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CHAIRVISION: UNVEILING AUTOMATED MOBILITY

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ABSTRACT

This project introduces an automated chair parking system that can be controlled through mobile using the Arduino Robo application. It features the Atmega328p microcontroller and incorporates a 12V relay, side shaft gear motor, input-output capacitors, a Bluetooth module, and diode protection for a 12V lithium-ion battery. Users can wirelessly control the chair's movement with simple commands (forward, back, left, right).

An ultrasonic sensor is also included to facilitate automated alignment by detecting obstacles within a 50 cm range, which enhances both safety and precision. This system is designed for easy and flexible chair positioning in environments like conference rooms or classrooms, showcasing effective control and obstacle avoidance capabilities.

Keywords: Smart Motorized, Automation, User-Friendly, Control.

I. INTRODUCTION

In today's fast-paced world, making the most of available space is essential, particularly in crowded or busy areas. Chair parking or automated chair positioning systems have been developed to save space, enhance convenience, and improve accessibility. By integrating automation with mobile commands through microcontrollers like the Atmega328p, we can achieve precise control over movement and positioning. This project introduces a smart chair parking system that utilizes mobile commands and is powered by an Arduino-based Atmega328p microcontroller. It features Bluetooth communication for command input, motorized movement through a relay and gear motor, and obstacle detection using ultrasonic sensors. The goal of this project is to make seating arrangements easily adjustable, optimize space usage, and enhance accessibility.

II. METHODOLOGY

The smart chair parking project employs a systematic approach to design, assemble, and program a system that allows for mobile-controlled chair movement using an Arduino setup.

1. Component Selection and Sourcing: Identifying the necessary components that meet the project's needs

2. Circuit Design: Creating a schematic that guarantees safe and reliable connections among all components

3. Programming, Testing and Calibration: Utilizing the Adriano IDE to program the Atmega328p microcontroller for receiving commands, controlling the motor, and integrating the sensor.

Conducting real-time tests for each command to ensure smooth movement in all directions.

III. MODELING AND ANALYSIS

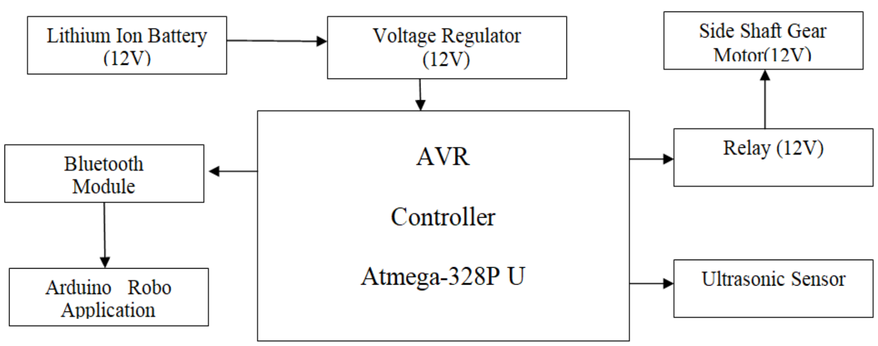

Figure 1: Architectural Block Diagram

IV. RESULTS AND DISCUSSION

Control Responsiveness

Test and Outcome: Using the Arduino Robo mobile application, users could send commands for moving forward, backward, left, and right. The Bluetooth module (HC-05) paired effectively with the Atmega328p microcontroller, allowing for a smooth wireless connection.

Performance: On average, the response time for commands was around 0.2 seconds, indicating low latency, which is crucial for real-time control. This quick response enabled users to execute precise movements, making it easier to park and reposition the chair.

Analysis: The Bluetooth module maintained stable communication within a range of about 10 meters, offering flexibility for remote operation. However, performance showed slight variations when obstacles like walls or furniture were present, suggesting that signal boosters might be needed in densely populated areas.

Motor Stability and Directional Accuracy

Test and Outcome: The side shaft gear motor, managed by the Atmega328p and relay, enabled the chair to move in all four directions. Testing each directional command demonstrated consistent stability.

Limitations and Areas for Improvement

Limitations: The system faced minor difficulties in detecting certain obstacles, especially transparent ones. While the Bluetooth range was generally sufficient, it occasionally experienced interference in crowded environments.

Potential Improvements: Future upgrades could involve the integration of additional sensors, such as infrared or LiDAR, to enhance detection accuracy, the addition of a battery status indicator, and possibly upgrading other components.

V. CONCLUSION

The Automatic Autonomus-Parking Chair project successfully demonstrates the integration of advanced technology to enhance mobility and independence for individuals with mobility challenges. Through careful design, implementation, and testing, the chair has proven its ability to navigate autonomously and park it Autonomous in designated spaces, addressing a critical need for assistive devices in everyday environments. While the results are promising, user feedback has highlighted opportunities for further enhancement, particularly in terms of customization and sensor capabilities. These insights will guide future iterations of the design, ensuring that the chair not only meets but exceeds user expectations.

Key findings from the project indicate that users appreciate the intuitive controls provided by the mobile application, the comfort and ergonomics of the chair, and the effectiveness of its safety features. The chair's robust performance in obstacle detection and navigation confirms its reliability as a functional mobility aid.

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