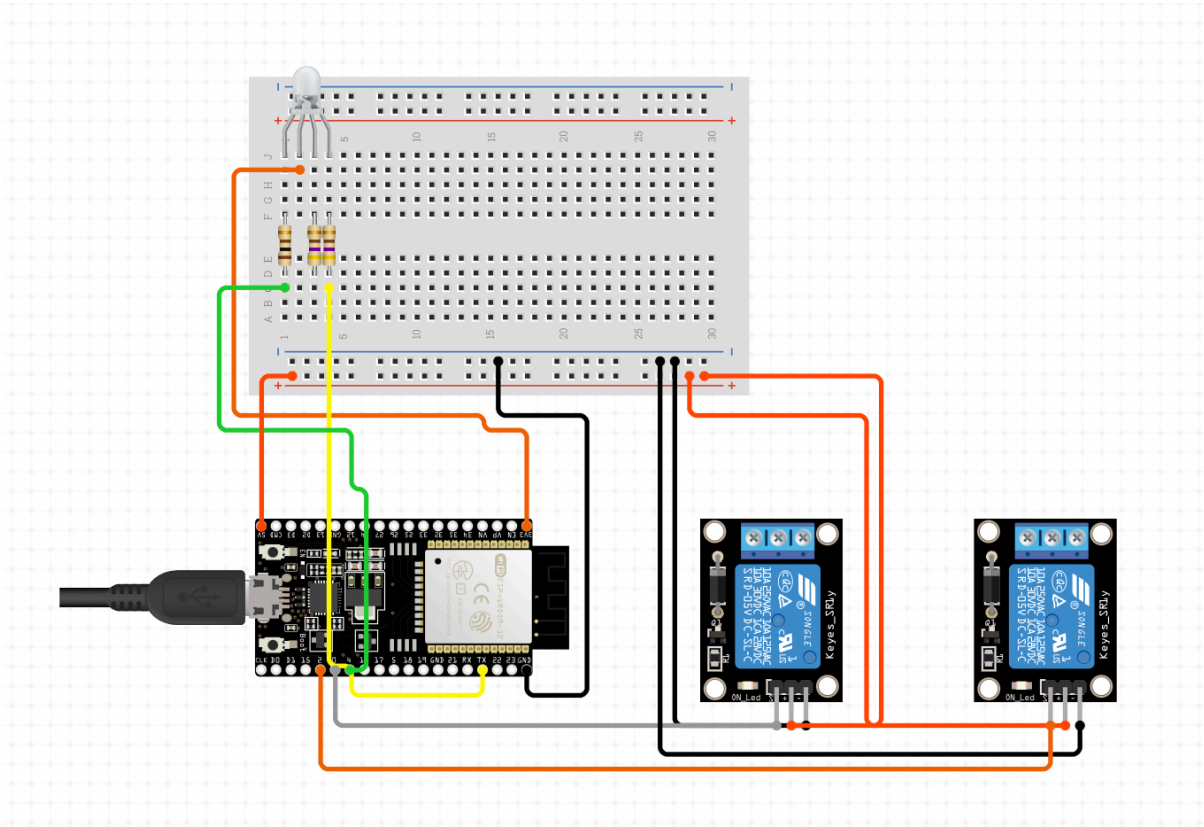


HARDWARE USED AND CIRCUIT DIAGRAM

ESP32 Module

- The integration of Wi-Fi and Bluetooth ensures that a wide range of applications can be targeted. The EPS32 module is very versatile. Using Wi-Fi ensures connectivity within a large radius. ESP32 is the brain of the whole system. Using this we have an interaction between software and hardware.

Circuit Diagram



SOFTWARE USED AND CODE

Android Studio

- Android Studio was used to build the android app (Java).

Arduino IDE

- Arduino IDE was used to program the ESP32 board (C++).

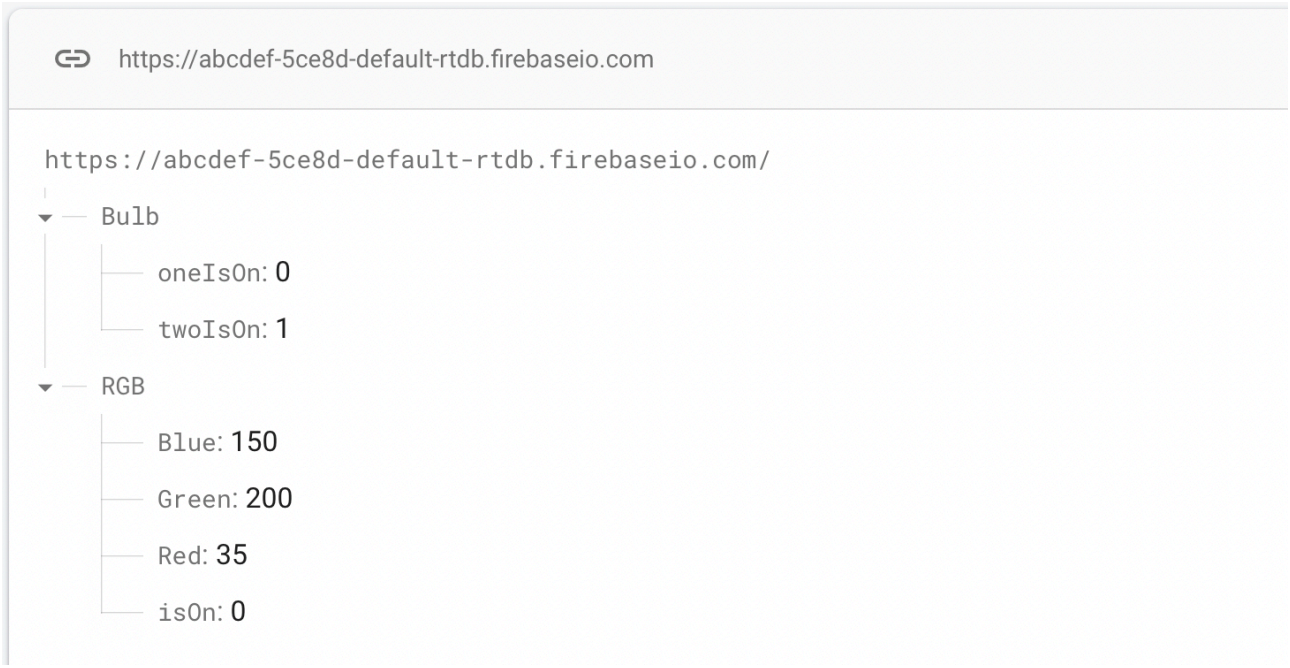
Firebase

- Firebase was used to build the backend for the project (NoSQL).

Frontend code : https://github.com/AkashCSanjeev/IOT
Hardware code : https://github.com/atharvparkhe/iot

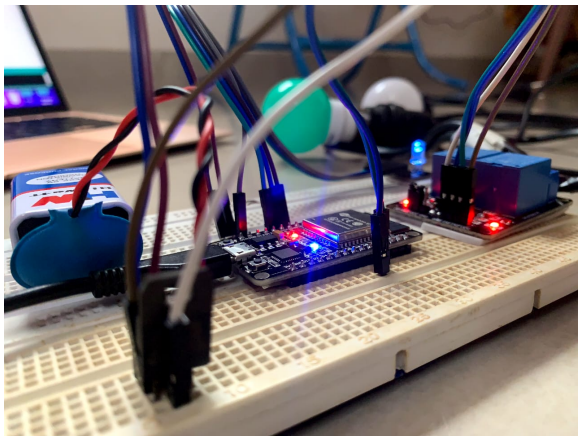
DATABASE DESIGN

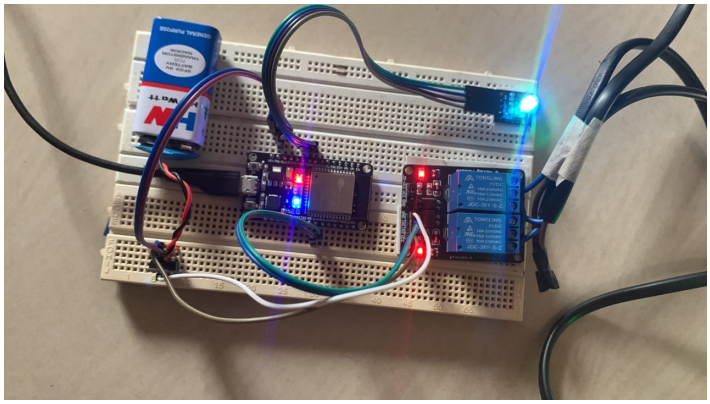
The Database used is Firebase (Google). It's a NoSQL type database. We used/ implemented 2 nodes. One for Bulb control (On/Off) which was boolean value, and one for RGB control.

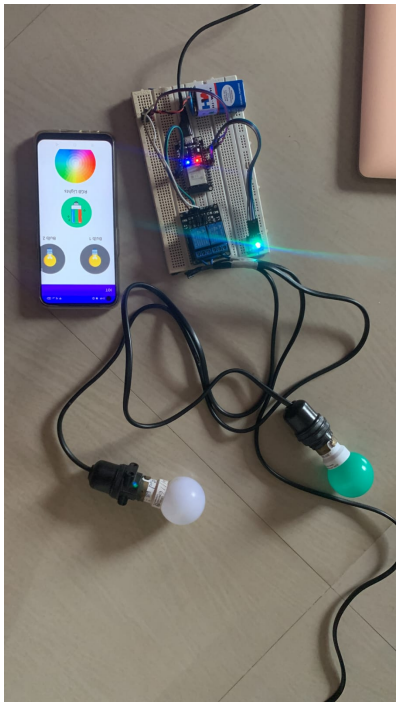


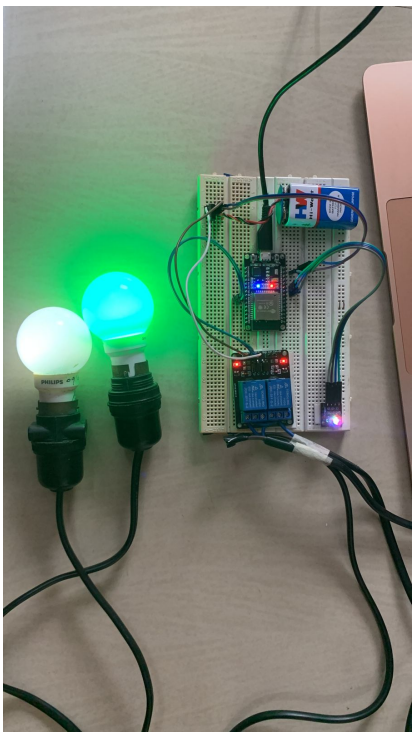
SNAPSHOTS AND RESULT

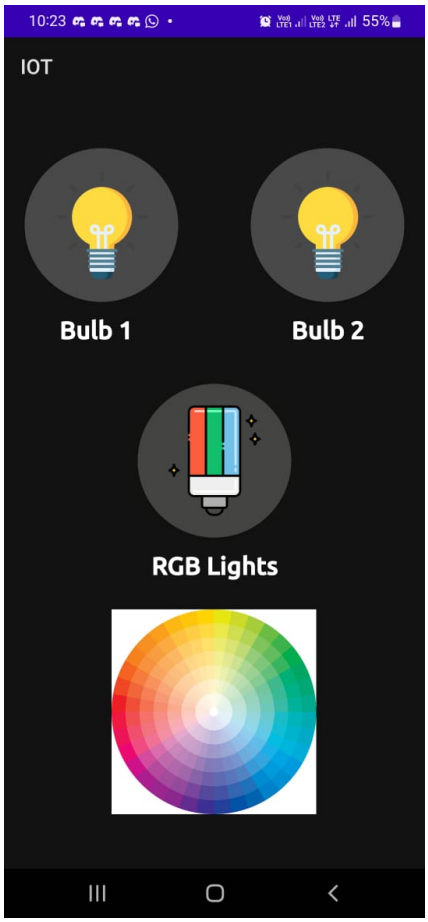
Simulation of home automation using IOT was successfully studied and implemented. Android application used for controlling the system. State of the variable getting updated on Firebase as the buttons are pressed on the app; and the state of bulbs was changing when the variables in the database changed.

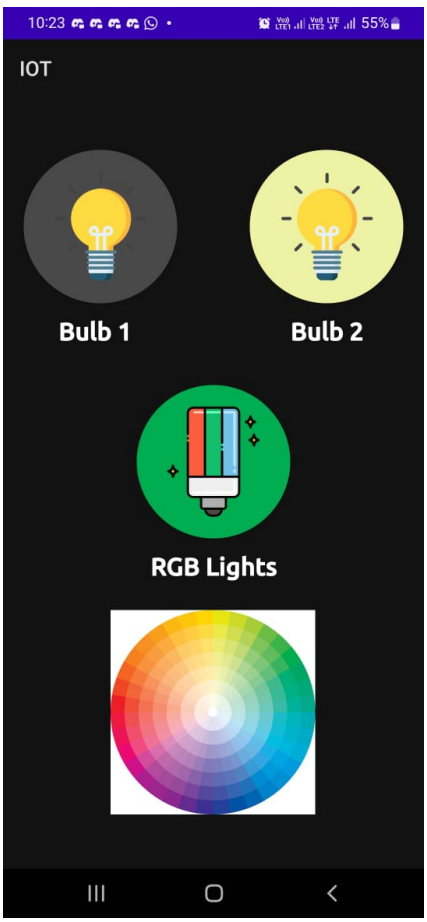









10:23
55%
IOT
Bulb 1
Bulb 2
RGB Lights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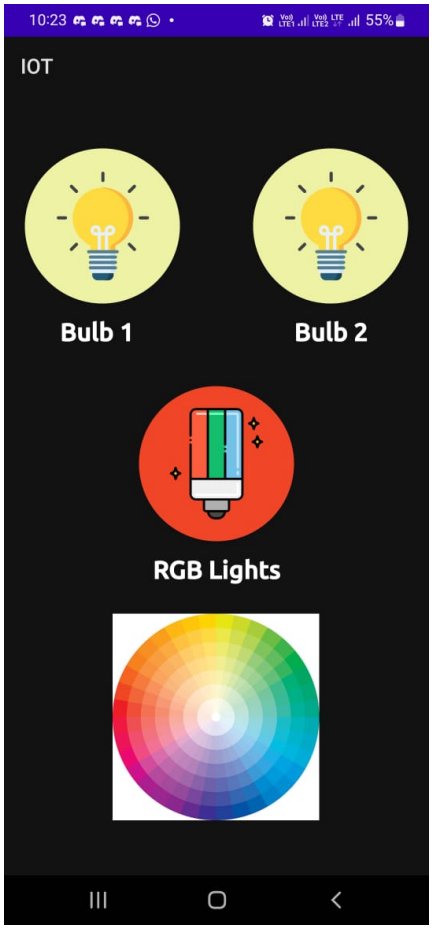
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IOT
Bulb 1
Bulb 2
RGB Lights

CHAPTER 2

CASE STUDY

SUMMARY

Over the last few years, many different Internet of Things(IoT) devices have made their way into the market. As a result, many smart home solutions have been introduced by different companies. In this project we have simulated a smart home automation system using IoT. The hardware components used are ESP32 Module, LED bulbs, Relay, RGB module, a battery and some additional hardware components like jumper wires, bulb holders and a breadboard. The LED bulbs are connected to the ESP32 module. We have used an Android application to control the bulbs and RGB module over Wi-Fi. The application and the ESP32 module have been connected to Firebase, which is a database that acts as the backend. The state of the LED bulbs and the RGB module (ON/OFF state) is updated in real time on Firebase as the buttons are clicked on the app. The app consists of 3 buttons that are used to control the 2 LED bulbs and the RGB module respectively. A RGB colour picker is also implemented in the app that is used to change the colour of the RGB module.

FUTURE SCOPE

Home Automation is getter popular day by day making it the basic requirement for future homes which will be smart enough to provide the best possible comfort to people. Daily household devices which we have been using for decades are evolving to become smarter providing better results to their users. Some common devices that have evolved are lights, television, refrigerator and washing machine. The future of smart homes will be consisting of devices that will provide virtual experiences like new before where everything will be possible without even moving out of homes. Things like ordering stuff, meetings, parties, working will evolve to less physically demanding which can be done virtually from our smart homes.

REFERENCE

- https://www.youtube.com/watch?v=lUkNbpVK2vA
- https://randomnerdtutorials.com/esp32-pwm-arduino-ide/
- https://randomnerdtutorials.com/esp32-firebase-realtime-database/