Optimization and Biomechanics for Human Centred Robotics
KIT BioRobotics Lab

Prof. Dr. Katja Mombaur

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

Bachelor's or Master's Thesis: Investigation of stability during standing up and sitting down with robotic assistance

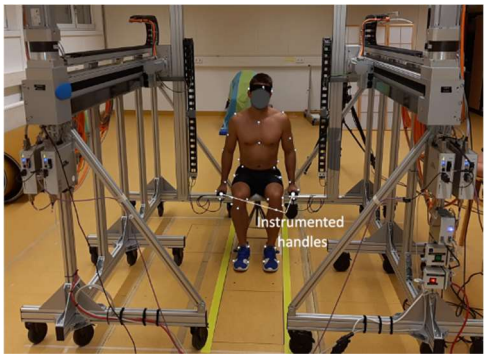
Supervisor: Marko Ackermann (marko.ackermann@kit.edu)

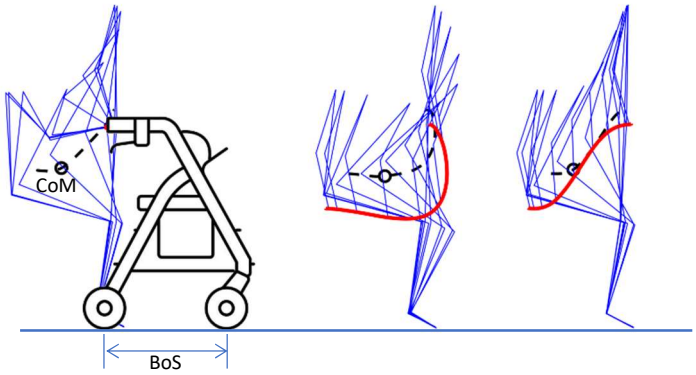
Background

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; Jeyasurya et al., 2013). Robotic rollators and other robotic devices can help people stand up and sit down, but the effects of such assistance on the biomechanics and stability of the user are poorly understood (Geravand et al., 2023).

Scope of the thesis

The Bachelor thesis focuses on the investigation of stability during standing up and sitting down with the support of a robotic assistance simulator. You will work with previously collected data of assisted standing up and sitting down to investigate the stability of the human-machine system by means of stability metrics such as center of mass (CoM) and Extrapolated Center of Mass (XCoM) trajectories with respect to the base of support (BoS) provided by the rollator or assistive device.





Required knowledge

This thesis requires basic knowledge of Biomechanics, a basic understanding of concepts of stability, and programming skills in Matlab or Python.

References

P. O. Riley et al., "Mechanics of constrained chair-rise," Journal of Biomechanics, 24, 1991,77–85.
J. Jeyasurya et al., "Comparison of seat, waist, and arm sit-to-stand assistance modalities in elderly population," Journal of Rehabilitation Research and Development, 50, 2013, 835-844.
M. Geravand et al., "A Survey on Rollator-Type Mobility Assistance Robots," in Handbook of Human-Machine Systems, Ed. John Wiley & Sons, 2023, 165-179.