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Full Hand Pose Recognition and Clinical Assessment Under Dexterous Articulation in Activities of Daily Living for Tele-Rehabilitation: A Review

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Abstract

The rehabilitation of individuals who have suffered a stroke primarily relies on physical therapy directed towards enhancing the affected limb capabilities and mitigating lasting disability. Clinical assessment of a stroke patient is a critical step in determining the appropriate treatment and management of the patient's condition. The clinical assessment also helps to determine the severity of the stroke which can affect the patient's prognosis and the type of care that is needed. The dilemma with current clinical assessment in rehabilitation is that they are subjective and rely heavily on therapist's experience, which leads to inconsistency and do not directly quantify patients' ability to perform activities of daily living (ADLs). In this context, hand pose recognition and recovery estimation present significant academic and technical challenges due to complex structure and

dexterous movement of human hands. This paper thoroughly examines the current research status of hand pose recognition and hand recovery estimation when performing ADL tasks, focusing on various types of hardware deployed for data collection. It carefully analyzes the advantages and drawbacks of hardware technologies and reviews the performances of different machine learning algorithms deployed. Furthermore, the clinical assessment tools were categorized into four groups based on the evaluation methods. The current clinical assessments tools deployed in studies and utilized in stroke rehabilitation were reviewed. The summary of the existing research limitation and initiates a discussion on future research are provided. © 2025, National University of Malaysia. All rights reserved.

Author keywords

clinical assessment; Hand pose recognition; hand recovery estimation; machine learning algorithms

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