BLUETOOTH-CONTROLLED VOICE ACTIVATED WHEELCHAIR

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ABSTRACT
A voice-activated wheelchair designed for individuals with diverse physical ailments represents a significant step forward in enhancing accessibility and independence for those with mobility challenges. By integrating an Arduino system with Bluetooth voice recognition technology, this innovative wheelchair offers a transformative solution for individuals whose impairments affect their hands, feet, or lower body, rendering traditional wheelchair controls difficult or impossible to manage. The Arduino's capability to control two motors in response to voice commands enables smooth and intuitive movement, empowering users to navigate their environments with ease. Moreover, the integration of speech recognition technology marks a paradigm shift in human-machine interaction, enabling seamless communication between the user and the wheelchair. This system not only facilitates daily tasks but also fosters a sense of autonomy and empowerment for individuals who rely on mobility assistance. With its user-friendly interface and adaptive technology, the voice-activated wheelchair represents a significant advancement in assistive technology, promising to improve the quality of life for countless individuals living with physical sickness or disability.

INTRODUCTION
This project aims to improve the lives of individuals who have lost mobility in their legs due to paralysis, accidents, or old age. Many of these individuals rely on assistance to move their wheelchairs, facing significant challenges when navigating public spaces. Studies show that a notable percentage of those trained to use power wheelchairs struggle with daily activities, and a substantial portion find it difficult to steer and maneuver their wheelchairs effectively.

In India, a Census is conducted every decade, with the latest one in 2011 revealing that 2.21% of the population has a disability, totalling around 2.68 crore individuals. The majority of disabled individuals reside in rural areas, accounting for 69% of the total disabled population. Under the RPWD Act 2016, 21 types of disabilities are recognized, with 13% attributed to movement-related impairments. The prevalence of disability is highest among individuals aged 10-19 and 20-29 years, regardless of gender.

Recognizing the paramount importance of speech in human communication, this project explores the development of a voice-controlled wheelchair using mobile platforms and Bluetooth technology. Additionally, ultrasonic sensors are incorporated to detect obstacles within a 4-meter range, enhancing safety and autonomy. The implementation of a Smart Wheelchair control system utilizing Arduino Uno microcontroller and Bluetooth Module via an Android application further enhances usability. Mobility disabilities can arise from various factors, including birth conditions or accidents. Assistive devices, such as wheelchairs, play a vital role in aiding individuals with disabilities. Electric-powered wheelchairs, in particular, are favoured for their ease of use and minimal physical exertion requirements, effectively addressing mobility challenges for disabled individuals.

LITERATURESURVEY

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EXISTING METHOD

Despite the widespread availability of voice-controlled wheelchairs, individuals with paralysis, physical disabilities, or handicaps still encounter challenges, particularly in critical situations where their safety or well-being may be compromised. While these systems represent a significant advancement in accessibility technology, they may not fully address the diverse needs and obstacles faced by users. Factors such as environmental hazards, limited responsiveness in emergencies, and the necessity for personalized adjustments underscore the pressing need for alternative solutions in mobility assistance. Future innovations could explore approaches such as enhanced environmental awareness, adaptive control interfaces, integrated health monitoring, collaborative robotics, telepresence, and user-centric design. By embracing a multidisciplinary approach and leveraging emerging technologies, these alternative solutions aim to empower users with mobility limitations to lead more independent, active, and fulfilling lives.

Figure.1. Schematic diagram for proposed model

PROPOSED METHOD

The proposed system is designed to harness the power of voice commands as its primary mode of wheelchair operation, recognizing the widespread accessibility and intuitive nature of voice communication for users with mobility limitations. Through the interpretation of user commands, the system will seamlessly control the direction of the wheelchair, offering a responsive and user-friendly experience. What sets this system apart from existing wheelchair technologies is its innovative integration of multiple cutting-edge technologies, including GPS location tracking, into a single, multipurpose solution.Unlike conventional wheelchairs that typically offer either manual control or voice control as separate functionalities, the proposed system aims to combine these features into a cohesive and comprehensive platform. By integrating GPS location tracking, users will not only be able to navigate their surroundings safely but also benefit from location-aware capabilities that enhance convenience and security. This means that the wheelchair can not only respond to voice commands for directional control but also provide real-time information about the user's location, nearby points of interest, and potential hazards in the environment.
Furthermore, the incorporation of GPS technology opens up a myriad of possibilities for additional functionalities and services. For instance, the wheelchair could offer personalized route planning

assistance, suggesting accessible paths and avoiding obstacles or steep inclines. It could also provide alerts or notifications to the user about upcoming turns, intersections, or changes in terrain, thereby improving situational awareness and reducing the risk of accidents.

Moreover, the integration of GPS location tracking enables advanced features such as geo-fencing, allowing caregivers or family members to define safe zones for the user and receive alerts if the wheelchair strays beyond specified boundaries. This added layer of security offers peace of mind to both users and their loved ones, especially in scenarios where the user may be at risk of wandering or getting lost.

Overall, by leveraging the power of voice commands and integrating GPS technology, the proposed system aims to revolutionize the landscape of wheelchair mobility, offering enhanced functionality, versatility, and safety to users with mobility limitations. It represents a significant step forward in accessibility technology, empowering individuals to navigate their environment with greater independence, confidence, and peace of mind.

THE DESIGN STRUCTURE OF THE WHEEL CHAIR

Wheelchair design adopts a holistic approach, prioritizing not only structural assistance but also the social, psychological, and physical well-being of users. Beyond mere functionality, wheelchairs serve as vehicles for independence, self-assurance, and dignity, empowering individuals with mobility limitations to navigate the world with confidence. This comprehensive approach encompasses features aimed at enhancing comfort and control, such as customizable seating arrangements, intuitive control panels, and innovative suspension systems. These elements not only facilitate mobility but also imbue users with a sense of style and convenience as they interact with their environment.

Moreover, wheelchair designers collaborate closely with end users and healthcare providers to ensure that each wheelchair meets individual desires and aspirations while also fulfilling clinical requirements. By embracing user-centered design principles, designers strive to create personalized, life-changing experiences that transcend mere functionality, enriching users' lives and fostering inclusivity and equality for all.

Through continuous innovation and technical advancements, wheelchair designers are dedicated to overcoming obstacles and pushing the boundaries of accessibility technology. By harnessing the latest technological developments and insights from user feedback, they aim to create wheelchairs that not only meet the diverse needs of users but also enhance their quality of life and promote social inclusion on a global scale. In doing so, wheelchair designers play a pivotal role in shaping a more inclusive and equitable society, where individuals of all abilities can thrive and contribute to their communities with confidence and dignity.

RESULT ANALYSIS

This project aims to design a simple and effective automatic speech recognition system for isolated command words, facilitating motion control of a speech-enabled wheelchair for differently-abled individuals. The system integrates processing units, including a speech kit and a microcontroller, directly into the wheelchair, creating a compact and autonomous solution. The speech recognizer's performance is rigorously tested to ensure precise movement of the wheelchair.

To achieve this, audio files are recorded and trained for five command words: "forward," "backward," "left," "right," and "stop." These words are selected based on their ease of pronunciation and their widespread usage across different countries. Additionally, the chosen words exhibit significant phonemic variation, enhancing the system's ability to accurately recognize spoken commands.

The figures below illustrate the recognizable phonemic representations of each voice command, demonstrating the system's capability to interpret and execute user instructions effectively.

Fig 2

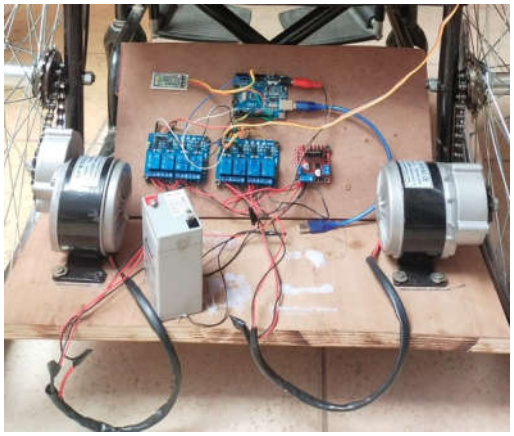
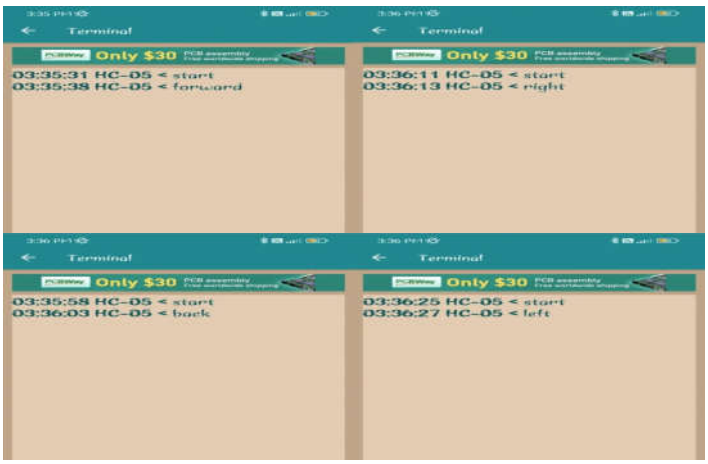


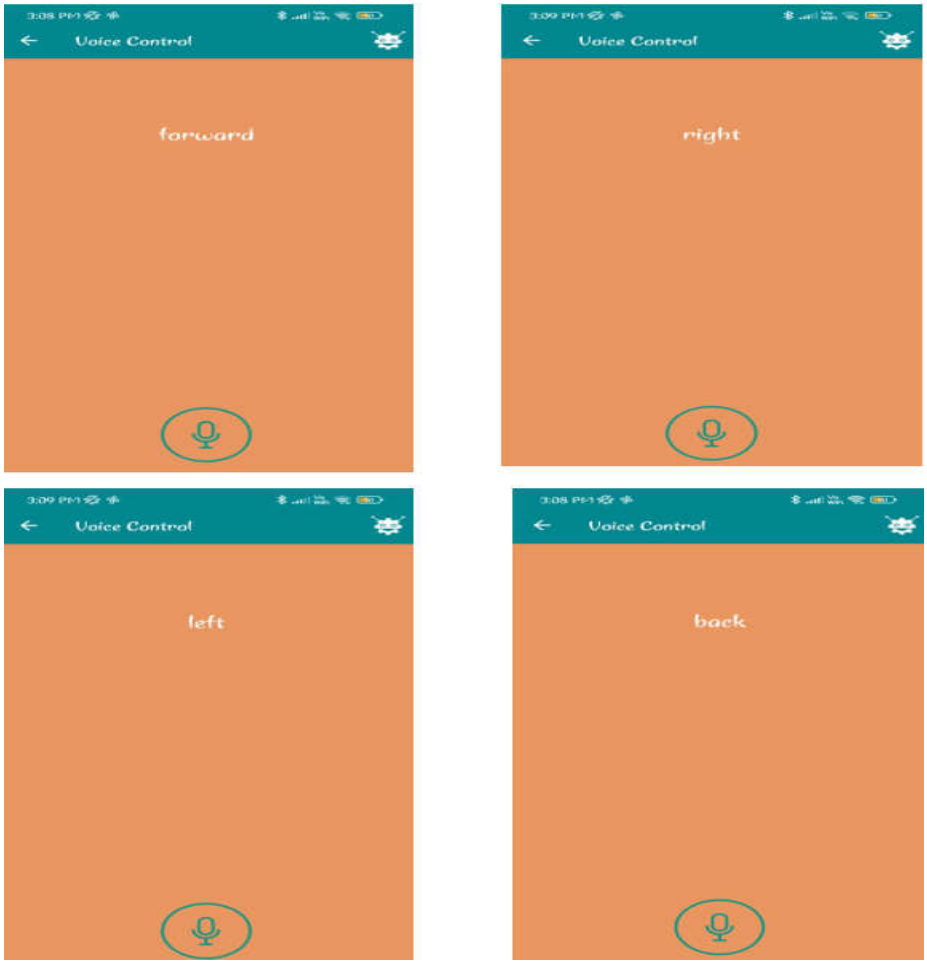
Fig 3

USERVOICE COMMAND	CONDITION	STRING COMMAND	LEFT/RIGHT MOTOR
FORWARD	MOVES FORWARD	FORWARD	ON/ONFORWARD
BACK	MOVES BACKWARD	BACK	ON/ON BACKWARD
LEFT	MOVESLEFT	LEFT	OFF/ON FORWARD
RIGHT	MOVESRIGHT	RIGHT	ON/OFF FORWARD

Table of Commands



Text commands



Voice Commands (Forward,Backward,Left, Right)TakenbyABCApplication

FORWARD

RIGHT

LEFT

BACK

CONCLUSION

To alleviate the suffering of individuals living with physical disabilities, significant advancements have been made in technology, particularly in the field of surveillance. One such breakthrough is the development of a voice-controlled automatic wheelchair. This innovative wheelchair operates seamlessly through simple voice commands, offering greater independence to individuals who have difficulty controlling their movements, especially those with limited arm and hand mobility.

This project focuses on the design and construction of a Speech-enabled Wheelchair, incorporating a Bluetooth Module for enhanced functionality. The circuitry efficiently translates user commands into corresponding wheelchair movements, ensuring smooth operation and user satisfaction.

Furthermore, a tracking system has been integrated to monitor the patient's current location using an Android app. This feature enhances the system's user-friendliness, speed, and cost-effectiveness, providing additional peace of mind to caregivers and loved ones. Careful positioning of the hardware components within the wheelchair is a critical aspect of the project, ensuring optimal functionality and ease of use.

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