

Fall Avoidance Control of Wheeled Inverted Pendulum Type Robotic Wheelchair While Climbing Stairs

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Abstract : The wheelchair is the major means of transport for physically disabled people. However, it cannot overcome architectural barriers such as curbs and stairs. In this paper, the authors proposed a method to avoid falling down of a wheeled inverted pendulum type robotic wheelchair for climbing stairs. The problem of this system is that the feedback gain of the wheels cannot be set high due to modeling errors and gear backlash, which results in the movement of wheels. Therefore, the wheels slide down the stairs or collide with the side of the stairs, and finally the wheelchair falls down. To avoid falling down, the authors proposed a slider control strategy based on skyhook model in order to decrease the movement of wheels, and a rotary link control strategy based on the staircase dimensions in order to avoid collision or slide down. The effectiveness of the proposed fall avoidance control strategy was validated by ODE simulations and the prototype wheelchair.

Keywords : EPW, fall avoidance control, skyhook, wheeled inverted pendulum

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