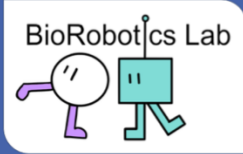


Optimization and Biomechanics for Human Centred Robotics KIT BioRobotics Lab



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Endowed Chair by Hector Foundation II
Institute for Anthropomatics and Robotics (IAR)



Bachelor's Thesis: Perturbations during assisted standing up and sitting down using an assistance simulator robot

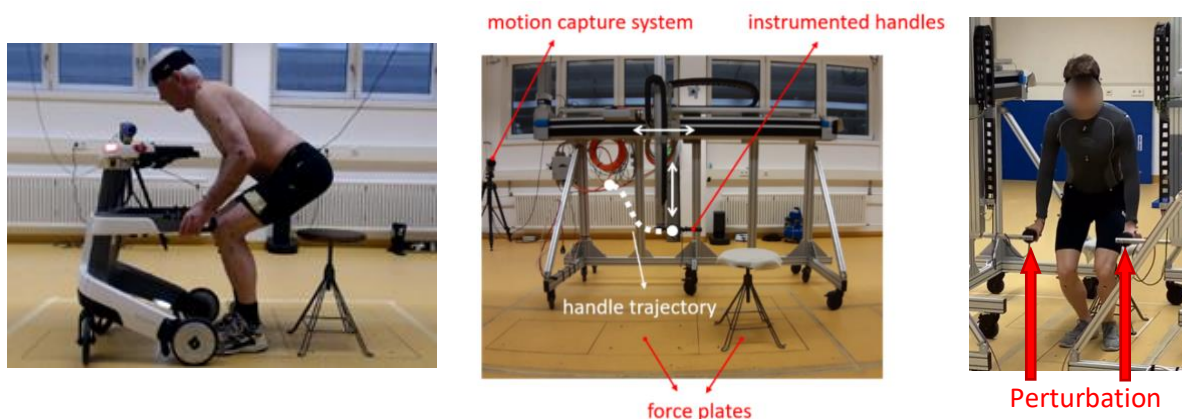
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Background

Standing up and sitting down are important daily living activities. Difficulties in performing these tasks, which affect particularly older adults, can impact quality of life (Riley et al., 1991). Although assistive devices such as rollators can help people stand up and sit down, there is evidence that these assistive devices are associated with more severe injuries resulting from falls (van Riel et al., 2014). Perturbation-based training can improve balance recovery strategies and reduce the risk of falls in activities such as gait (Rieger et al., 2020).

Scope of the thesis

The Bachelor thesis focuses on the implementation of perturbation trajectories during assisted standing up and sitting down using two instrumented cartesian robots (robotic assistance simulator). This perturbation profiles can be used to investigate the user stability response and to develop perturbation-based training programs to reduce the risk of falls. You will propose perturbation patterns, implement them in the robotic assistance simulator, and perform validation measurements in a motion capture laboratory.



Required knowledge

This thesis requires a basic knowledge of robotics and kinematics, and programming skills in Matlab/Simulink.

References

- Riley et al., "Mechanics of constrained chair-rise," *Journal of Biomechanics*, 24, 1991,77–85.
- Van Riel, K. M. M., et al. "Four-wheeled walker related injuries in older adults in the Netherlands." *Injury prevention*, 20.1 (2014): 11-15.
- Rieger, et al. "Perturbation-based gait training to improve daily life gait stability in older adults at risk of falling: protocol for the REACT randomized controlled trial." *BMC geriatrics* 20 (2020): 1-12.