Electric Wheelchair Portable For Patient Lift With Continuous Health Monitoring

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Abstract

Electric wheelchairs help people with disabilities move around more easily, giving them more freedom and a better quality of life. Adding joystick controls has made it easier to drive the wheelchair, making users more independent. In recent years, health monitoring systems have been added to track important health signs like heart rate and oxygen levels. This paper explains how joystick-controlled electric wheelchairs work, how health monitoring is added, their benefits, challenges.

1. Introduction

Mobility issues are common among elderly and disabled individuals, often reducing independence. Electric wheelchairs have transformed mobility by allowing users to move freely without needing help. Joystickcontrolled models make navigation easy and require minimal effort, improving user comfort and confidence.

Recently, the integration of health monitoring systems into electric wheelchairs has become an important advancement, enhancing both mobility and health management. These systems are designed to track key health parameters such as heart rate, blood pressure, oxygen saturation (SpO2), and body temperature in real time. Sensors embedded in the wheelchair monitor these vital signs continuously and transmit the data to a display or a connected device, such as a smartphone.

For instance, a pulse oximeter measures oxygen saturation and heart rate, while a blood pressure monitor tracks fluctuations in blood pressure levels. If any abnormal readings are detected, the system can send alerts to caregivers or medical professionals, allowing for quick intervention. This is particularly beneficial for individuals with chronic health conditions, such as cardiovascular diseases, respiratory problems, where constant monitoring is necessary to prevent emergencies.

This integration of health monitoring and mobility support provides a significant improvement in the quality of life for users, enhancing their independence while ensuring better health management and quicker response to potential medical issues.

2. Joystick-Controlled Electric Wheelchair Systems

Joystick-controlled electric wheelchairs provide a simple and effective way for individuals with mobility impairments to move independently. These systems are designed to be user-friendly, offering precise and smooth control over the wheelchair's movement through an intuitive interface.

Main Components of Joystick-Controlled Systems:

1. Joystick:

The joystick is the primary input device that allows users to control the wheelchair's speed and direction. It consists of a stick that can be moved in multiple directions (forward, backward, left, and right).

The joystick is designed to be ergonomic and sensitive to small movements, making it suitable for users with limited hand strength or motor control.

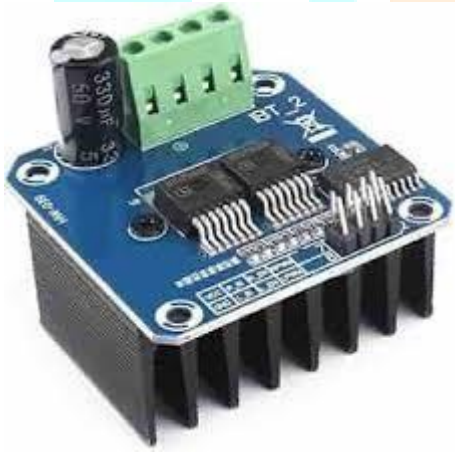
The sensitivity can often be adjusted to meet the user's comfort and physical ability.

2. Microcontroller:

The microcontroller acts as the "brain" of the system. It processes the signals received from the joystick and translates them into commands for the motors.

For example, if the joystick is pushed forward, the microcontroller will signal the motors to move the wheelchair forward at a speed based on how far the joystick is pushed. It ensures smooth acceleration and deceleration for a comfortable user experience.

3. Motor Driver:



The motor driver is responsible for controlling the wheelchair's motors. It receives low-power signals from the microcontroller and converts them into high-power signals that can drive the motors. The motor driver controls both the speed and direction of the motors based on the processed signals from the microcontroller. This allows the wheelchair to move forward, backward, turn left or right, and even rotate in place.

Features and Functionalities:

Smooth and Precise Control: Joystickcontrolled systems provide smooth handling, even on uneven or rough terrains. Speed Adjustment: Users can adjust the speed settings based on their comfort level and the environment.

3. Health Monitoring Integration

Health monitoring systems have become increasingly important in electric wheelchairs, particularly for users with chronic health conditions. These systems track vital signs and physiological parameters to ensure the user remains in good health while operating the wheelchair.

Common features of these systems include:

Vital Sign Monitoring: Devices like pulse oximeters and blood pressure monitors are integrated into the wheelchair to continuously track the user's vital signs. The data is processed and displayed on a user-friendly interface, allowing the user or caregiver to monitor health status.

Wireless Communication: Health data is transmitted wirelessly to caregivers or healthcare providers through Wi-Fi networks. This allows for remote monitoring, which is especially useful for users living in assistedliving facilities or who require frequent health check-ups.

4. Benefits of Health Monitoring in Electric Wheelchairs

Health monitoring systems in electric wheelchairs help keep track of the user's health while they are using the wheelchair, especially for people with long-term health problems. These systems monitor important health signs and provide real-time updates to ensure the user stays safe and healthy.

Main Features:

1. Vital Sign Monitoring:

The wheelchair is fitted with devices like pulse oximeters (to measure oxygen levels) and blood pressure monitors. These devices constantly check important health signs like heart rate, blood pressure, and oxygen levels. The results are shown on a simple screen so that both the user and caregivers can easily see the health status.

2. Wireless Communication:

The health data is sent to caregivers or healthcare providers using Wi-Fi.

This allows doctors or caregivers to check the user's health remotely without needing to be physically present.

It is especially useful for people who live in assisted-living homes or require regular health check-ups.

3. Health Data Analysis:

The system uses smart software to study the health data in real-time. If the system notices something unusual (like a sudden drop in oxygen levels), it will

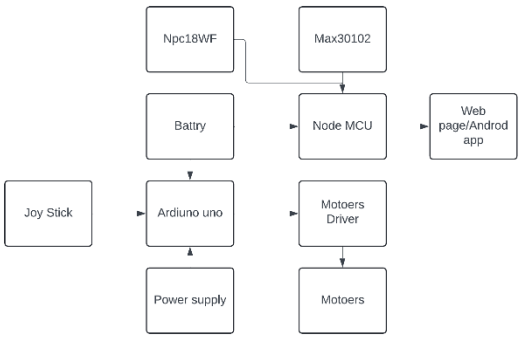
send an alert to the user and the caregiver. Over time, the system can learn patterns in the data and predict potential health problems before they become serious. This helps prevent emergencies and ensures quick medical attention if needed.

Benefits:

Helps in early detection of health issues. Improves user safety by sending real-time alerts. Reduces the need for frequent doctor visits by allowing remote monitoring. Makes it easier for caregivers to keep track of the user's health.

Health monitoring systems make electric wheelchairs smarter and safer, giving users more independence while ensuring their health is always under watch.

5.Block Diagram



6. Challenges and Limitations

Despite their benefits, joystick-controlled electric wheelchairs with health monitoring systems face several challenges:

1. High Cost:

Adding health monitoring and advanced controls makes the wheelchair expensive. This may make it difficult for people from lowincome backgrounds to afford it.

2. Battery Life:

Sensors and wireless systems use extra power, reducing battery life. Users may need to recharge the wheelchair more often, which can be inconvenient.

3. Data Privacy:

Health data sent wirelessly to caregivers or devices can be exposed to hacking if not properly secured. This raises concerns about the safety and privacy of the user's health information.

4. Technical Complexity:

Adding health monitoring systems makes the wheelchair more complicated. This increases the chances of malfunctions, requiring regular maintenance and software updates.

7. Actual photo of the developed electric wheelchair model.

8. Conclusion

Electric wheelchairs with joystick control and integrated health monitoring systems provide a smart and helpful solution for individuals with mobility challenges. They make movement easier, support independent living, and help track vital health signs in real time. This allows users and caregivers to respond quickly to any health concerns, improving safety and overall well-being. With ongoing advancements in technology and efforts to reduce manufacturing costs, these wheelchairs are becoming more affordable and accessible, helping more people benefit from greater comfort, independence, and continuous health support.

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