ABSTRACT

Gait impairments or stroke caused by injuries or neurological conditions require rehabilitation systems that can adapt to the physiological characteristics of each individual. One of the key challenges in developing robotic rehabilitation systems lies in designing accurate motion control based on user-specific physiological data. This study aims to analyze the pattern of lower limb angular velocity based on gait phases and evaluate the estimation of angular velocity using Body Mass Index (BMI) and walking speed as input parameters. The datas were obtained from joint angle signals captured by 3D motion markers from 24 healthy subjects classified by four BMI groups. The analysis was performed on the average angular velocity of the hip, knee, and ankle joints over four gait phases for both legs, followed by classification based on movement direction (flexion or extension). Results revealed distinctive directional patterns for each joint in every gait phase, consistent with biomechanical literature. Angular velocity estimation was carried out using three regression models: linear, logarithmic, and polynomial. For the result, the polynomial model yielded the best results by achieving the highest coefficient of determination (R^2) of 0.634 in phase 2 and the lowest data variance. These findings suggest that the polynomial regression model holds promise as a reference control basis for personalized robotic rehabilitation systems targeting lower limb movement.

Keywords: *Angular Velocity, BMI, Regression, Robotic Rehabilitation, Walking Speed.*