عنوان مقاله:

The Non-negative factorization to extract muscular synergies for balancing external bi-axial moments isometrically by a redundant 3D biomechanical shoulder model

محل انتشار:

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خلاصه مقاله:

In this study we utilized the concept of synergy formation as a simplifying control strategy to manage the high numbers of degree of freedom presented in the maintenance of the posture, and also during the movement of the shoulder joint. We addressed how to find the muscle synergy recruitment map to the biomechanical demands (biaxial external torque) during an isometric shoulder task. We used a numerical optimization based shoulder model to obtain muscle activation levels when a biaxial external isometric torque is exposed at the shoulder glenohumeral joint.The numerical experiments simulated varying torque directions in horizontal plane crossing this joint and used predicted muscle activation data for grouping muscles in some fixed element synergies by the nonnegative matrix factorization method. Then we scrutinized how predicted muscle synergies relate to a specific torque direction at the shoulder. The results confirmed our expectation that the few dominant synergies each created torque specifically in a given direction while each muscle contributed to more than one synergy.

کلمات کلیدی:

synergies, shoulder torque, muscle activation patterns, biomechanics, muscular moment