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Smart Wheel Chair using IOT

Dr. Shivakumar K S[1], Keerthi. B[2], Sai Charan. M[3], Mohammed Nauman. M S[4], Tej Paul. S[5]
Assistant Professor, Department of Electronics and Communication Engineering[1]
Students, Department of Electronics and Communication Engineering[2,3,4,5]
Ballari Institute of Technology And Management, Allipura, Ballar, Karnataka, India

Abstract: *The microcontroller based wheelchair using android is a device designed to assist individuals with mobility impairments. The system utilizes an Android application installed on a smartphone to control the movement of the wheelchair. The smartphone communicates with a microcontroller via Bluetooth, which is responsible for processing the received commands and controlling the movement of the wheelchair's motors. The system includes obstacle detection sensors that detect any obstacles in the wheelchair's path and prevent collisions.*

The microcontroller based wheelchair using android is a device that combines modern technologies to help individuals with mobility impairments. It utilizes an Android application and a microcontroller to control the movement of the wheelchair. Here are some more details about this innovative device:

Android Application: The Android application is installed on a smartphone and acts as a remote control for the wheelchair. The user can use the application to move the wheelchair forward, backward, left, and right. Additionally, the application provides the user with real-time feedback on the wheelchair's battery level, speed, and direction.

Microcontroller: The microcontroller is responsible for processing the commands received from the smartphone and controlling the movement of the wheelchair's motors. The microcontroller is programmed to interface with the wheelchair's motors and control their speed and direction.

Improving the quality of life for the elderly and disabled people and giving them the proper care at the right time is one the most important roles that are to be performed by us being a responsible member of the society. It's not easy for the disabled and elderly people to maneuver a mechanical wheelchair, which many of them normally use for locomotion.

Hence there is a need for designing a wheelchair that is intelligent and provides easy maneuverability. In this context, an attempt has been made to propose a thought controlled wheelchair, which uses the captured signals from the brain and eyes and processes it to control the wheelchair. Electroencephalography (EEG) technique deploys an electrode cap that is placed on the user's scalp for the acquisition of the EEG signals which are captured and translated into movement commands by the arduino microcontroller which in turn move the wheelchair

Keywords: Smart wheelchair

I. INTRODUCTION

A microcontroller-based wheelchair is an assistive device designed to help individuals with mobility impairments. This type of wheelchair uses a microcontroller to control the movement of the chair, and can be operated using various input devices such as buttons, joysticks, or sensors.

An Android-based system can be used to control the microcontroller-based wheelchair wirelessly. An Android application can be developed to communicate with the microcontroller via Bluetooth or Wi-Fi, enabling users to control the wheelchair using their smartphones or tablets. This type of system offers greater convenience and flexibility for users, as they can control the wheelchair without the need for physical buttons or joysticks.

The Android application can be customized to include various features such as speed control, obstacle detection, and safety features such as emergency stop buttons. The wheelchair itself can be designed to be lightweight, compact, and easily maneuverable, making it suitable for indoor and outdoor use.

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Overall, a microcontroller-based wheelchair using Android offers a cost-effective and practical solution for individuals with mobility impairments, providing them with greater independence and freedom of movement.

A microcontroller-based wheelchair that is controlled using an Android smartphone is a popular and accessible option for individuals with disabilities who have limited mobility. The microcontroller serves as the brain of the wheelchair, while the Android smartphone provides the user interface and control.

The microcontroller is responsible for controlling the motors that drive the wheels of the wheelchair. It receives input from sensors that detect the position and speed of the wheelchair, as well as from the Android smartphone via a Bluetooth connection. The microcontroller processes these inputs and generates appropriate signals to drive the motors in the desired direction and speed.

To control the wheelchair using an Android smartphone, a custom mobile application needs to be developed. This application communicates with the microcontroller over Bluetooth and sends commands to control the direction, speed, and other functions of the wheelchair.

The user interface of the application can be customized to meet the specific needs of the wheelchair user, including the ability to adjust the speed, control the turning radius, and stop the wheelchair.

The microcontroller-based wheelchair using an Android smartphone can be customized to meet the specific needs of the user, including the addition of features such as obstacle detection, voice control, and automatic braking. This type of wheelchair is often more affordable and flexible than traditional powered wheelchairs, making it a popular choice for individuals with limited mobility.

In summary, a microcontroller-based wheelchair using an Android smartphone provides an accessible and customizable option for individuals with disabilities who have limited mobility. By using a custom mobile application, users can easily control the wheelchair and adapt it to their specific needs. Android-controlled Wheelchair.

A microcontroller-based wheelchair using android is a type of electric wheelchair that is operated by an Android smartphone or tablet. The wheelchair is equipped with a microcontroller, which is a small computer that controls the movement of the wheelchair. The microcontroller communicates with the Android device through Bluetooth or Wi-Fi, allowing the user to control the wheelchair with a custom-built Android application.

The Android application provides a user-friendly interface for controlling the movement of the wheelchair, including direction, speed, and other functions such as turning on and off the lights or horn. The application can also display real-time information about the wheelchair, such as battery level and distance traveled.

The microcontroller-based wheelchair is designed to be customizable and can be modified to suit the needs of different users. For example, the wheelchair can be fitted with sensors and other devices to assist users with mobility impairments or other disabilities.

1.1 OBJECTIVES OF PROJECT

- Control and maneuverability: Develop a microcontroller-based wheelchair system that can be controlled wirelessly using an Android device.
- User-friendly interface: Create an intuitive Android application that allows users to easily control the wheelchair's movements, such as forward, backward, left, and right turns, as well as speed adjustments.
- Safety features: Implement safety mechanisms into the wheelchair system, such as obstacle detection and collision avoidance, to ensure the user's safety during operation.
- Accessibility and customization: Design the wheelchair system to accommodate different user needs, considering features like adjustable seating positions, customizable control options, and additional assistive technologies.
- Battery management: Develop efficient power management algorithms to optimize the wheelchair's battery life, ensuring extended operation time and providing low-battery warnings.
- Real-time monitoring and feedback: Enable real-time monitoring of the wheelchair's status, including battery level, motor performance, and system diagnostics, and provide feedback to the user through the Android application.

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II. LITERATURE REVIEW

In the past few years, many projects are developed related to the wheelchair. The existing wheelchair for the disabled and aged people are designed in such a way that they can't move independently without an external support. The developed projects are based on the joystick, voice, hand gesture and brain wave sensing. In the recent years, the battery powered wheelchairs also have been invented, which had gained popularity because it's more helpful for the physically disabled and the aged people.

From reference [1] With this work, we encourage the application of smart driving assistance algorithms to support the operator of an automated wheelchair in complex navigational situations. On the basis of an empirical study in which eight untrained subjects performed a given course using a conventional joystick and a proportional head-joystick respectively, we are able to prove benefits resulting from the application of a newly developed driving assistance module. Altering the translational and rotational velocities in situations where an obstacle blocks the user- commanded way, the driving assistance module significantly improves driver-performance by preventing all collisions along the way.

From the reference [2] New development in sensors, radar and ultrasonic technologies has proved to be a boon for electronics travelling aids (ETAs). These devices are widely used by blind and physically challenged peoples. C5 laser cane, Mowat sensor, belt and binaural sonic aid, NAV guide cane are among popular electronic travelling aids used by blind peoples. For physically challenged person electric wheel chairs controlled by joystick, eye movement and voice recognition are also available but they have their own limitation in terms of operating complexity, noise environment and cost. Our paper proposes an automated innovative wheelchair controlled by neck position of person. It uses simple LEDs, photo sensor, motor and microcontroller to control the movement of wheelchair.

From the reference [3] Many people in wheelchairs are unable to control a powered wheelchair with the standard joystick interface. A robotic wheelchair can provide users with driving assistance, taking over low-level navigation to allow its user to travel efficiently and with greater ease. Our robotic wheelchair system, Wheelesley, consists of a standard powered wheelchair with an on-board computer, sensors and a graphical user interface. This paper describes the indoor navigation system and the customizable user interface.

From the reference [4] The Motivation wheelchair outperformed Whirlwind wheelchair on rough and smooth tracks, and in some metrics on the tight spaces track. Motivation and Whirlwind wheelchairs significantly outperformed the hospital transport wheelchair in all metrics on the rough track skills test.

From the reference [5] Wheelchair sports are an important tool in the rehabilitation of people with severe chronic disabilities and have been a driving force for innovation in technology and practice. In this paper, we will present an overview of the adaptive technology used in Paralympic sports with a special focus on wheeled technology and the impact of design on performance (defined as achieving the greatest level of athletic ability and minimizing the risk of injury). Many advances in manual wheelchairs trace their origins to wheelchair sports. Features of wheelchairs that were used for racing and basketball 25 or more years ago have become integral to the manual wheelchairs that people now use every day; moreover, the current components used on ultralight wheelchairs also have benefitted from technological advances developed for sports wheelchairs. For example, the wheels now used on chairs for daily mobility incorporate many of the components first developed for sports chairs. Also, advances in manufacturing and the availability of aerospace materials have driven current wheelchair design and manufacture. Basic principles of sports wheelchair design are universal across sports and include fit; minimizing weight while maintaining high stiffness; minimizing rolling resistance; and optimizing the sports-specific design of the chair. However, a well-designed and fitted wheelchair is not sufficient for optimal sports performance: the athlete must be well trained, skilled, and use effective biomechanics because wheelchair athletes face some unique biomechanical challenges.

From the reference [6] This paper present the trajectory generation for the knee joint. The study of human walking cycle uses quintic polynomial equation and cubic polynomial equation. The walking cycle is divided into eight sub-phases gaits. In this paper, we are using the quantic and cubic equation in order to generate the same profile as the normal human walking for position, velocity and acceleration. The generated signal will be used to control a device to duplicate and copy the knee movement for a normal person during walking. Then a comparison between the real data of human walking and the data gained from the quantic and cubic equations during the phases of the gait walking cycle will be shown in graphs using matlab.

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From the reference [7] A new intelligent powered wheelchair is urgently needed for the individuals with tetraplegia and similar impairments who are unable to use the standard joystick. Based on the tongue motion detection, a new control system is introduced in this paper which is helpful for users to operate powered wheelchair efficiently and easily. This article introduces two control modes, including tongue motion control mode and infrared control mode. Wherein the infrared control mode mainly use the infrared controller. The tongue motion can be detected with several vibration film sheets that were embedded in the headset and a standard analog signal can be generated with embedded controller to control the wheelchair. The tongue motion drive system integrated into headset was developed and the control of the wheelchair has been tested moving along the designed route. Preliminary results show that the system is simple and convenient to control powered wheelchair with low cost, which has potential application in intelligent control domain.
From the reference [8] A head tilt controller has been used to help quadriplegics and paralyzed patient to control an electrical wheelchair by head movement instead of using the conventional joystick control. In this paper, several functions for improving the performance of the head tilt controller have been proposed. Command confirmation function has been used to remove the effect of involuntary head motion between stop and motion control commands regions. The emergency stop function has been used to provide safety conditions when the head orientation goes out of the limited ranges. The orientation sensor error handling function has been integrated to track the orientation data of the user's head as well as of the wheelchair and send an alarm if there is no change or update on the orientation information to avoid the wrong command in case of one or both sensors are not responding.

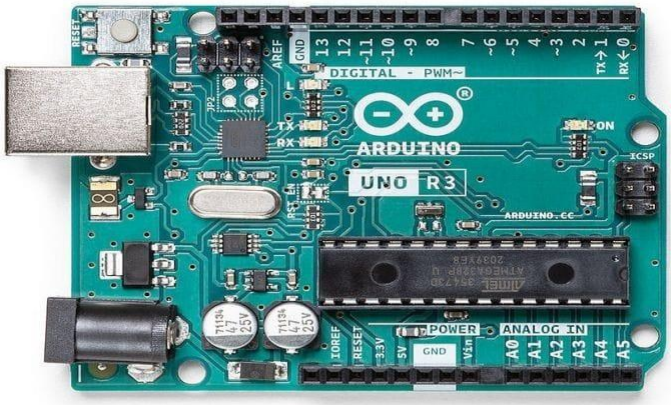
III. METHODOLOGY

The methodology for developing a microcontroller-based wheelchair using Android involves several steps. Here is a general overview of the process:

3.1 COMPONENTS DESCRIPTION

A. ARDINO UNO

Arduino is a popular microcontroller platform that can be used to control various electronic devices and systems, including a wheelchair. Here are some general steps on how to use Arduino in a microcontroller-based wheelchair using Android.



The Arduino Uno board features digital input/output pins, analog input pins, PWM (Pulse Width Modulation) outputs, UART (Universal Asynchronous Receiver-Transmitter) for serial communication, and various other interfaces. It also has a USB connection for programming and power supply.

B. NODE MCU

Node MCU is a low-cost open source IoT platform.[4][5] It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 module.[6][7] Later, support for the ESP32 32-bit MCU was added.

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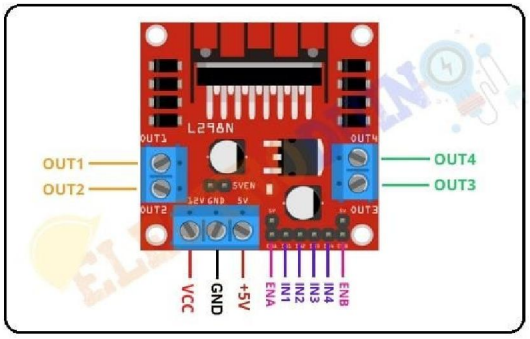
The Node MCU board is designed to be programmer-friendly, allowing developers to easily program and interact with it using the Lua scripting language or the Arduino IDE. It has a USB interface for power supply and programming, as well as a set of general-purpose input/output (GPIO) pins for connecting and controlling external devices.

C. L298N MOTOR:

The LP298N is a voltage regulator commonly used in electronic circuits, including microcontroller-based systems like a wheelchair controlled by an Android device. In such a system, the LP298N is typically used to regulate the voltage supplied to the microcontroller and other components.

Here's a concise overview of how the LP298N is used in this application:

- Power Supply: The LP298N takes in an unregulated power source, such as a battery, and provides a stable output voltage required by the microcontroller and other components.
- Voltage Regulation: The LP298N regulates the voltage to a specific value, ensuring a steady and reliable power supply for the microcontroller. This is crucial for preventing voltage fluctuations that could adversely affect the system's performance.



D. LED LIGHT

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In a microcontroller-based wheelchair using Android, LED lights are used for various purposes, including safety, visibility, and user interface feedback. LEDs, or Light Emitting Diodes, are compact, energy-efficient light sources that can be easily controlled by the microcontroller.

Safety and Visibility: LED lights can be incorporated into the wheelchair to enhance visibility, especially in low-light conditions or during nighttime. They can be positioned as front and rear lights to make the wheelchair more noticeable to pedestrians, cyclists, and other vehicles, improving safety.

Turn Signals: LED lights can be used as turn signals to indicate the intended direction of the wheelchair's movement. This helps in communicating the wheelchair user's intentions to other people around, enhancing safety during turns or lane changes

E. ULTRASONIC SENSOR

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic soundwaves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay backinformation about an object's proximity.

The sensor emits a burst of ultrasonic waves, typically in the range of 40 kHz to 200 kHz.These sound waves travel through the air and, when they encounter an object, they bounce back or get reflected.

The sensor's receiver detects the reflected waves.

By measuring the time it takes for the sound waves to travel back, the sensor can calculate the distance to the object using the speed of sound in air (approximately 343 meters per second at room temperature).

Some ultrasonic sensors provide additional information, such as the strength of the reflected signal,which can be used to infer the characteristics of the object or its surface

F. JUMPER WIRES

Jumper wires are essential components used in electronics and prototyping to establish electrical connections between various electronic components such as breadboards, microcontrollers, sensors, and other devices. They consist of thin, insulated wires with connectors or pins at each end.

Jumper wires come in different types and sizes, such as male-to-male, male-to-female, and female- to-female, to accommodate various connection needs. Male connectors have exposed pins, while female connectors have receptacles to receive the male pins.

These wires allow for quick and temporary connections without the need for soldering or permanent wiring. They enable easy experimentation, circuit modifications, and prototyping by providing a flexible and versatile means of connecting different components together

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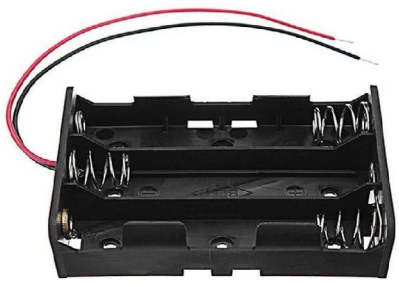
G. LITHIUM ION BATTERIES

Aan Android device, a lithium-ion battery is typically used as the power source. Lithium-ion batteries are popular in these applications because of their high energy density, relatively low weight, and long cycle life .The microcontroller is the brain of the wheelchair and manages the power distribution from the battery to the motors that drive the wheels. The microcontroller also receives commands from the Android device via a wireless communication module such as Bluetooth or Wi-Fi

H. BATTERY HOLDER

A battery holder is a mechanical device used to hold batteries in place, and it is commonly used inmicrocontroller-based wheelchairs using an Android device. The battery holder is used to securelyhold the lithium-ion battery that powers the wheelchair. The battery holder is typically attached tothe frame of the wheelchair using screws or other fasteners. The holder is designed to accommodate the specific size and shape of the battery used in the system.



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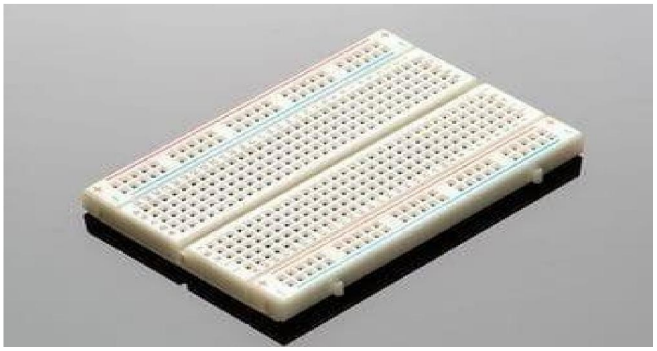
Purpose: The primary purpose of a battery holder is to provide a secure and convenient means of holding batteries within a device. It prevents the batteries from moving or rattling, ensuring a stableelectrical connection.
Construction: Battery holders are typically constructed using plastic or other non-conductive materials. They consist of a compartment or slots designed to hold the batteries firmly in place. The compartment may have springs, clips, or contacts that apply pressure to the battery terminals,establishing electrical connections

I. FOAM BOARD

Foam board is a lightweight, rigid board made of polystyrene foam and is commonly used in microcontroller-based wheelchairs using an Android device. It is typically used as a mounting platform for the components of the system.
Foam board can be easily cut and shaped to fit the specific requirements of the system. It is also lightweight, making it ideal for use in portable systems such as a

Foam board, also known as foam core board or foam sheet, is a lightweight and versatile materialcommonly used in various applications, including arts and crafts, signage, displays, and modeling. It consists of a rigid foam core sandwiched between two layers of paper or plastic

J. BREAD BROAD



A breadboard, also known as a protoboard or solderless breadboard, is a device usedto create and test electronic circuits without the need for soldering. It provides a platform for quickly and easily connecting electronic components, such as resistors,capacitors, integrated circuits, and wires, for rapid prototyping and experimentation.

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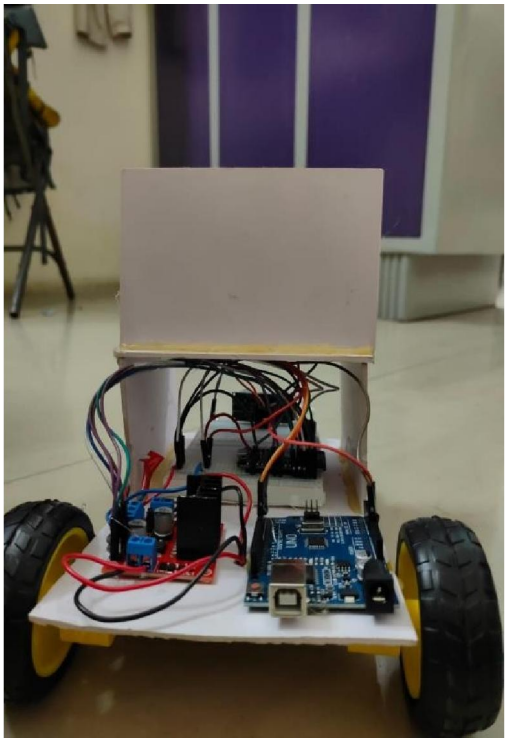
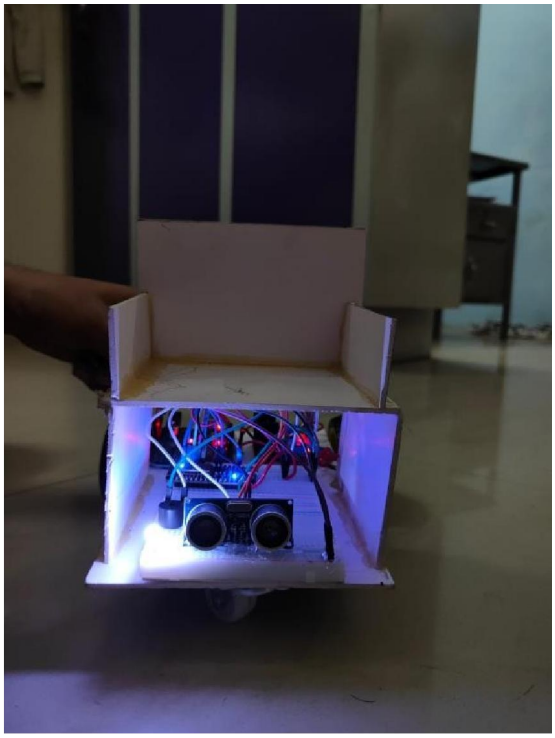
IV. RESULT AND DISCUSSION





As an AI language model, I do not have access to specific information regarding a particular project or study. However, I can provide some general information regarding microcontroller based wheelchair using Android.

A microcontroller based wheelchair using Android is a type of assistive technology designed to improve the mobility and independence of people with disabilities. It uses a microcontroller to control the movement of the wheelchair, which can be operated using an Android smartphone.

One advantage of this type of system is that it provides a more convenient and accessible way forusers to control the wheelchair, compared to traditional joystick-based systems. It also allows forcustomization of the control interface, such as adjusting the speed and sensitivity of the wheelchair's movements, and adding additional features like voice control or obstacle avoidance.

However, the effectiveness and safety of a microcontroller based wheelchair using Android would depend on several factors, such as the quality of the hardware and software, the user's ability to operate the system, and the environment in which the wheelchair is used. Therefore, thorough testing and evaluation would be necessary to ensure that the system is reliable and meets the needs of the users.

Overall, a microcontroller based wheelchair using Android has the potential to improve the mobility and quality of life of people with disabilities. However, it is important to carefully consider the design, implementation, and evaluation of such systems to ensure their safety and effectiveness

V. APPLICATIONS

- Remote Control: An Android application can be developed to remotely control the wheelchair, enabling users to maneuver it using their smartphone or tablet. The app can send commands to the microcontroller, allowing the wheelchair to move forward, backward, turn, and stop.
- Sensor Integration: Android devices are equipped with various sensors, such as accelerometers, gyroscopes, and GPS. These sensors can be utilized to enhance the functionality of the wheelchair. For example, the app can use accelerometer data to detect gestures or tilting of the device for controlling the wheelchair's movement.

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- User Interface: Android applications provide a user-friendly interface that can display vital information about the wheelchair's status, such as battery level, speed, and distance traveled. This information can be communicated between the microcontroller and the Android app via a wireless connection.
- Customization and Accessibility: Android apps can be customized to cater to individual needs and preferences. Users can adjust settings like speed limits, sensitivity, and braking options according to their requirements. Additionally, accessibility features such as voice control, gesture recognition, or switch-based control can be integrated into the app to accommodate users with different abilities.
- Mapping and Navigation: With the integration of GPS capabilities, an Android app can provide navigation functionalities to assist wheelchair users in finding the most accessible routes. The app can display maps, highlight accessible locations, and provide real-time directions.
- Data Logging and Analysis: The Android app can collect and store data related to the wheelchair's usage, including distance traveled, speed, and battery usage. This information can be used for monitoring, maintenance, and further analysis to improve the wheelchair's performance.

Overall, integrating an Android application with a microcontroller-based wheelchair enhances its control, functionality, accessibility, and user experience.

VI. ADVANTAGES

- User-friendly control: By integrating Android technology, the wheelchair can be controlled using a familiar and intuitive interface. This can be especially beneficial for individuals who are already accustomed to using Android devices.
- Customizability: Android offers a wide range of customization options, allowing users to personalize the wheelchair's control interface, accessibility settings, and other features to suit their specific needs and preferences.
- Connectivity and communication: Android devices have built-in wireless connectivity capabilities such as Wi-Fi, Bluetooth, and mobile data. These features enable the wheelchair to connect with other devices, such as smartphones or home automation systems, facilitating seamless communication and integration with other smart devices.
- Sensor integration: Android devices can utilize various sensors such as accelerometers, gyroscopes, GPS, and cameras. Integrating these sensors into the wheelchair can enhance safety and functionality, enabling features like obstacle detection, collision avoidance, location tracking, and object recognition.
- Software ecosystem: Android has a vast software ecosystem, including a wide range of applications and developer support. This provides opportunities for developers to create specialized wheelchair-related apps, offering additional functionalities and accessibility options.

VII. DISADVANTAGES

- Reliance on technology: Android-based wheelchairs heavily rely on technology, including microcontrollers, sensors, and software. If any of these components fail or experience technical issues, it can disrupt the functionality of the wheelchair and potentially cause inconvenience or safety concerns for the user.
- Software complexity: Android systems can be complex, requiring a certain level of technical expertise to set up, configure, and troubleshoot. This complexity may pose challenges for users who are not familiar with technology or require assistance in managing and maintaining

VIII. CONCLUSION

A microcontroller-based wheelchair using an Android device is a promising assistive technology that can provide improved mobility and independence to people with disabilities. By incorporating an Android device as a control interface, the user can easily operate the wheelchair using a familiar and intuitive touchscreen interface.

Moreover, the use of a microcontroller allows for precise control of the wheelchair's movements and enables the implementation of various safety features, such as obstacle detection and automatic braking. Additionally, the system

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can be customized to suit the specific needs and preferences of the user, such as adjusting the speed and acceleration of the wheelchair.

Overall, a microcontroller-based wheelchair using an Android device has the potential to greatly enhance the quality of life for people with disabilities and improve their mobility and independence. However, it is important to ensure that the system is reliable, safe, and user-friendly, and that it meets the specific needs of the user.

The Smart Wheelchair has the ability to uncover learning potential and facilitate the recognition of abilities in children previously excluded from access to independent mobility. Given the significant limitation that restrictions in mobility pose to participation for children with physical disabilities, therapists must begin to understand the effectiveness of interventions such as the Smart Wheelchair. The descriptive findings of this study allow for future, more rigorous .

This technology offers several advantages, including real-time monitoring of the wheelchair's status, customizable control options, and the ability to incorporate additional features such as obstacle detection and collision avoidance systems. The Android platform provides a familiar and intuitive interface, making it accessible to a wide range of users.

Furthermore, the microcontroller-based wheelchair offers the potential for remote control and monitoring, allowing caregivers or family members to assist and track the user's activities. This enhances safety and facilitates better communication and coordination.

However, it is important to address potential challenges, such as ensuring robust and reliable communication between the microcontroller and the Android device, implementing appropriate safety measures, and optimizing power management to extend battery life.

Overall, the integration of a microcontroller with an Android device for wheelchair control holds promise for improving the quality of life for individuals with physical disabilities, providing them with increased mobility, independence, and convenience. Further research and development in this field can lead to even more advanced and user-friendly solutions in the future.

IX. FUTURE SCOPE

A microcontroller-based wheelchair that can be controlled using an Android device has great potential for future development. Here are some possible areas for improvement and expansion:

- User interface: The Android app used to control the wheelchair can be made more user-friendly and intuitive, with additional features such as voice commands or gesture recognition.
- Smart sensors: Incorporating smart sensors such as obstacle detection and avoidance sensors, pressure sensors on the seat and backrest, and heart rate sensors can help provide a safer and more comfortable ride for the user.
- Autonomous operation: The wheelchair can be designed to operate autonomously, with the ability to navigate around obstacles and reach its destination independently.
- Remote monitoring: The wheelchair's performance and health can be monitored remotely, allowing caregivers to keep an eye on the user's safety and wellbeing.
- IoT integration: The wheelchair can be integrated with other IoT devices, such as smart home systems, to provide a seamless and integrated experience for the user.
- Customization: The wheelchair can be designed to be customizable, with the ability to adjust the seat height, backrest angle, and other features to suit the user's specific needs.
- Sustainability: The wheelchair can be designed to be eco-friendly, with features such as regenerative braking, solar-powered charging, and recyclable materials.

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