利用多源运动信息的下肢假肢多模式多步态识别研究

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摘　要：

运动状态识别对智能下肢假肢的控制非常关键，本文利用下肢表面肌电信号、腿部角度和足底压力信号在运动模式和步态分析中的优势和特点，对下肢假肢的多模式多步态识别进行研究。通过建立下肢运动信息系统，获取下肢多源运动信息。先提取下肢肌电信号的小波包能量作为特征，建立多个HMM对下肢假肢的运动模式进行识别；再根据大小腿和膝关节的角度信息，以及经阈值法后得到的足底压力信号，研究运动信息的模糊规则，进行下肢步态分析。实验结果表明，本文的方法可以有效的实现下肢假肢多种运动模式下多个步态的识别，多源运动信息在下肢假肢识别中的优势也得到了验证。

关键词：步态识别；多源信息；小波包；HMM；下肢假肢

Multi-mode and Gait Phase Recognition of Lower Limb Prosthesis Based on Multi-source Motion Information

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Abstract:

Motion state recognition is crucial to the control of intelligent lower limb prosthesis. Taking advantage of the features of EMG, leg angle and plantar pressure, multi-mode and gait phase recognition of lower limb prosthesis was studied. Acquisition system of lower limb was established to get the multi-source motion information. Firstly, features of EMG were extracted by wavelet packet energy, and several HMMs were established to recognize the motion modes of lower limb. Then based on leg information and plantar pressure processed by threshold method, gait phases were analyzed by the fuzzy rule. The experimental results show that multi-mode and gait phase recognition of lower limb is recognized effectively, and the superiority of utilizing multi-information is validated.

Keywords: phase recognition; multi-information; wavelet packet; HMM; lower limb prosthesis

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