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Voice Recognition Elevator System

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Abstract: This project presents a smart voice-controlled elevator system designed using an Arduino Atmega328P microcontroller. This project is about creating a voice-controlled elevator system to make it easier and safer for people to use, especially those with physical disabilities. It uses an Arduino ATmega board along with parts like a Bluetooth module (HC-05), LCD screen, ultrasonic sensor, DC gear motor, motor driver, and a fire sensor. A special Android app is used to send voice commands through Bluetooth. The elevator then responds by moving to the correct floor and showing the status on the LCD. The ultrasonic sensor helps with automatic door opening, and the fire sensor warns users if there's any danger. This smart system offers a modern, hands-free way to operate elevators in buildings.

I. INTRODUCTION

In recent years, the rapid growth of smart technologies has brought forward creative and practical solutions to simplify everyday life. One such innovation is elevator automation, which plays a key role in improving comfort and accessibility, especially in smart homes and buildings. This project presents the development of a voice-activated elevator system built around the Arduino microcontroller platform. The core aim of this project is to design an elevator that operates through voice instructions, eliminating the need for physical interaction and offering a more convenient user experience. An Android mobile application captures voice commands and transmits them wirelessly via a Bluetooth module to the Arduino. The microcontroller interprets these commands and controls the elevator's movement using a motor driver and DC motor. Additionally, an LCD screen is used to display real-time updates such as the current floor and system status.This system not only demonstrates how voice recognition can be used in automation but also provides valuable experience in integrating components like sensors, displays, motors, and wireless communication. The outcome is a functional prototype that showcases how traditional elevator systems can be enhanced with modern technology to align with future smart building trends.The project was inspired by the need to reduce physical contact during the COVID-19 pandemic and to increase accessibility for people with disabilities. Individuals who may struggle with physical controls can still use voice commands to operate the elevator effectively. This approach makes vertical mobility more inclusive and safe. By combining an Android app, Bluetooth communication, and Arduino-based control, the system executes elevator functions based on spoken instructions. This design offers both innovation and practical utility in the field of home automation and assistive technology.

II. RELATED WORK

Advancements in smart elevator systems have increasingly focused on touchless operation through voice recognition to improve user convenience and accessibility. Traditional elevators that depend on button inputs can be limiting, especially for elderly or physically challenged individuals. To overcome this, researchers and developers have integrated voice-command features using microcontrollers like ATmega328 and communication modules such as HC-05 or ESP32.

In these systems, a mobile application processes the user's voice, converts it to text, and transmits it to the microcontroller via Bluetooth. Upon receiving the command, the system activates a motor driver to move the elevator to the desired floor. Additionally, safety sensors—such as ultrasonic for obstacle detection and MQ-series for gas or smoke sensing—are often included to ensure safe operation. These sensors help in stopping the elevator during emergencies or obstructions, preventing accidents.

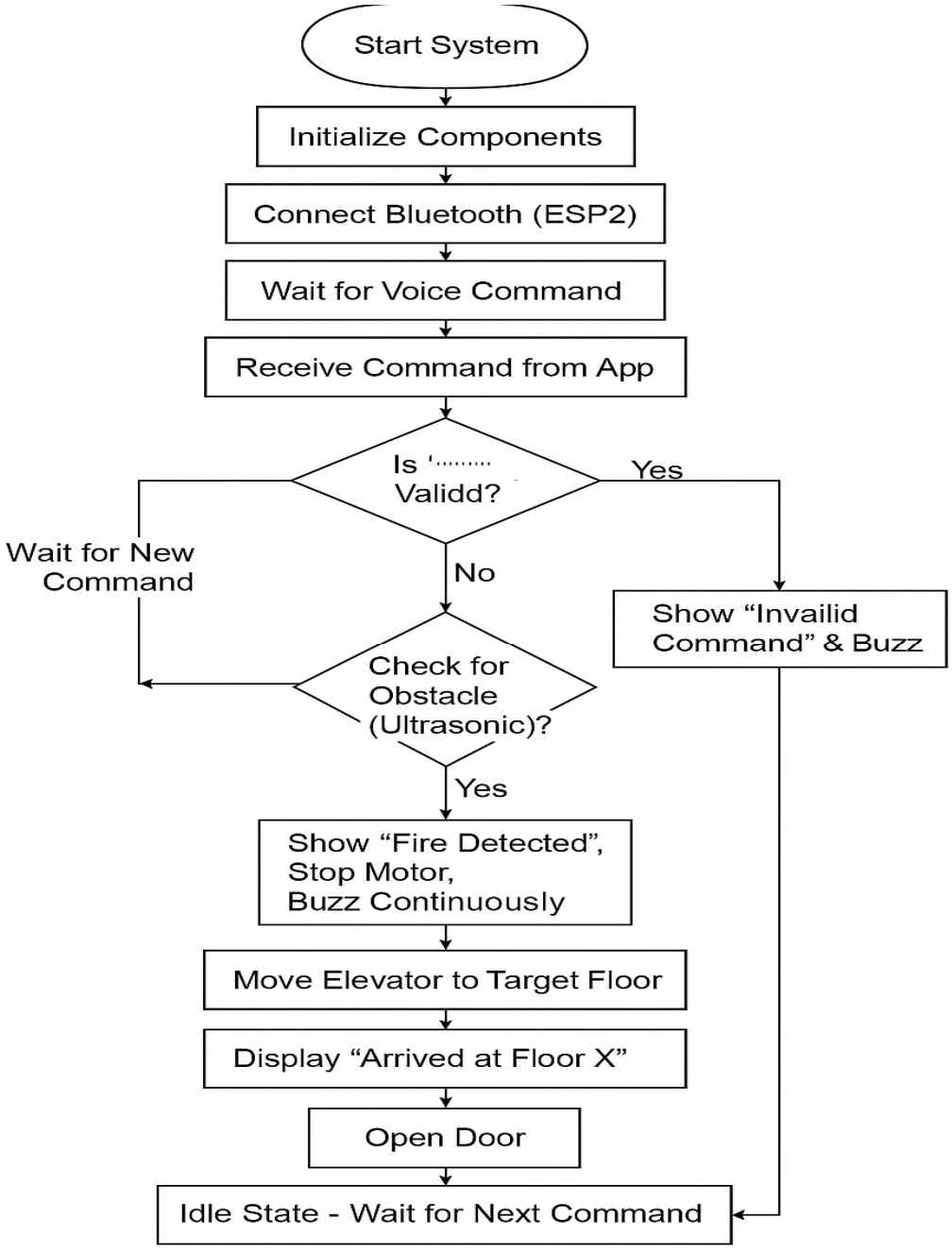
User feedback is commonly enhanced through LCD displays and buzzers, making the interaction more intuitive. As technology progresses, modules like ESP32 are preferred due to their better range, speed, and built-in features, resulting in smoother communication and faster response times.

This project leverages these technologies to implement a reliable, voice-controlled elevator system that emphasizes hands-free operation, real-time safety alerts, and ease of use for all users.

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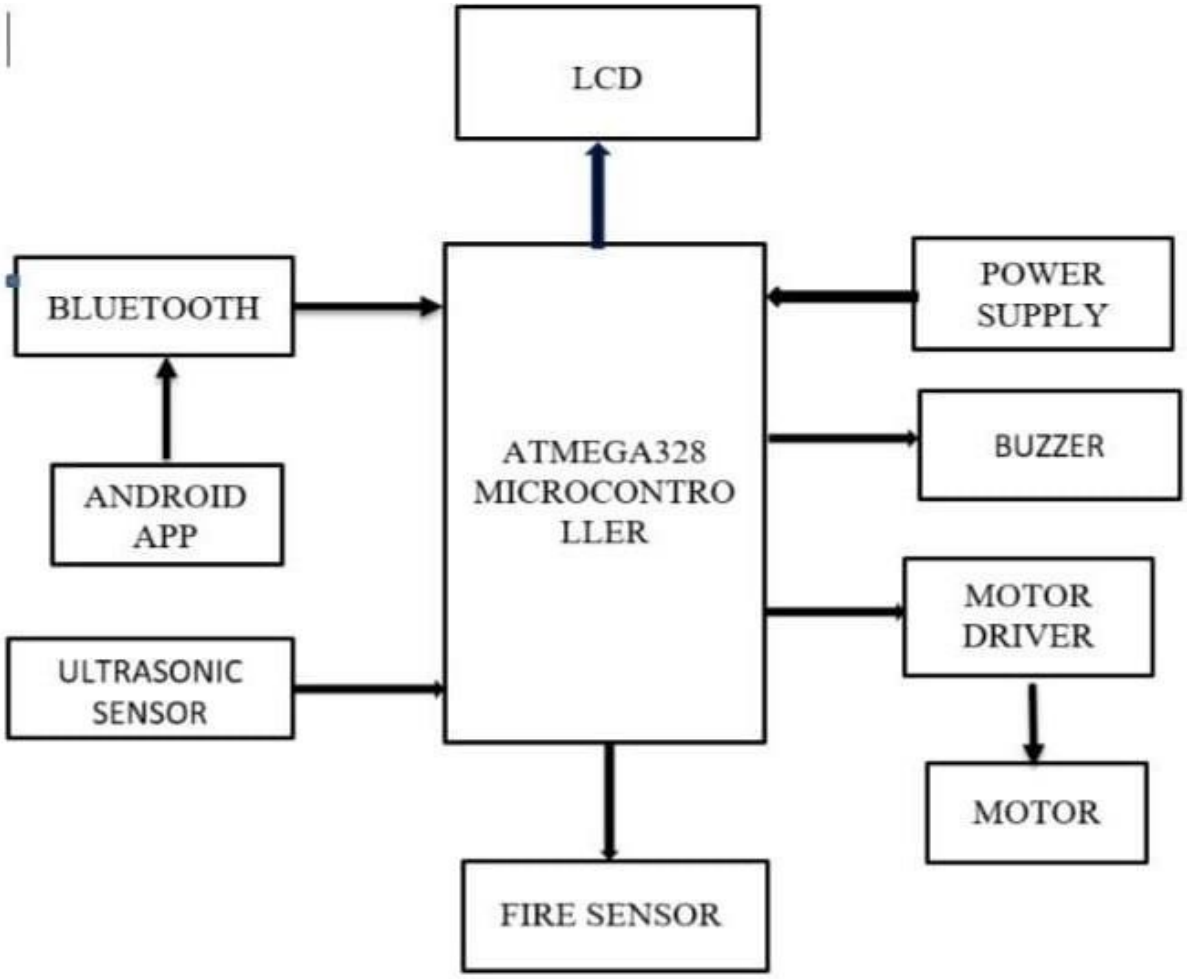
III. PROPESED ALGORITHM

1) Start the System
2) Bluetooth Initialization
3) Voice Command Processing
4) Command Validation
5) Safety Check Before Movement
6) Elevator Movement
7) Arrival at Destination
8) Idle Mode
9) End / Repeat from Step 2

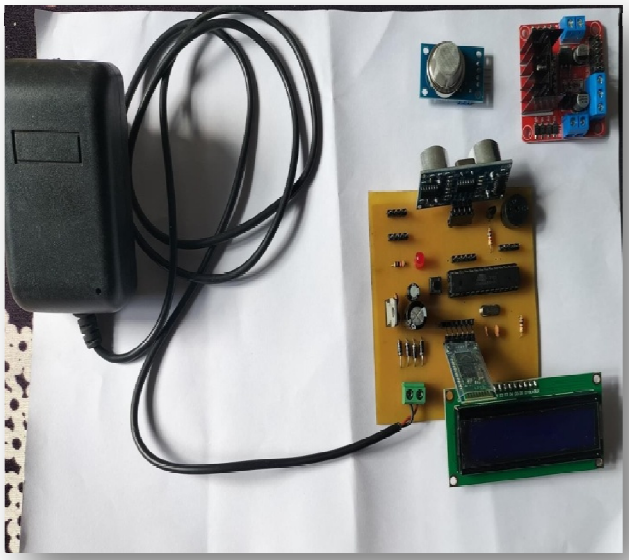


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IV. BLOCK DIAGRAM



V. EXPERIMENTAL AND ACTUAL RESULT



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VI. COMPONENT REQUIRED

1) ATmega328 microcontroller

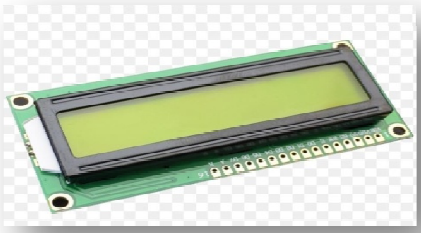
The **ATmega328** is an 8-bit microcontroller developed by **Microchip Technology**. It's a popular choice for embedded applications and is best known for being the core of boards like the **Arduino Uno**. This microcontroller strikes a solid balance between performance, power efficiency, and ease of use, making it suitable for both beginners and professionals in electronics and embedded systems.





2) 16x2 LCD Display Module

The 16x2 LCD is a widely used alphanumeric display designed to show 16 characters per line across two lines. It's a popular choice in microcontroller projects for displaying text and simple visuals.



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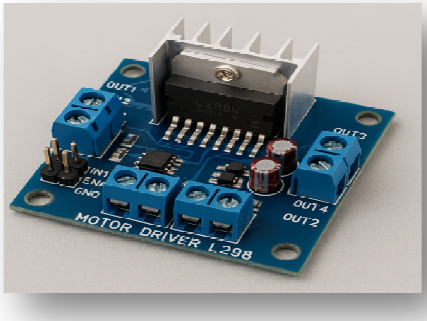
3) Power Supply

A power supply is an electronic device or circuit designed to deliver a consistent 5-volDC output, which is essential for running various electronic circuits and components.



4) Motor Driver L298

The L298 is a dual H-bridge motor driver integrated circuit used for controlling both DC motors and stepper motors. It enables bidirectional movement for up to two motors, making it ideal for robotics and automation projects.



5) DC Gear Motor

A DC gear motor combines a DC motor with a gearbox to lower speed while boosting torque,making it well-suited for applications that require precise control and strong rotation force.



6) ESP 32 Bluetooth Module

The ESP32 Bluetooth Module is a versatile and powerful wireless communication module that integrates both Wi-Fi and Bluetooth capabilities. It's commonly used in IoT (Internet of Things) projects, home automation, wearable devices, and wireless data transfer applications.

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7) Buzzer

A buzzer is an electronic component designed to generate sound when it's powered, often used for alarms, notifications, or signaling tasks.



8) HC-04 Ultrasonic Sensor

The HC-SR04 Ultrasonic Sensor is an affordable and popular device for measuring distances using ultrasonic sound waves. It's frequently used in robotics projects, obstacle detection systems, and various distance sensing application.



VII. APPLICATION

1) Accessibility for the Elderly:Designed to offer hands-free operation, this system helps individuals with physical challenges who may struggle to usertraditional elevator buttons.
2) Smart Home Connectivity:Integrated as part of a smart home ecosystem, the elevator can be operated through voice commands, enabling seamless control of household devices, including lifts.
3) Modernization in Commercial Spaces: Enhances user experience in places like shopping centers, corporate buildings, and hotels by replacing conventional elevator controls with voice-activated technology.
4) Enhanced Safety Features: In environments like hospitals, schools, or apartment complexes, elevators are equipped with safety mechanisms such as fire detection and obstacle sensors to ensure secure usage.

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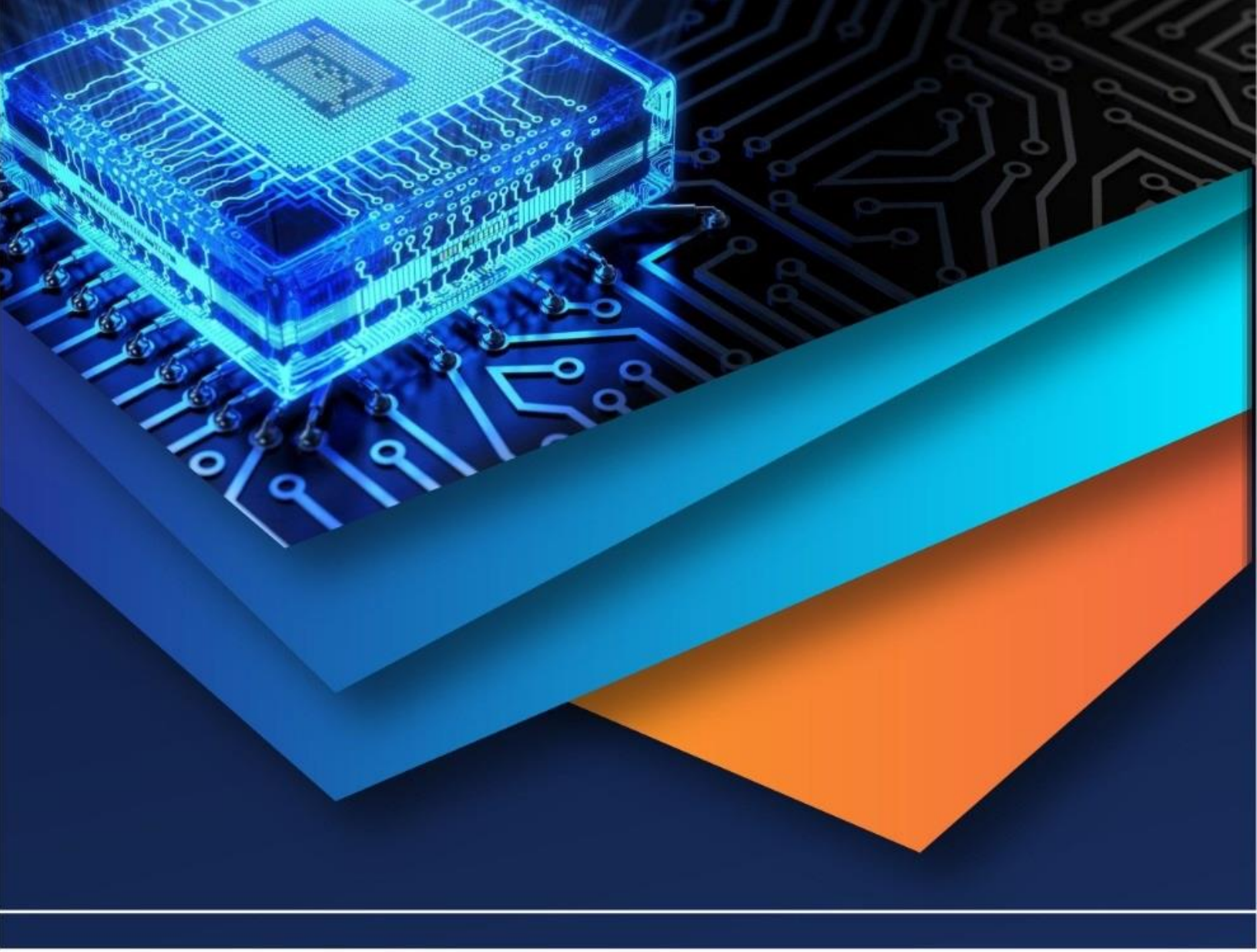
VIII. CONCLUSION

Elevators play a significant role in our daily routines, and the use of voice-activated elevators is gaining traction because of their simplicity and user-friendliness. By removing the need for physical contact, this technology helps lower the chances of virus transmission, such as COVID-19, and offers a reliable, long-term solution for safe and independent elevator usage. A speech recognition module is integrated into the control system, allowing users to interact with the elevator through voice commands. A DC motor drives the elevator's movement based on instructions processed by the microcontroller. In today's health conscious environment, such systems contribute to increased safety and encourage precautionary measures.

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