عنوان مقاله:

A PCA-Assisted EMG-Driven Model to Predict Upper Extremities' Joint Torque in Dynamic Movements

محل انتشار:

بیستمین کنفرانس مهندسی پزشکی ایران (سال: 1392)

تعداد صفحات اصل مقاله: 6

نویسندگان:

Shakiba Rafiee - *Biomedical Engineering Department Amirkabir University of Technology Tehran, Iran*

Hossein Ehsani - *Biomedical Engineering Department Amirkabir University of Technology Tehran, Iran*

Mostafa Rostami - *Biomedical Engineering Department Amirkabir University of Technology Tehran, Iran*

خلاصه مقاله:

To relate electromyographic signals (EMG) to net joint torque, different approaches have been taken into account. In this regard, some researchers chose to use PrincipalComponent Analysis (PCA). A Study in 2001 reported a linear relationship between the PCA-processed EMG data and the joint torque while investigating isometric movements. In this project we questioned the possibility to use this method for free dynamictasks. Four healthy subjects participated in the current study,performing three sets of Dumbbell Kick Back exercise for five different dumbbell weights. The net joint torque was calculatedusing the kinematic data in an inverse dynamics model. Meanwhile the EMG data were processed with a PCA method,and then were input to the model to estimate the joint torque. In order to predict this torque, we used two models; a single-inputmodel that was fed with the PCA-processed EMG of the all corresponding muscles; and a double-input model that utilized the PCA-rocessed EMG data of the agonist and antagonist muscles separately. The results demonsrated that both the single-input and double-input models are apable of predicting the torque for both isometric and free dynamic tasks. Employing a paired t-test we found that the double-input model was significantly more successful in estimating the torque comparing to the single-input model ($p < 0.005$). The other factor (the movement type) proved to also have a significant effect on theestimation outcome ($p < 0.0005$). In general, this study suggests that a linear relationship exists between PCA-processed EMGdata and the joint torque in both isometric and free dynamic movements; however, in order to have a better estimate of the net joint torque, .distinguishing the agonist-antagonist muscle groups' generated torques may be beneficial

کلمات کلیدی:

EMG-Torque Relationship, Principal Component Analysis, Free Dynamic Task, Parameter Identification

لینک ثابت مقاله در پایگاه سیویلیکا:

https://civilica.com/doc/340028