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IOT based Home Automation System

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Abstract: ***This research paper presents an IoT-based home automation system that uses an ESP32 microcontroller to communicate using the ESP32 NOW protocol. The system allows users to remotely monitor and control home appliances through a mobile application. The paper discusses the hardware and software components of the system, including the ESP32 microcontroller, sensors and actuators, and mobile applications. It also describes the communication protocols used for data transfer and user interface design for mobile applications. The proposed system offers several advantages such as low power consumption, high data transfer rate and easy scalability. It also offers users an easy and friendly interface to manage home devices remotely. The results of the experimental evaluation of the system show its efficiency and reliability, indicating that it can be a promising solution for the implementation of smart home automation. Overall, this paper provides valuable insights into the development of IoT-based home automation systems using ESP32 and Flutter technologies that can be useful for researchers and practitioners interested in this field.***

Keywords: Automation System, Internet of Things, Intelligent Home, ESP32, ESPNOW, Flutter

I. INTRODUCTION

Implement and simulate an IoT based Home Automation System(HMS),using Micro controller, an open source IoT platform, to successfully design, develop, and simulate an IoT-based Home Automation System (HMS), giving complete control of all the loads in the system from anywhere in the globe, via a public web application, with an internet connection.

The term "Home automation" may be applied to specific programmable devices like heating systems and sprinklers, but it is more specifically applied to homes where almost every component, including electrical outlets, fans, lights, and Heating, Ventilation, and Air conditioning systems, is linked to a network that can be controlled from a distance. From the perspective of home safety, this might also include any alarm systems, all the doors, windows, locks, smoke sensors, surveillance cameras and any other sensor, that may be attached to it.

II. LITERATURE REVIEW

A. Ravi Kishore Kodali and Vishal Jain

The goal of this project is to create a wireless home security system. Web security with AES encryption. The home security is managed using the internet to notify the user when there is an intruder, it can also make a sound when needed.

B. D. Pavithra and Ranjith Balakrishnan

This extend presents the viable utilize of IoT (Web of Things) to screen and control domestic machines by means of the World Wide Web. Domestic computerization frameworks utilize convenient gadgets as client interfacing. They can communicate with the domestic mechanization arrange through a Web portal.

C. Majid Al-Kuwari and Abdulrhman Ramadan

This paper presents the general design of IoT-based information and monitoring for smart home automation. The design uses the EmonCMS platform to collect and visualize data to monitor and manage home and remote devices.

D. P. Siva Nagendra Reddy and K. Tharun Kumar Reddy

This article explains how to manage and monitor home devices over the Internet using an Android application. There are many home automation systems on the market. However, they are designed for limited use.

E. Suraj and Ish Kool

In this paper, we present a vision-based machine intelligence system to sense the
ON/OFF state of commonly used household appliances like Television, Fan, and Tube light/CFL.

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F. Tushar Chaurasia and Prashant Kumar Jain

The report represents an IoT-based approach to smart home automation that is secure and at the same time reduces the computing load. The aim is to ensure the confidentiality, accuracy and integrity of the information displayed and exchanged by smart home devices.

G. Satyendra K. Vishwakarma and Prashant Upadhyaya

In this article, a smart, energy-efficient home automation system is planned to access and control home appliances from anywhere in the world. For this system, the internet connection depends on the main power of the building system and can access the internet.

H. Shradha Somani and Parikshit Solunke

The IoT project in this article focuses on the creation of a smart home wireless security system that sends alerts to homeowners over the Internet with the option to sound in the event of an accident.

I. K. Agarwal and A. Agarwal

This research project presents a method to implement a smart home using wirelessly controllable IoT. A home automation system refers to how to remotely monitor and control home appliances using the concept of the Internet of Things (IOT).

J. P. Jariyayothin and K. Jeravong-aram

This project demonstrates the IoT behind the building to monitor and control the irrigation of plants. We use Internet of Things (IoT) and affordable technologies, focusing on underground facilities with irrigation systems and taps.

III. OBJECTIVE

To build a centralized system having the functionality of controlling the household appliances whilst monitoring the moisture of the plants ensuring their growth all through a mobile App.

A. Design Goals

An important part of the home automated system is that it provides convenience to the customer, can save electricity and you can use with confidence. It is an growing sector so may systems are already present in the market but all these system are quite expensive, so most of the people is still unable to access these system which will be possible through our system as its inexpensive, reliable and robust.

User Action - User define the task which he wants to be performed by the system. Example – Switching light, fan

- **Microcontroller** - Now, users command is directed to microcontroller which is wifi enabled and is connected to different components.
- **Command to microcontroller** - Users command is acquired by the microcontroller and it gives command to perform the task

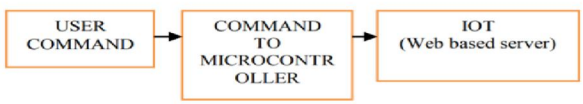


Fig (III.1) Working Principle

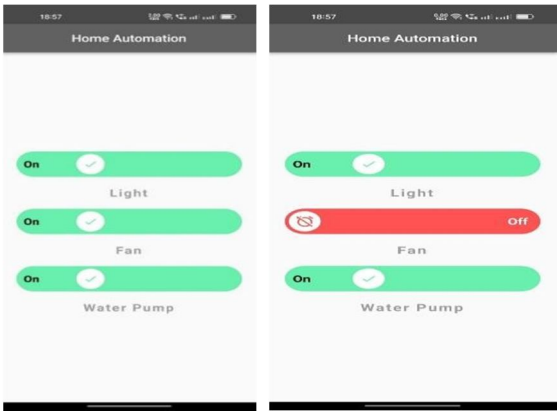


Fig (III.2) GUI of Home Automation App.

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IV. METHODOLOGY

A. *Hardware And Software Used*

1) Flutter
2) Arduino IDE
3) Firebase
4) ESP 32
5) Solenoid Valve
6) PIR Sensor
7) Relay Module
8) Ultrasonic Sensor
9) Temperature Sensor

B. *Installing Vscode*

The whole project has been coded and edited on vscode, flutter SDK has been installed on vscode which is used for the development of android app and uses dart as programming language.
Flutter version 3.3.8 was used and vscode 1.73 Community Version to satisfy the need for an efficient compiler required to create the project. The modules required to formulate the code were readily available within the compiler.

C. *Creating APP*

A basic app is created using flutter which provides full control to user manually operate any devices. The app provides three basic features to turn on/off light, fan and motor pump.

D. *Connection With Firebase*

A proper communication channel has to be there so that ESP32 can communicate with each other and app, for which real time database (firebase) has been used. The firebase is connected to app and ESP32 so any changes done by user is reflected in the app.

E. *Connection of ESP32*

In the project we have used 2 ESP32 out of which one is master and other is slave, master ESP32 is connected to the real-time database along with app which controls light and fan operations, while slave ESP32 is connected to master ESP32 which creates a separate system for water pump regulation/monitoring. Slave ESP32 sends/receives data from master ESP32 which is connected to real-time database.

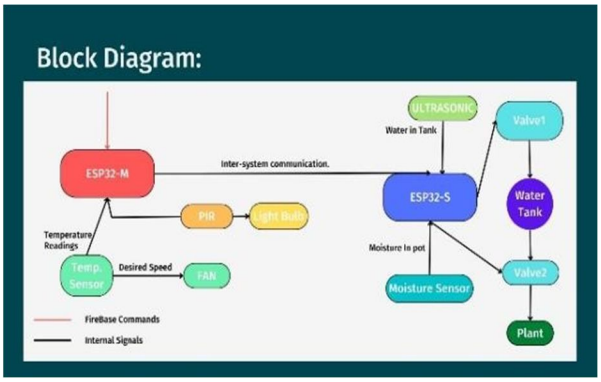


Fig (III.2) Schematic diagram of proposed Home Automation System.

V. RESULT AND DISCUSSION

The components are connected successfully and working properly. Through the app, we can control lights and fans. A water system is also introduced which is also operated using the app, where a pump is used to water the plants and an ultrasonic sensor is used which is mounted on the top of container to measure water height in the container.

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VI. CONCLUSION

We all know that the Internet of Things (IoT) is one of the most important aspects of the home automation system. It makes life easier for everyone and also helps people with disabilities. In this project, a method of establishing a home automation system based on the Internet of Things (IoT) has been adopted. We use an ESP32 board with a wireless module to control the system.

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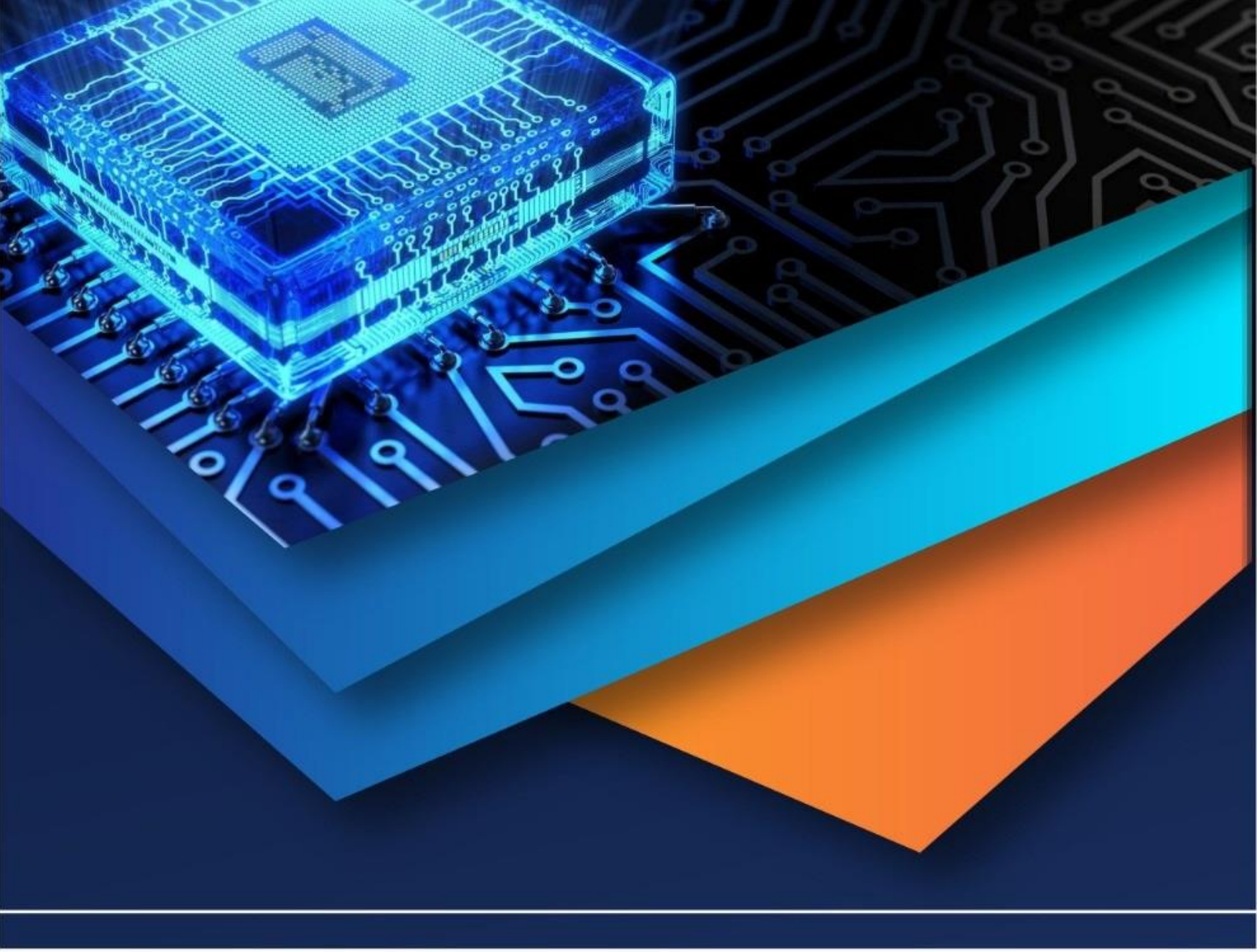
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