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Mobile Driven Autonomous Robot

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***Abstract*— This paper introduces a system that enables robotic control through human voice commands, replacing the traditional speech recognition module with an Android-based application. The application captures and converts spoken instructions into text, which is then processed to control the robot's movements. The primary objective is to enhance accessibility for individuals with motor impairments by simplifying the interaction with everyday objects. Unlike conventional voice recognition systems, which often involve high implementation costs, this approach provides a cost-effective alternative. Several experiments were conducted to evaluate different control methods for the robot. The findings indicate that effective manipulation of real-world objects is achievable using voice commands alone. These results strongly support the potential for further development of voice-controlled robotic systems in practical applications.**

I. INTRODUCTION

Technological advancements, particularly in robotics, have been accelerating for years and are now significantly influencing daily human life. Robots are increasingly taking over repetitive and labor-intensive tasks that were once performed by humans, especially in industrial settings. This trend is also expanding into service sectors, where automation is becoming more prevalent. A large number of robots in use today are fully autonomous and capable of conducting routine inspections, managing fleets, and overseeing internal logistics operations without human intervention. In addition to commercial applications, these robotic systems play a critical role in defense operations, offering capabilities for reconnaissance, support, and combat missions in environments that are hazardous or inaccessible to humans. By reducing the need for human presence in life-threatening conditions, robotic deployment greatly enhances safety and survivability. Modern robots are equipped with highly sophisticated sensors that surpass human sensory perception, particularly in vision and auditory functions. Their resilience in extreme conditions makes them ideal for challenging missions, such as space exploration, where unmanned rovers like Sojourner, Spirit, Opportunity, Curiosity, and Perseverance have successfully operated on other planets within our solar system.

II. LITERATURE SURVEY

Much of the research and work has been done In the field of MOBILE DRIVEN AUTONOMOUS ROBOT

Borys et al. (2020) explored the optimization of robotic packaging systems, highlighting the importance of precision and control in automation. Their study emphasized sensor integration and decision-making algorithms to enhance operational efficiency in industrial environments.

Kaczmarek and colleagues (2021) investigated human-robot interaction through graphical interfaces, enabling intuitive control of industrial robots in both online and offline modes. This user-friendly approach aligns well with mobile-based robotic systems designed for accessibility and convenience.

Panasiuk et al. (2022) introduced a concept for testing robotic grippers, focusing on the mechanical and sensory feedback required for reliable material handling. Their work underpins the need for accurate perception modules in autonomous robots, particularly when used in service or delivery applications.

Matthews (2018) detailed the evolution of robot precision, underscoring its significance in expanding use cases across industries. This precision, achieved through advanced sensors and actuators, is critical in mobile robots intended for navigation and task execution in dynamic environments**.**

Jayawardana and Bandaranayake (2021) reviewed planetary exploration using unmanned robotic systems, showcasing how mobility, autonomy, and remote operation can be extended to challenging terrains. These findings serve as inspiration for terrestrial autonomous systems aiming for similar robustness and adaptability.

Additionally, Ghael et al. (2021) discussed the role of microcontrollers such as Raspberry Pi in embedded robotics. Their analysis supports the use of low-cost hardware like ESP8266 and Arduino, as used in this project, to achieve reliable communication and control.

III. EXISTING SYSTEM

Conventional autonomous robots are generally controlled through pre-defined programming and manual interfaces. These systems often depend on wired configurations and dedicated hardware for operation, which can be restrictive and less adaptable. While they might include standard sensors and actuators, they typically do not incorporate mobile technology, reducing their flexibility and limiting their effectiveness in rapidly changing or interactive environments.

IV. PROPOSED SYSTEM

The proposed system eliminates the need for a dedicated speech recognition module to interpret voice commands. Instead, it utilizes an Android application that captures and processes spoken input, converting it into text using Google's speech-to-text functionality. This text is then transmitted to the robot via Bluetooth. Upon receiving the data, the microcontroller interprets the text and executes the corresponding commands to control the robot's actions.

V. METHODOLOGY

The Mobile-Driven Autonomous Robot is designed to utilize a smartphone as the central unit for both control and processing. It incorporates key components such as sensors (like IR and ultrasonic) for environmental detection, motors for movement, and a microcontroller or single-board computer (such as Arduino) for hardware interfacing. Communication between the smartphone and the robot is facilitated through Bluetooth, Wi-Fi, or MQTT, allowing seamless interaction. A mobile application provides a user-friendly interface for real-time monitoring and control. Navigation capabilities are enhanced using SLAM (Simultaneous Localization and Mapping), enabling the robot to build maps and determine optimal routes through path-planning algorithms like A* or RRT. Sensor integration supports obstacle detection and avoidance to ensure safe navigation in dynamic settings. The system is evaluated in both simulated environments (such as Gazebo) and real-world conditions, focusing on metrics like accuracy, obstacle handling, and energy efficiency. Overall, the robot offers a compact, affordable, and flexible solution suitable for applications including delivery, monitoring, and mapping.

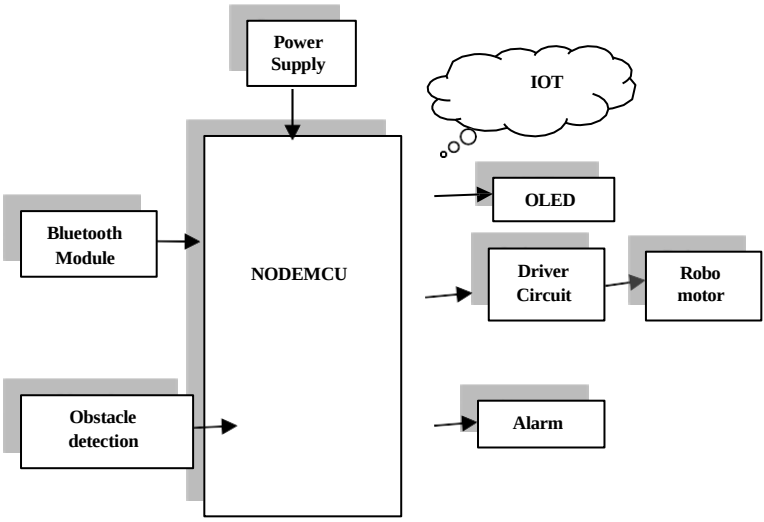


FIG 1 Block diagram of Mobile Driven Autonomous Robot

Applications

This voice-controlled mobile robot has practical uses in assistive technology, helping people with motor disabilities perform tasks using voice commands. It can be applied in healthcare for basic patient support, in industries for remote machine control in risky areas, and in smart homes for hands-free appliance operation. Additionally, it serves as a valuable educational tool for learning embedded systems and robotics, and is ideal for cost-effective prototyping in innovation labs.

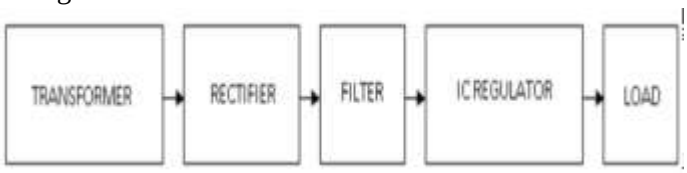
VI. HARDWARE DETAILS

POWER SUPPLY

The power supply section is the section which provide +5V for the components to work. IC LM7805 is used for providing a constant power of +5V.

The ac voltage, typically 220V, is connected to a transformer, which steps down that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially

filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.



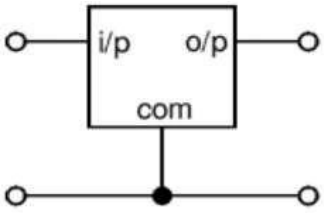
Transformer

Transformers convert AC electricity from one voltage to another with little loss of power. Transformers work only with AC and this is one of the reasons why mains electricity is AC.

Step-up transformers increase voltage, step-down transformers reduce voltage. Most power supplies use a step-down transformer to reduce the dangerously high mains voltage (230V in India) to a safer low voltage.

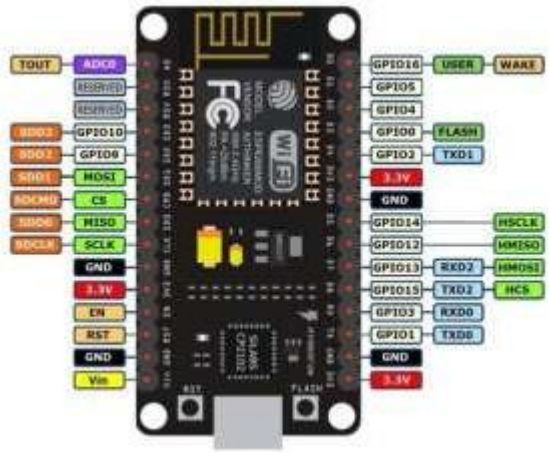
Voltage Regulators

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. IC units provide regulation a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustably set voltage. The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts totens of watts.



MICROCONTROLLER

The ESP8266 is a low-cost, Wi-Fi-enabled microcontroller widely used in IoT applications for its built-in wireless networking capability and compact design. Featuring a 32-bit RISC processor (Xtensa LX106) operating at 80 MHz, it supports protocols like UART, SPI, I2C, and PWM through its GPIO pins. The popular NodeMCU development board, based on the ESP8266, includes USB support, flash memory, and user-friendly pin headers, making it ideal for rapid prototyping. Compatible with the Arduino IDE, it allows developers to create smart, energy-efficient devices for automation, remote sensing, and wireless control systems without requiring separate communicationmodules.



OLED (Organic Light Emitting Diodes)

OLED (Organic Light Emitting Diodes) is a flat light emitting technology, made by placing a series of organic thin films between two conductors. When electrical current is applied, a bright light is emitted. OLEDs are emissive displays that do not require a backlight and so are thinner and more efficient than LCD displays (which do require a white backlight).

IR SENSOR

IR sensor is very useful if you are trying to make a obstacle avoider robot or a line follower. In this project we are going to make a simple IR sensor which can detect a object around 6-7 cm. IR sensor is nothing but a diode, which is sensitive for infrared radiation. This infrared transmitter and receiver is called as IR TX-RX pair.

Driver Circuit:

L293D IC generally comes as a standard 16-pin DIP (dual-in line package). This motor driver IC can simultaneously control two small motors in either direction; forward and reverse with just 4 microcontroller pins (if you do not use enable pins).

Bluetooth module:

A Bluetooth module is a compact and versatile hardware component used for enabling wireless communication between devices over short distances. It

operates using Bluetooth technology, which is based on radio frequency (RF) communication in the 2.4 GHz ISM band.

DC motor:

A DC motor is a simple device that turns electrical energy from a direct current (DC) source into mechanical motion. It is widely used because its speed can be easily adjusted, making it suitable for tasks that need precise movement or control. The motor has two main parts: the stator, which stays still, and the rotor, which spins to create motion.

BUZZER

A buzzer or beeper is a signaling device, usually electronic, typically used in automobiles, house hold appliances such as a microwave oven, or game shows.

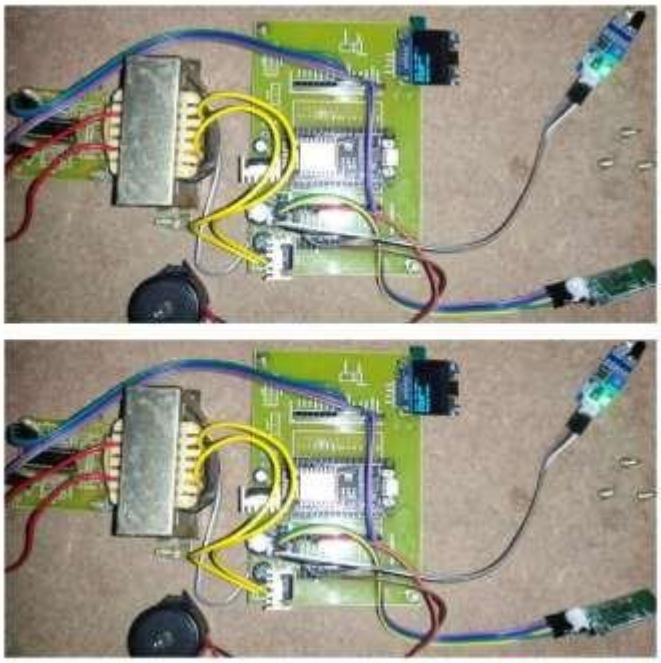
It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed,

and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound.

VI. SOFTWARE DETAILS

THE ARDUINO INTEGRATED DEVELOPMENT ENVIRONMENT

Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.



VII. CONCLUSION

Robotics is playing a growing role in everyday life as engineers work to automate tasks that are repetitive, physically demanding, or hazardous. While industrial settings remain the primary area of use, robots are also becoming more common in service sectors and even in households. As robotic systems evolve, they rely not only on advanced hardware but also on complex software, which is essential for enabling autonomous operation..

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REFERENCES

[1] Borys, Szymon, Wojciech Kaczmarek, and Dariusz Laskowski. 2020. “Selection and optimization of the parameters of the robotized packaging process of one type of product”. Sensors 20 (18): 5378-1-21.

[2] Kaczmarek, Wojciech, Bartłomiej Lotys, Szymon Borys, Dariusz Laskowski, and Piotr Lubkowski. 2021. "Controlling an industrial robot using a graphic tablet in offline and online mode”. Sensors 21 (7): 2439- 1-20.

[3] Panasiuk, Jarosław, Wojciech Kaczmarek, Michał Siwek, and Szymon Borys. 2022. “Test Bench Concept for Testing of Gripper Properties in a Robotic Palletizing Process”. Armament, Aviation, Safety Engineering. 13 (2): 51-64.

[4] Płaczek, Ewa, Kornelia Osieczko. 2020. Zastosowanie robotów AGV w intralogistyce”. Zarządzanie Innowacyjnew Gospodarce i Biznesie 1 (30): 165-176.

[5] Matthews, Kayla. 2018. "How Robot Precision Has Evolved, Enabling More Uses”.

[6] Jayawardana, J.K. Rahul, and T. Sameera Bandaranayake. 2021. "A review of unmanned planetary exploration on Mars”. International Research Journal of Modernization in Engineering Technology and Science 3 (2): 451-462.

[7] Besseghieur, Khadir Lakhdar, Radosław Trębiński, Wojciech Kaczmarek, and Jarosław Panasiuk. 2020. “From Trajectory Tracking Control to Leader–Follower Formation Control”. Cybernetics and Systems 5 (27) : 339-356.

[8] Prusaczyk, Piotr, Wojciech Kaczmarek, Jarosław Panasiuk, and Khadir Besseghieur. 2019. “Integration of robotic arm and vision system with processing software using TCP/IP protocol in industrial sorting application”. AIP Conference Proceedings 2078: 020032-1-8.

[9] Siwek, Michał, Leszek Baranowski, Jarosław Panasiuk, and Wojciech Kaczmarek. 2019. “Modeling and simulation of movement of dispersed group of mobile robots using Simscape multibody software”. AIP Conference Proceedings 2078: 020045-1-5.

[10] Besseghieur, Khadir Lakhdar, Radosław Trębiński, Wojciech Kaczmarek, and Jarosław Panasiuk. 2018. “Trajectory tracking control for a nonholonomic mobile robot under ROS”. Journal of Physics: Conf. Series 1016: 012008-1-5.

[11] Besseghieur, Khadir Lakhdar, Wojciech Kaczmarek, and Jarosław Panasiuk. 2017. “Multi-robot Control via Smart Phone and Navigation in Robot Operating System”. Problemy mechatroniki.Uzbrojenie,lotnictwo, inżynieria bezpieczeństwa / Problems of Mechatronics. Armament, Aviation, Safety Engineering 8 (4): 37-46.

[12] Ghael, Hirak Dipak, L. Solanki, and Gaurav Sahu. 2021. "A Review Papier on Raspberry Pi and its Applications”. International Journal of Advances In Engineering and Management (IJAEM) 2 (12): 225-227.