Gesture Controlled Bluetooth Speaker Using ESP32 and Node MCU

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Abstract

This study proposes a low-cost solution for enhancing the Gesture Control Bluetooth Speaker. The system utilizes Node MCU and ESP32 microcontrollers for wireless connections and MPU 6050 Sensor for detecting the motions. By employing a simple yet effective control mechanism, the system of speaker is controlled by the hand gestures detected by sensor. The research investigates the feasibility, performance, and practical implications of the proposed system in real-world applications.

1. Introduction

The use of gesture control technology in everyday electronics has changed the manner in which users interact, especially with audio playback devices that we utilize on a daily basis. This project aims to create a Bluetooth speaker that is gesture-controlled, leveraging the advanced capabilities of the ESP32 and Node MCU platforms. These two powerful platforms introduce cutting-edge wireless features with strong processing capabilities. The ESP32 has a unique dual-core processing system and offers Wi-Fi and Bluetooth capabilities, making it a great choice for real-time gesture detection and stable wireless communication. In contrast, the Node MCU is a very versatile development platform for quickly developing and deploying IoT applications that are highly sought after today. This new project will significantly enhance user experience by being capable of using simple physical gestures to manage key audio features such as play, pause, or volume.

2. Key Objective

The primary objective of the Gesture-Controlled Bluetooth Speaker project is to develop an innovative audio device that allows users to control playback, adjust volume by eliminating the need for physical controls or voice commands, while offering a portable, wireless, and accessible solution for modern audio interaction.

3. Block Diagram

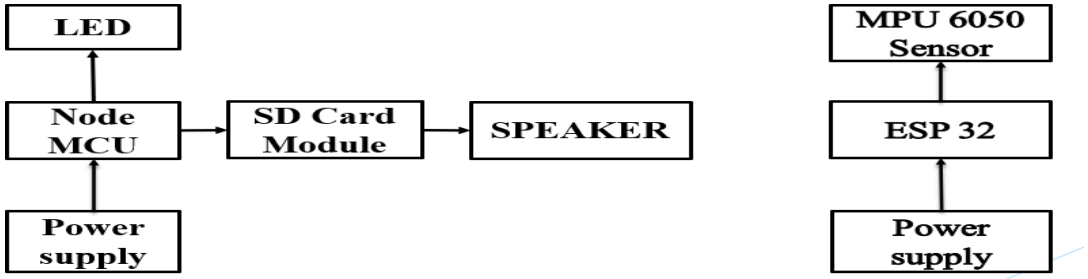

Figure 1. : Block Diagram of System.

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3.1 Block Diagram Description: Gesture Control Bluetooth Speaker

First block is the ESP 32 it is the microcontroller Wi-Fi and Bluetooth are interested in the ESP32.it gives the output to the MPU 6050 sensor .MPU6050 sensors is detect our hand movement and give input to the NodeMcu8226. Power supply is giving the supply to the ESP32. This is transmission side. Now receiver side power supply supply's the NodeMcu8226.NodeMcu8226 is receives the input and process in it and is gives the input to the LED. Also, the NodeMch8226 hives the input to the SD Card Module. in the SD Card Module, we are storing the music and commands.SD card module is giving the input to the speaker. Speaker is beeping the sound and its hives output.

3.2 Hardware design with component details, circuit diagram with working description

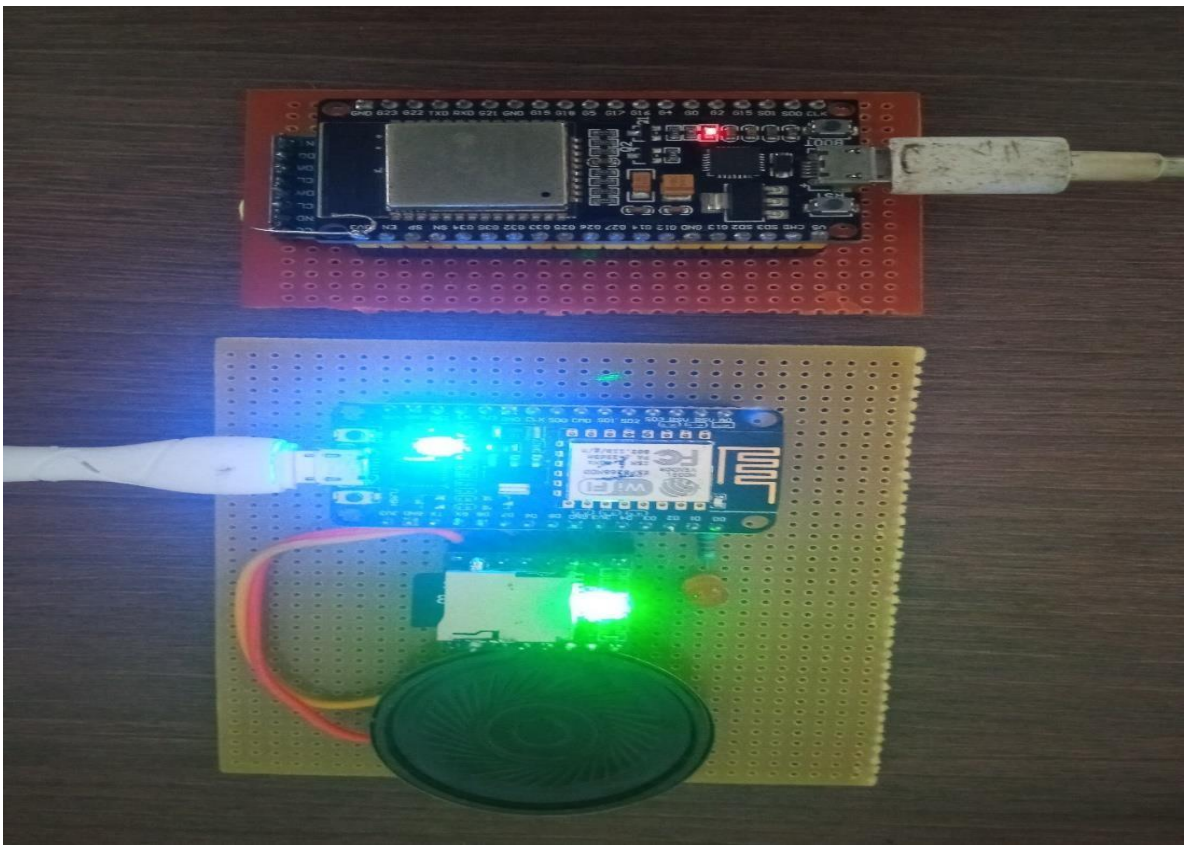

Figure 2 : Hardware of Gesture Control Bluetooth speaker

3.3 Circuit Diagram:

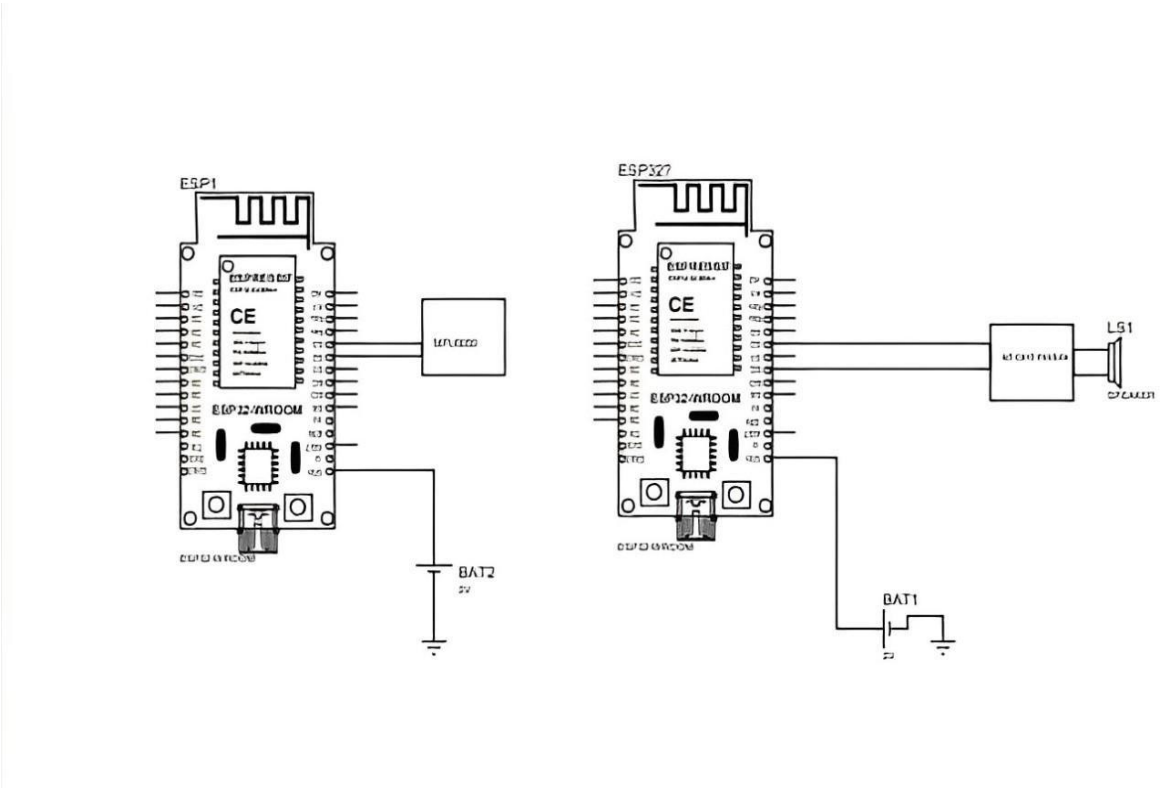

Figure 3: Circuit Diagram of System

Sunlight is detected by an LDR (Light Dependent Resistor).The LDR's output is fed into the TDA 2030, an audio power amplifier IC, which compares the light intensity received by two LDRs (LDR1 and LDR2).If the light intensity detected by LDR1 is greater than that of LDR2, the DC motor connected to it rotates to the right, causing the solar panel to change its direction and face the area of higher light intensity. Conversely, if the light intensity detected by LDR1 is less than that of LDR2, the DC motor connected to LDR2 rotates to the left, causing the solar panel to change its direction and face the area of higher light intensity. This process repeats as the sunlight changes, allowing the solar panel to maximize its exposure to sunlight and optimize its energy production.

4. Conclusion

The development of gesture-controlled Bluetooth speakers using Node MCU and ESP32 microcontrollers represents a significant advancement in user interface design and IoT technology. By combining intuitive gesture recognition with efficient wireless communication, these devices offer a seamless and accessible way to control audio playback and integrate with smart home systems. As technology evolves, further innovations in gesture recognition algorithms, power management, and security protocols will undoubtedly enhance the capabilities and user experience of these devices, paving the way for more sophisticated and user-centric IoT solutions.

5. Acknowledgment

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6. Conflict of Interest

The authors declare that they have no conflict of interest.

7. Funding Declaration

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About Author

Vaishnavi Satish Belure is currently pursuing a Bachelor's Degree in Electronics and Telecommunication Engineering at Dr. Babasaheb Ambedkar Technological University. Her academic and research interests include automation, Microcontroller (ESP 32 and Node MCU), Gesture detection and audio processing techniques and Bluetooth technologies.

Vaishnavi has hands-on experience in C programming and is skilled in Arduino IDE, Proteus. Aim to design system that improve daily life and solve common challenges with smart technology. Aspires to work in embedded technology, IOT, and smart device development for consumer Electronic.