



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Modelling and simulation of double-link scenario in a two-wheeled wheelchair (Article)

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Abstract

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Wheelchairs on two wheels are essential part of life for disabled persons. But designing control strategies for these wheelchairs is a challenging task due to the fact that they are highly nonlinear and unstable systems. The subtle design of the system mimics the inverted pendulum with a double-link scenario. This forms an example of multi degree of freedom system where there are three actuators, one on each wheel, and one for position between the two links. The system starts to work with lifting the front wheels (casters) to the upright position and further on stabilizing in the upright position. The challenge resides in the design, modelling and control of the two-wheeled wheelchair to perform comparably similar to normal four-wheeled wheelchair. This paper is aimed to model the highly nonlinear and complex two-wheeled wheelchair system using two different approaches. A state-space model is obtained from the linearised mathematical model as an initial attempt for control design investigation. Then a complex visualized mathematical model is developed, which proves as a good technique for prediction and simulation of the two-wheeled wheelchair. © 2014 IOS Press.

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