عنوان مقاله:

(Rehabilitation of stroke patients using control and modeling of knee ergometer and functional electrical stimulation (FES

محل انتشار:

تعداد صفحات اصل مقاله: 9

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خلاصه مقاله:

Functional electrical stimulation (FES) - induced limb movement is believed to provide therapeutic benefits for stroke patients. However, direct stimulation for a continuous repetitive movement can cause early muscle fatigue and ruin the patients desire to continue exercising. In this study, a model of a FES-assisted knee ergometer was developed to utilize the voluntary non-paretic leg movement to assist the FES-induced paretic leg of stroke patients. A 'changing-in-direction' knee movement mechanism driven by a bevel gearbox allows the paretic knee to extend with energy contributed from the flexed non-paretic leg. This novel ergometer helps to reduce about ۴۳% of the required electrical stimulation. Although the present study did not include the incorporation of the muscle model, its applicability in reducing muscle fatigue can be expected. The reduced electrical stimulation with the aid of the ergometer was able to perform full knee extension and this action was repetitively controlled with a PID controller. A repetitive FES-induced knee exercise was performed and the maximum error between the actual and reference knee trajectories was recorded to be as lower as ۲.۷˚. It was shown that the knee ergometer which allows the utilization of the voluntary non-paretic movement had reduced the required stimulation to perform repetitive knee extension of the paretic leg.

کلمات کلیدی:

component; knee ergometer; functional electrical stimulation (FES); stroke rehabilitation

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