

Controller Design and Experimental Evaluation of a Motorized Assistance for a Patient Transfer Floor Lift

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Abstract : Patient transfer is a challenging, critical task because it exposes caregivers to injury risks. Available transfer devices, like floor lifts, lead to improvements but are far from perfect. They do not eliminate the caregivers' risk of musculoskeletal disorders, and they can be burdensome to use due to their poor maneuverability. This paper presents a new motorized floor lift with a single central motorized wheel connected to an instrumented handle. Admittance controllers are designed to 1) improve the device maneuverability, 2) reduce the required caregiver effort, and 3) ensure the security and comfort of patients. Two controller designs, one with a linear admittance law and a non-linear admittance law with variable damping, were developed and implemented on a prototype. Tests were performed on seven participants to evaluate the performance of the assistance system and the controllers. The experimental results show that 1) the motorized assistance with the variable damping controller improves maneuverability by 28%, 2) reduces the amount of effort required to push the lift by 66%, and 3) provides the same level of patient comfort compared to a standard unassisted floor lift.

Keywords : floor lift, human robot interaction, admittance controller, variable admittance

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