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A Comparison Between Computed Muscle Control Method and Static Optimization Technique to Determine Muscle Forces During a Weight Training Exercise with a Dumbbell

Arefeh Pashdar^a, Hossein Ehsani^b, Fatemeh Moosavi^a, Mostafa Rostami^b

^a Islamic Azad University, Science and Research Branch, Iran; ^b Amirkabir University of Technology, Iran

On account of redundancy of musculoskeletal system of human body, using pure multibody system dynamics to simulate this system is not enough. Optimization-based methods have been developed to overcome this difficulty. In this study, by simulating a flexion/extension weight training exercise with a dumbbell, two of these methods (Computed Muscle Control and Traditional Static Optimization) have been compared. 6 healthy right-handed subjects have participated in this study. During performing the actions, using a high speed camera the kinematic information of the motion has been captured. To actuate the system, a Hill-based muscle model in accompanied with a stiff tendon has been considered. The forces of elbow flexors (Biceps brachii, brachioradial, brachialis) and extensors (Triceps brachii) have been computed using two methods. Using a two-way ANOVA method the obtained results from both of the methods have been compared to each other and a significant difference has been observed ($P < 0.005$). All of the mathematical models and methods have been implemented on MATLAB.