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Gesture Control Wheel Chair

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Abstract

A gesture-controlled wheelchair is an innovative assistive technology designed to enhance mobility and independence for individuals with physical disabilities. This system enables users to control the movement of a wheelchair through simple hand gestures, eliminating the need for traditional manual or joystick-based controls. The primary objective of this project is to develop a user-friendly and efficient interface that translates human gestures into directional commands.

Keywords: Gesture Controlled Wheelchair; Hand Gesture Recognition; Assistive Technology; Computer Vision; Embedded Systems; IoT; Smart Healthcare; Obstacle Avoidance.

How to Cite This Article

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Introduction

Mobility plays a vital role in the daily lives of individuals, enabling independence and active participation in society. For people with physical disabilities, especially those with limited hand or body movement, operating a conventional wheelchair using manual controls or joysticks can be challenging. This creates a need for more advanced and user-friendly assistive technologies that can simplify wheelchair operation and improve the quality of life. A gesture-controlled wheelchair is an innovative solution that allows users to control movement through simple hand gestures. By using sensors such as accelerometers or flex sensors, the system detects the motion or orientation of the user's hand and converts it into corresponding commands. These commands are processed by a microcontroller, which directs the motors to move the wheelchair in desired directions such as forward, backward, left, or right.

Literature Review

Arun Singh, K. S. and Dr. Gaayathry K. (2021): This paper presents a gesture-controlled wheelchair using an accelerometer sensor and

microcontroller for interpreting hand movements. The system translates tilt- based gestures into directional commands, allowing users to move the wheelchair without physical effort, making it suitable for individuals with limited mobility.

Arun V. S. et al. (2020): A review paper on smart wheelchair systems that analyzes various control techniques such as gesture, voice, and joystick- based navigation. The study highlights the use of sensors like accelerometers and gyroscopes for motion detection, with microcontrollers processing the data and controlling motors. It emphasizes improved accessibility and reduced human assistance.

R. Kumar et al. (2019): This paper proposes a wireless gesture-controlled wheelchair using RF modules for communication between a hand gesture unit and the wheelchair. The system enhances user comfort by allowing remote operation and includes basic safety features for smooth navigation.

S. Patel and M. Shah (2022): This research presents an IoT-enabled gesture-controlled wheelchair integrated with obstacle detection using ultrasonic sensors. The system ensures safe movement by detecting obstacles in real time and stopping automatically, improving reliability and user safety.

P. N. Reddy et al. (2021): This paper introduces a gesture recognition system using machine learning algorithms to improve accuracy. The system classifies hand gestures with high precision and reduces errors in wheelchair navigation, providing a smarter assistive solution.

A. Mehta et al. (2023): This study focuses on a multi-modal wheelchair control system combining gesture and voice commands. It offers flexibility for users with different levels of disability and enhances usability by providing alternative

Methodology

The proposed system aims to develop a gesture-controlled wheelchair that enables physically disabled individuals to navigate easily using simple hand movements. The system is designed using a combination of sensors, a microcontroller, and motor control mechanisms to convert gestures into wheelchair motion. Initially, a gesture input module is implemented using an accelerometer sensor mounted on a wearable device such as a glove. This sensor detects the tilt and orientation of the user's hand in different directions. The analog signals generated by the sensor are sent to a microcontroller (such as Arduino or NodeMCU), where they are processed and converted into digital signals. The signal processing unit (microcontroller) analyzes the received data and maps specific gesture patterns to predefined commands such as forward, backward, left, right, and stop. These commands are then transmitted to the motor driver module. The motor driver module (e.g., L298N) receives control signals from the microcontroller and drives the DC motors attached to the wheelchair wheels. Depending on the command, the motors rotate in appropriate directions to achieve the desired movement. To enhance safety, an obstacle detection system using ultrasonic sensors is incorporated. These sensors continuously monitor the surroundings, and if an obstacle is detected within a certain range, the system automatically stops the wheelchair to prevent collisions. Additionally, a power supply unit is used to provide the required voltage to all components, ensuring stable operation. Optional modules such as wireless communication (Bluetooth/RF) can be included to allow remote control or improve flexibility.

Block diagram:

The system begins with the MPU6050 sensor module, which is used to detect hand gestures by measuring acceleration and orientation. When the user moves their hand, the sensor collects gesture data and sends it to the ESP8266 microcontroller, which acts as the main processing unit. The ESP8266, powered by a suitable power source, processes this data using embedded firmware and interprets the gesture into a specific movement command.

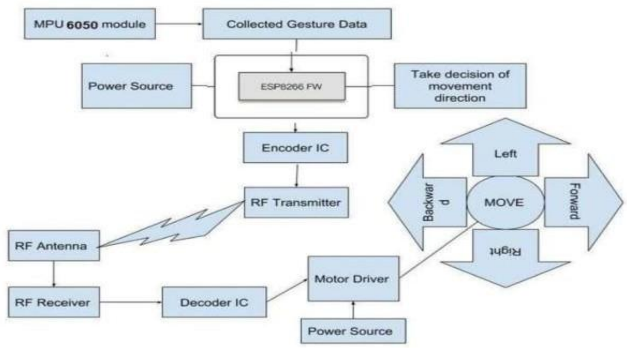

Fig.1. *Block Diagram*

Based on the processed data, the system takes a decision regarding the direction of movement, such as forward, backward, left, or right. These commands are then passed to an encoder IC, which converts the command into a transmittable format. The encoded signals are sent wirelessly through an RF transmitter and transmitted via an antenna. On the wheelchair side, the signals are received by an RF receiver connected to an antenna. The received signals are then passed to a decoder IC, which decodes the transmitted commands back into usable control signals. These signals are fed into the motor driver, which controls the movement of the wheelchair motors accordingly. The motor driver, powered by a separate power source, drives the motors to move the wheelchair in the desired direction. Overall, this system enables wireless gesture-based control of the wheelchair, providing ease of operation and improved mobility for users with physical disabilities.

ESP8266

The ESP8266 is a key component in a gesture-controlled wheelchair system, acting as the main control and communication unit. It is a Wi-Fi-enabled microcontroller that processes gesture data and controls the movement of the wheelchair. In this system, the ESP8266 receives input from the MPU6050 accelerometer and gyroscope sensor, which detects the hand gestures of the user. The sensor sends motion data (tilt, direction, and acceleration) to the ESP8266. The microcontroller then processes this data using programmed logic to identify specific gestures such as forward, backward, left, right, and stop.

Fig 2. *ESP8266*

MPU6050:

The MPU6050 is a highly important sensor used in a gesture-controlled wheelchair system for detecting hand movements. It is a combined 3-axis accelerometer and 3-axis gyroscope sensor, which allows it to measure both linear motion and rotational movement of the user's hand. In this project, the MPU6050 is typically mounted on a wearable device such as a glove. When the user moves their hand in different directions (forward, backward, left, right, or tilt), the sensor detects changes in acceleration and angular velocity. These analog motion signals are converted into digital data and sent to the microcontroller (such as ESP8266) through the I2C communication protocol.

L298N Motor Driver:

The L298N Motor Driver is an important component used in a gesture-controlled wheelchair system to control the movement of DC motors. It acts as an interface between the microcontroller (such as ESP8266) and the motors of the wheelchair. The signals generated by the

ESP8266 based on detected gestures are low-power control signals and cannot directly drive the motors. Therefore, the L298N motor driver is used to amplify these signals and provide sufficient current and voltage required for motor operation.

Fig 3. *L298N Motor Driver*

BO Motor:

The BO motor (Battery Operated DC gear motor) is a simple and widely used motor in robotics and embedded systems projects, including a gesture-controlled wheelchair model. It is a low-cost DC motor with an inbuilt gearbox, which helps to increase torque while reducing speed. In the gesture-controlled wheelchair system, BO motors are used as the driving force for the wheels. These motors receive control signals from the L298N motor driver, which is controlled by the ESP8266 based on the detected hand gestures from the MPU6050 sensor. Depending on the command, the BO motors rotate in forward or reverse direction, enabling the wheelchair to move left, right, forward, or backward

Fig 4. *BO Motor:*

Final Hardwre:

The final hardware of the gesture- controlled wheelchair consists of the ESP8266 microcontroller, MPU6050 sensor, L298N motor driver, BO DC gear motors, and a regulated power supply unit. The MPU6050 sensor is placed on a wearable glove to detect hand gestures based on tilt and motion. These signals are sent to the ESP8266, which processes the data and converts it into movement commands such as forward, backward, left, right, and stop. The system is designed to ensure simple and accurate gesture detection for controlling the wheelchair.

Fig 5. *Project Model*

Results and Discussions:

The gesture-controlled wheelchair was successfully implemented and tested. The system accurately converted hand gestures into movement commands using the MPU6050 sensor and ESP8266 microcontroller. The L298N motor driver effectively controlled the BO motors, allowing smooth movement in all directions. Overall, the project worked efficiently and provides a simple and cost- effective solution for improving mobility of physically challenged users.

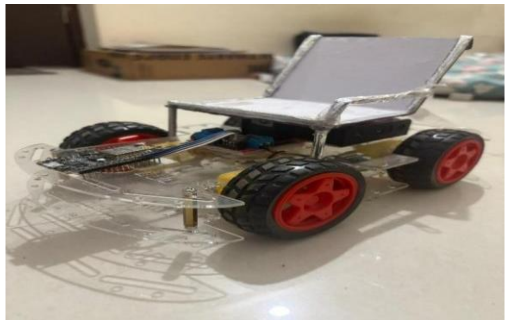

Fig. *Result 1*

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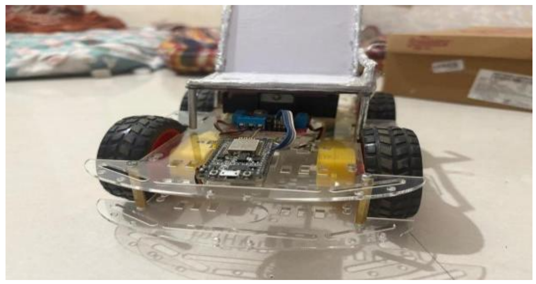

Fig. Result 2

Conclusion

The gesture control wheelchair is a smart and innovative mobility solution designed to help physically challenged individuals move independently and comfortably. By using hand gestures detected through an accelerometer sensor, the system allows users to control the direction of the wheelchair easily without physical strain or joystick operation. The integration of microcontrollers and wireless communication ensures smooth and efficient movement. This technology not only enhances user convenience but also promotes confidence and self- reliance among differently-abled individuals. With further improvements—such as obstacle detection, voice control, and safety features—the gesture-controlled wheelchair can become a highly effective assistive device for real-world applications.

References

1. Simpson, R. C. (2005). Smart wheelchairs: A literature review. Journal of Rehabilitation Research and Development, 42(4), 423–436. https://doi.org/10.1682/JRRD.2004.08.0101
2. Kumar, P., & Raja, K. (2020). Gesture controlled wheelchair using accelerometer and Arduino. International Journal of Engineering Research & Technology, 9(5), 1123–1127. https://doi.org/10.17577/IJERTV9IS050612
3. Dey, A., & Terwilliger, M. (2011). Intelligent wheelchair control through gesture recognition. IEEE Transactions on Neural Systems and Rehabilitation Engineering, 19(2), 156–165. https://doi.org/10.1109/TNSRE.2010.2093891
4. Kaur, H., & Mahajan, R. (2019). Hand gesture-controlled wheelchair for physically disabled people using MEMS sensor. International Journal of Advanced Research in Computer and Communication Engineering, 8(3), 55–60. https://doi.org/10.17148/IJARCCE.2019.8311
5. Joshi, A., & Sharma, N. (2021). IoT-based gesture controlled smart wheelchair using accelerometer and voice assistance. Materials Today: Proceedings, 45, 3892–3897. https://doi.org/10.1016/j.matpr.2020.12.1020
6. Chatterjee, S., & Gupta, A. (2018). Wireless hand gesture controlled robotic wheelchair for disabled persons. Procedia Computer Science, 132, 1004–1011. https://doi.org/10.1016/j.procs.2018.05.016
7. Prasad, M. V., Rao, P. S., & Kumar, V. (2022). Machine learning-based gesture recognition system for smart wheelchair navigation. Expert Systems with Applications, 198, 116748. https://doi.org/10.1016/j.eswa.2022.116748
8. Al-Jarrah, O., Yoo, P. D., Muhaidat, S., Karagiannidis, G. K., & Taha, K. (2015). Efficient machine learning for big data: A review. Big Data Research, 2(3), 87–93. https://doi.org/10.1016/j.bdr.2015.04.001
9. Lee, S., & Lee, H. (2020). Vision-based hand gesture recognition for intelligent wheelchair control using deep learning. Sensors, 20(18), 5373. https://doi.org/10.3390/s20185373
10. Mahmud, M. S., Rahman, M. M., & Islam, M. R. (2021). Smart gesture-based wheelchair navigation system using IoT and embedded sensors. IEEE Access, 9, 145678–145689. https://doi.org/10.1109/ACCESS.2021.312245