

B-Spline Modeling of Inertial Measurements for Evaluating Stroke Rehabilitation Effectiveness

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Abstract

Patients who experience upper limb paralysis after stroke require continual rehabilitation. Patient rehabilitation must be evaluated to appropriately adjust treatment; this assessment could be performed using inertial measurement units (IMUs) instead of standard scales or subjective evaluations. However, IMUs produce large amounts of data that are discretized; directly using these data is challenging. In this study, B-splines were used to estimate IMU trajectory data for objective evaluations of hand function and stability based on machine learning classifiers and mathematical indices. IMU trajectory data from a 2018 study on upper limb rehabilitation were used to verify the value of the related approach. Features extracted from B-spline trajectories could be used to classify participants in different groups with high accuracy, and the proposed indices also revealed differences between study groups. Compared with conventional rehabilitation evaluation methods, the proposed method may be more objective and effective.