



Sliding Mode Controller for a Two-Wheeled Balancing Wheelchair

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Abstract

The currently implemented PD controller is not able to stabilize the wheelchair for disturbances such as rough terrain and tilted surfaces. This thesis deals with the basic concept and experiments of implementing a sliding mode controller on the balancing wheelchair Scalevo. The goal is to figure out whether this new controller has better performance than the currently implemented PD controller. The main argument in favor of sliding mode control are the disturbance rejection and insensitivity to parameter variations. Both controllers were compared in different situations with their control actions. The software and hardware framework of the Scalevo wheelchair was adapted and improved to ensure maximal performance in both control structures by reducing delays and increasing the loop frequency. It was shown that the SMC can handle system disturbances above a certain threshold better than the PD controller. Below this threshold both controllers have similar performance.