

Application of multibody dynamics techniques to active orthosis design for gait assistance

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Abstract

The present work is being developed in the context of a national project that involves researchers from three Spanish universities (UDC, UEX and UPC). The main objective of the project is to develop a computer application that enables to virtually test different types, designs and controllers of active orthoses for gait assistance on the computational model of spinal cord-injured (SCI) subjects.

For this purpose, a parametric human multibody model of both a healthy subject and a subject walking with crutches aid has been created. A module to determine the muscular efforts from acquired kinematic and dynamic data is currently under development, so as to compare the muscular behavior of the disabled and able-bodied subjects.

On the other hand, an active orthosis prototype (stance-control knee-ankle-foot-orthosis) has been designed and its controller is being implemented. In a next step, the model of disabled subject will be complemented with the model of the active orthosis prototype, and a predictive module will be developed to provide the expected resulting dynamics. The orthosis prototype will be tested on disabled subjects from the SCI Unit of Hospital Juan Canalejo in La Coruña, so that the predictive module can be evaluated.

If successful, the obtained simulation tool could be extended to model other gait pathologies or other types of assistive devices.