ADVANCED WHEELCHAIR CONTROL SYSTEM RASBERRY PI-3-BASED JOYSTICK ANALOG AND VOICE CONTROL

Raheem Arsad, H. G. Sadeepa Wasana, Thevakumar Vathusha and D. T. Ganegoda

Department of Electro-mechanical Technology, University of Vocational Technology, Sri Lanka
mec19b102@uovt.ac.lk

Abstract: This research aims to transform the way wheelchair control systems operate by introducing a groundbreaking approach that incorporates Raspberry Pi 3-based joystick controls and voice activation. We delve into how modern technology can enhance accessibility for individuals with physical disabilities, addressing the shortcomings of traditional wheelchair interfaces, particularly regarding accuracy, adaptability, and user experience. Central to our project is the creation of a tailored prototype that utilizes the Raspberry Pi 3 as its core. This innovative device combines joystick analog controls with a voice recognition module to deliver an intuitive and user-friendly wheelchair system. To further elevate the control experience, we have integrated an accelerometer that responds to tilts or movements in the x, y, and z axes, which enhances maneuverability in tight spots or rough terrain. The voice activation feature is particularly noteworthy, allowing users to interact with the wheelchair effortlessly through spoken commands. Utilizing the Speech to Text API, this system processes voice inputs captured by the microphone, enabling the wheelchair to understand and act on verbal instructions. Additionally, our study examines the potential for incorporating smartphone sensors, specifically leveraging the compass data to provide precise directional control. This capability is designed to instill confidence in users as they navigate their surroundings with greater freedom. Our methodology encompasses recruiting participants from our target user group, developing a custom prototype, and executing meticulous testing protocols. Test scenarios will cover both indoor and outdoor settings, emphasizing real-world applications to evaluate the system's responsiveness and adaptability. The aim of this research is to not only create an advanced wheelchair control system but also to set a new standard in accessibility innovation. The project contributes to the field of assistive technologies by addressing the unique challenges faced by individuals with physical disabilities. The

results of testing procedures, coupled with user feedback, are expected to validate the efficacy of the proposed system, marking a significant stride towards creating a more accessible and user-centric wheelchair experience.