Simulation of the prosthetic gait with a six-axis robot

Prosthetic test procedures based on real-world biomechanical data

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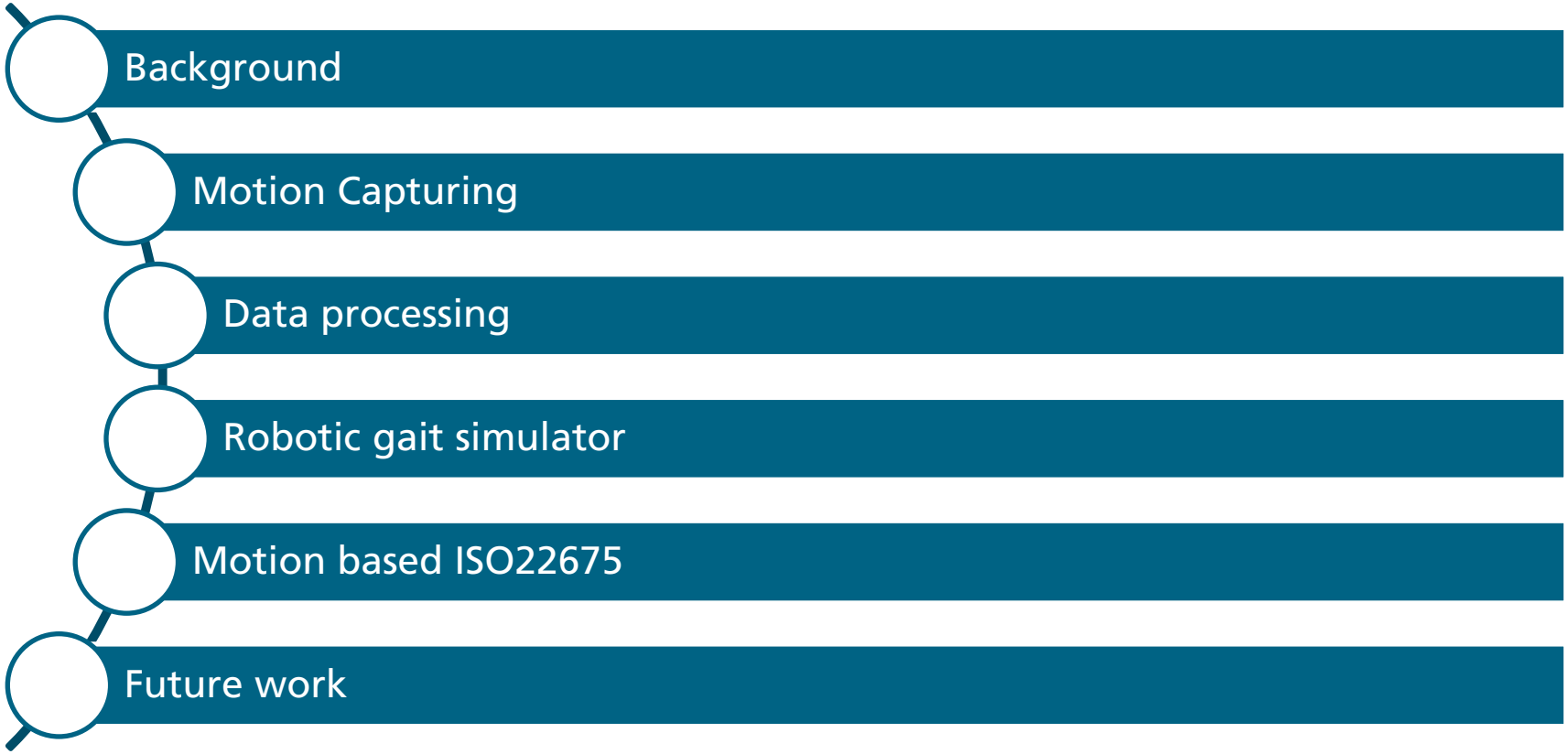
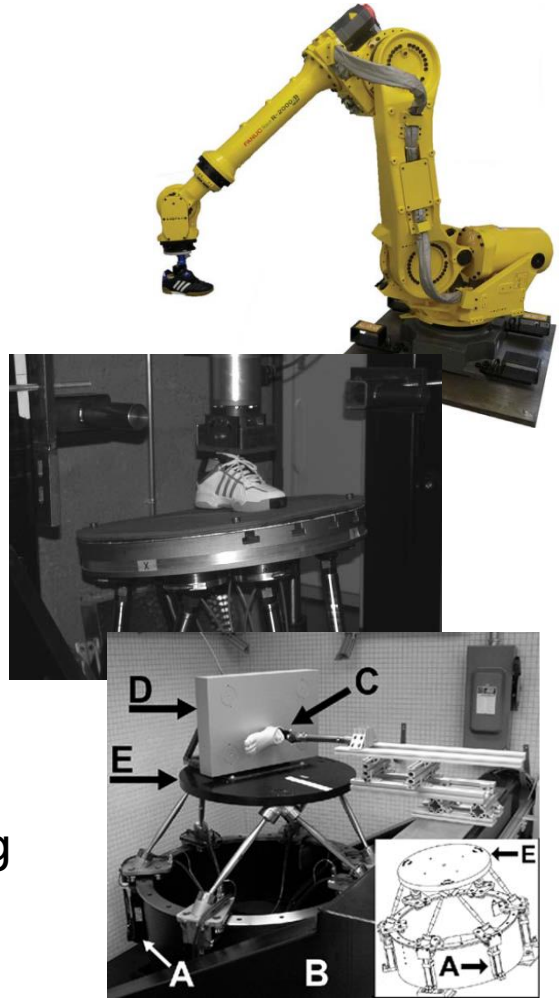
Outline



The author(s) declare(s) that the research for and communication of this independent body of work does not constitute any financial or other conflict of interest

Background

- Aim
  - Flexible testing procedures to test ankle foot prosthesis for
    - Level gait
    - Stair climbing
    - Slopes
  - patient indiviual kinematic and kinetic data for testing
- State of the art
  - Hexapods and 6-axis-robots in sport shoe testing
  - Seattle robotic gait simulator



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Motion capturing and ground reaction force

GAIT ANALYSIS

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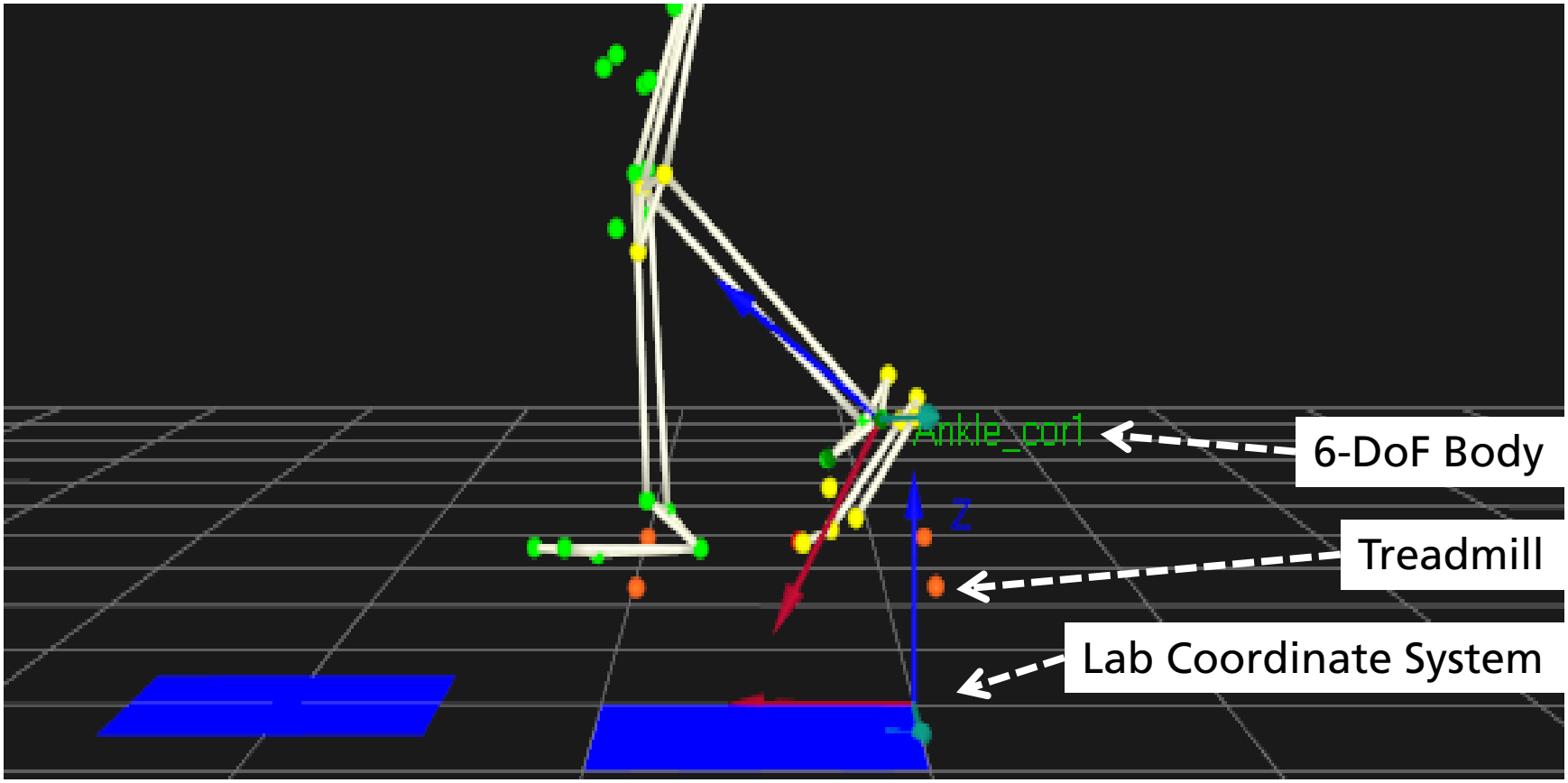
Gait analysis – Measurement setup

Gait analysis – Motion capture



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Simulate human gait on an industrial robot

GAIT2ROBOT

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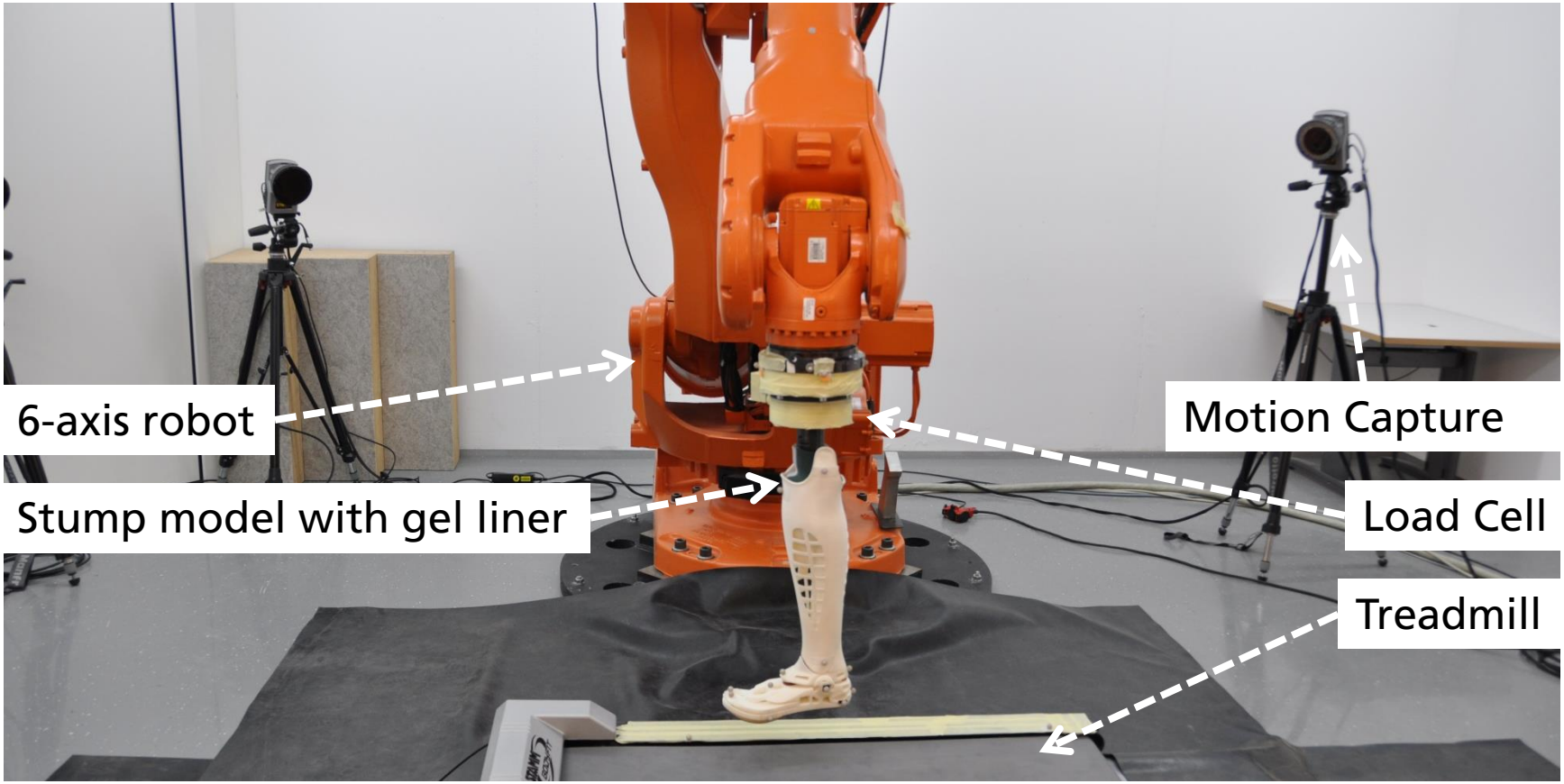
Gait2Robot – Trial setup



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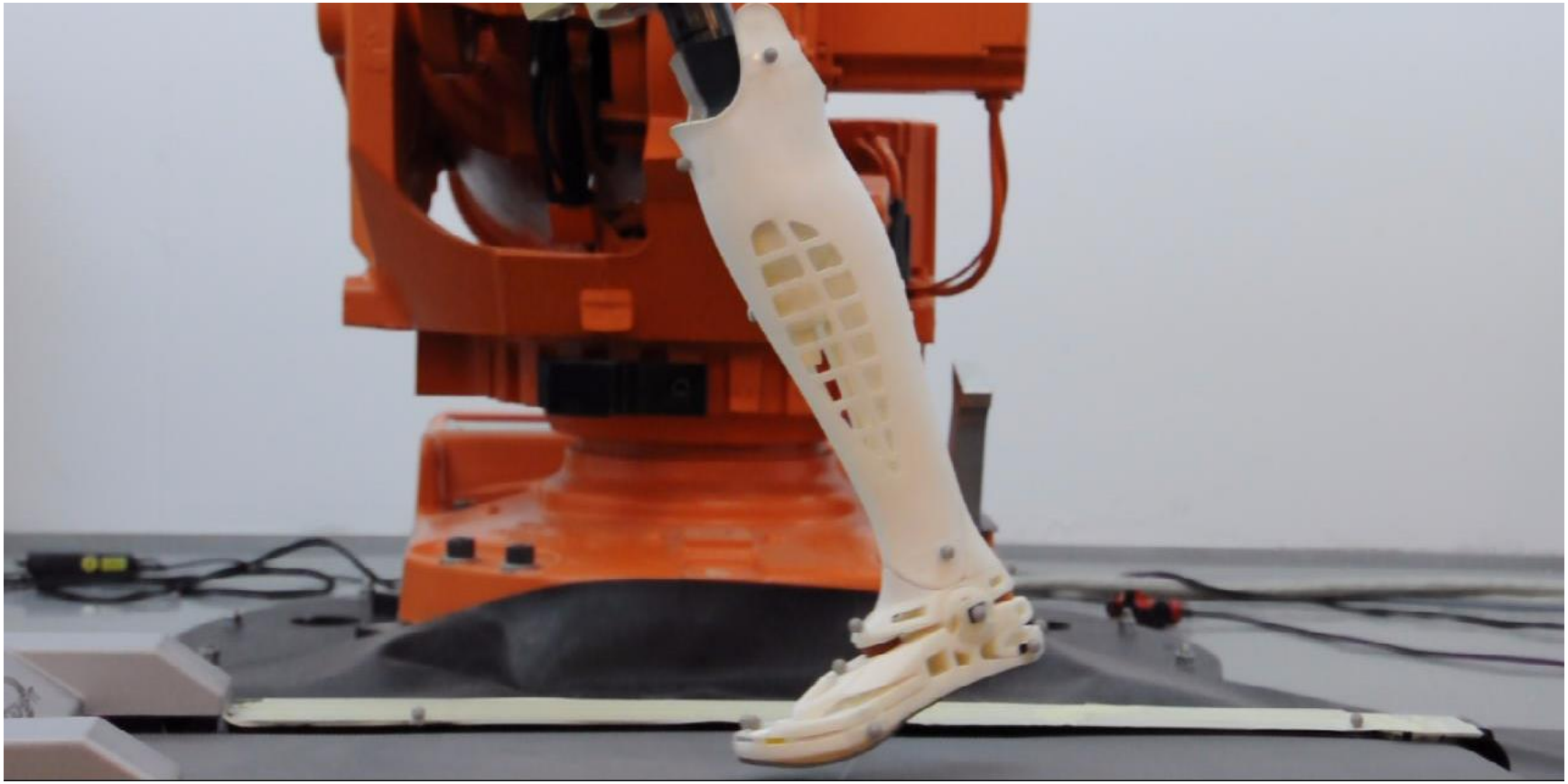
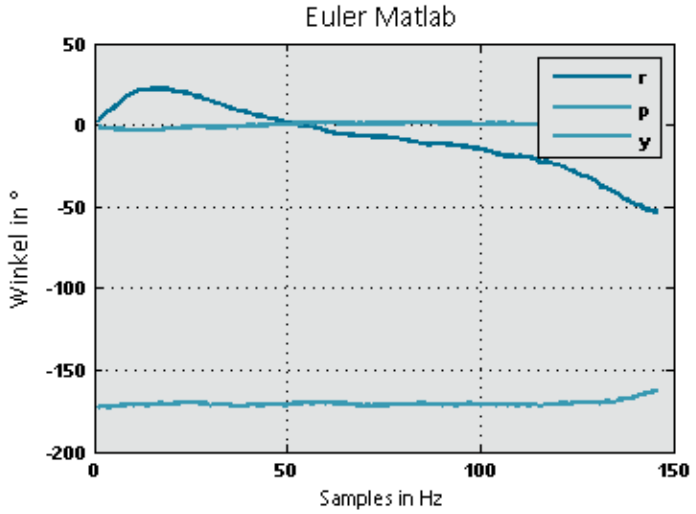
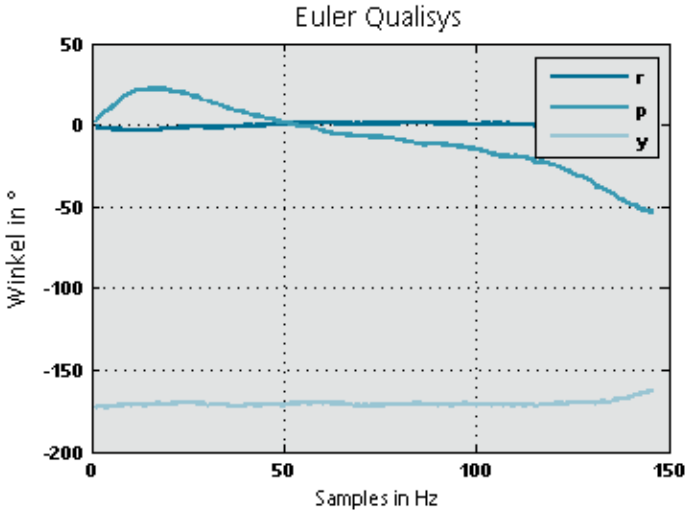
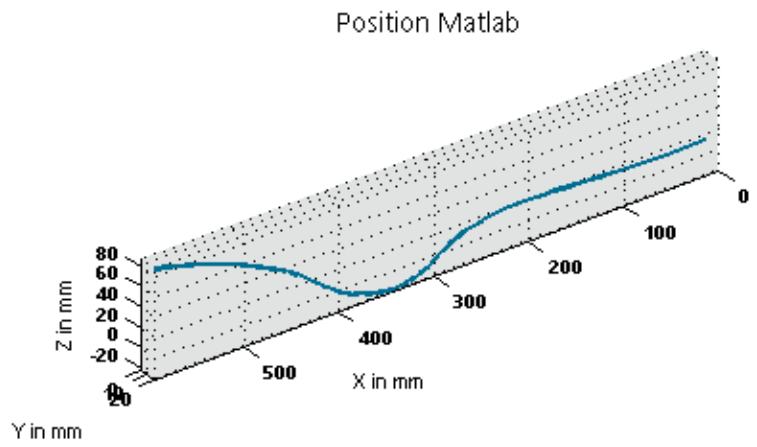
Gait2Robot – Trial video

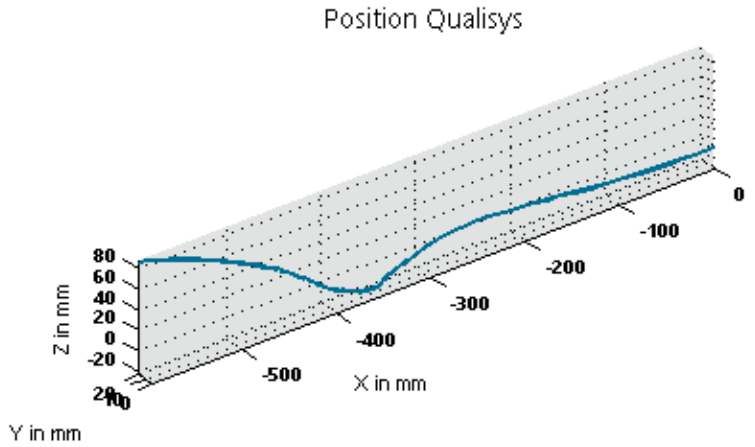


Gait2Robot – Kinematic results









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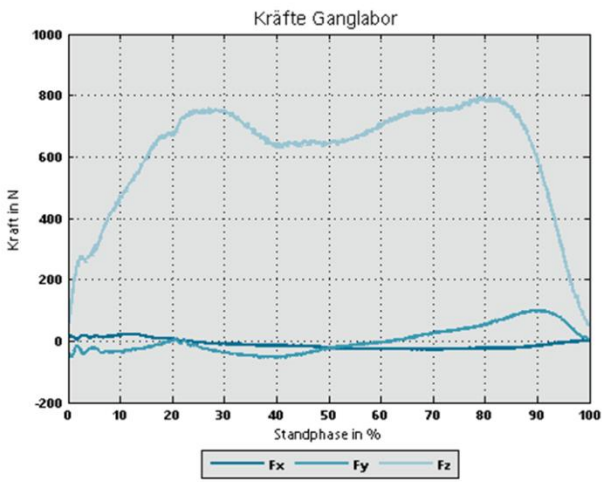
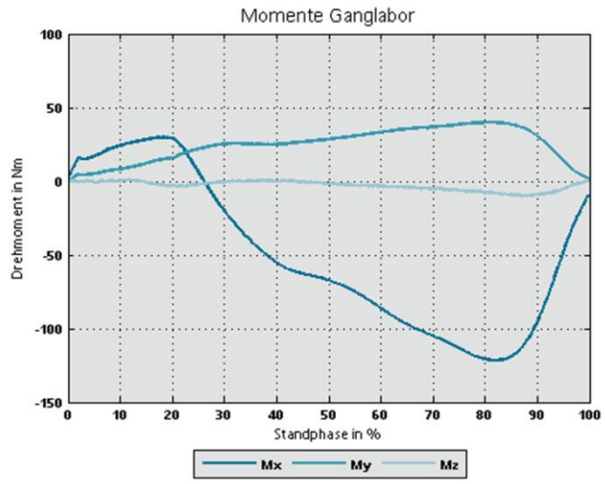
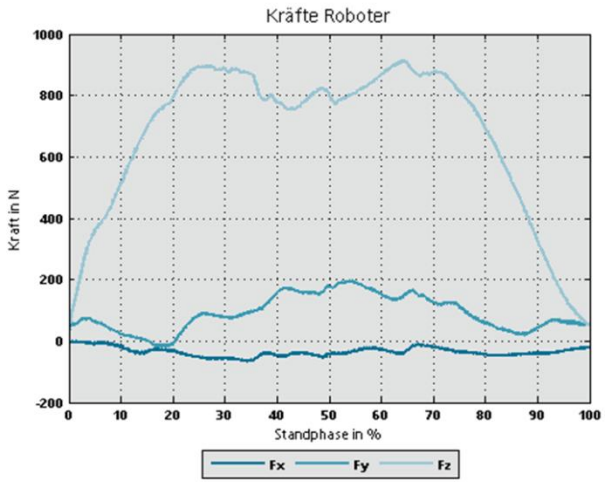
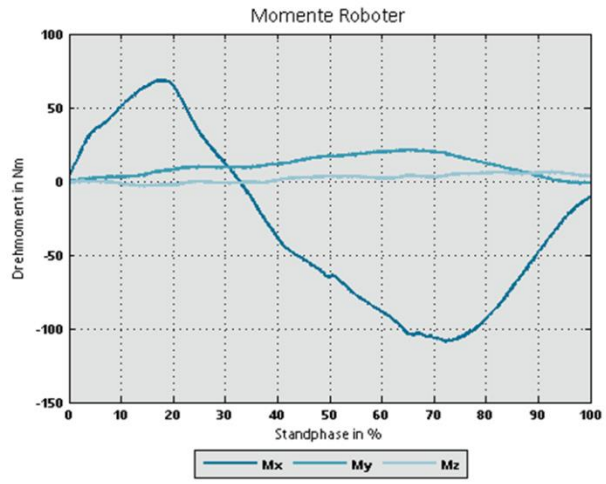
Gait2Robot – Kinetic results

Gait laboratory









Robot

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Adapted ISO22675 ankle foot testing

GAIT2ISO

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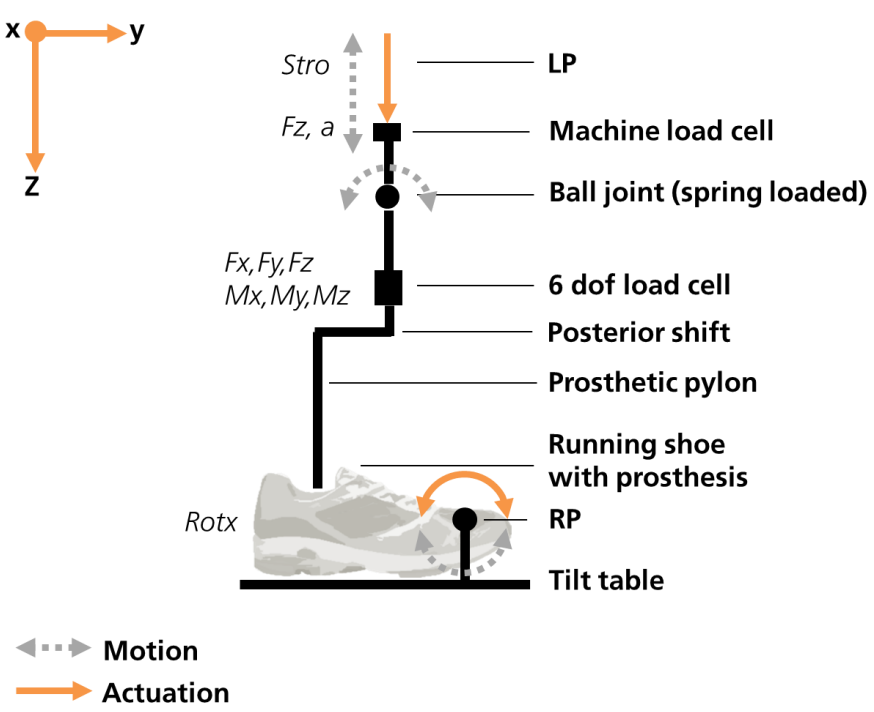
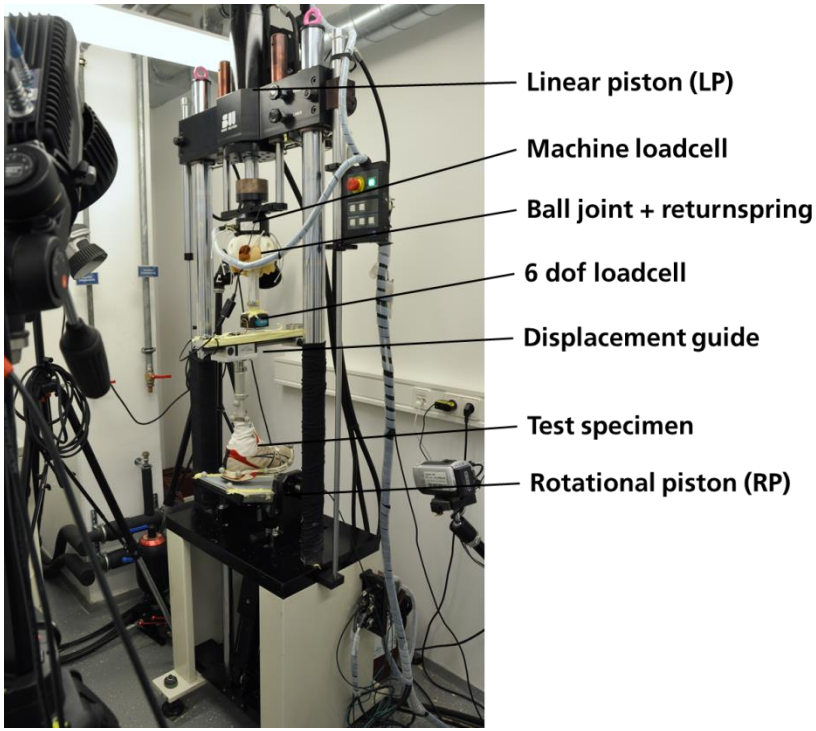
Gait2ISO – Trial setup





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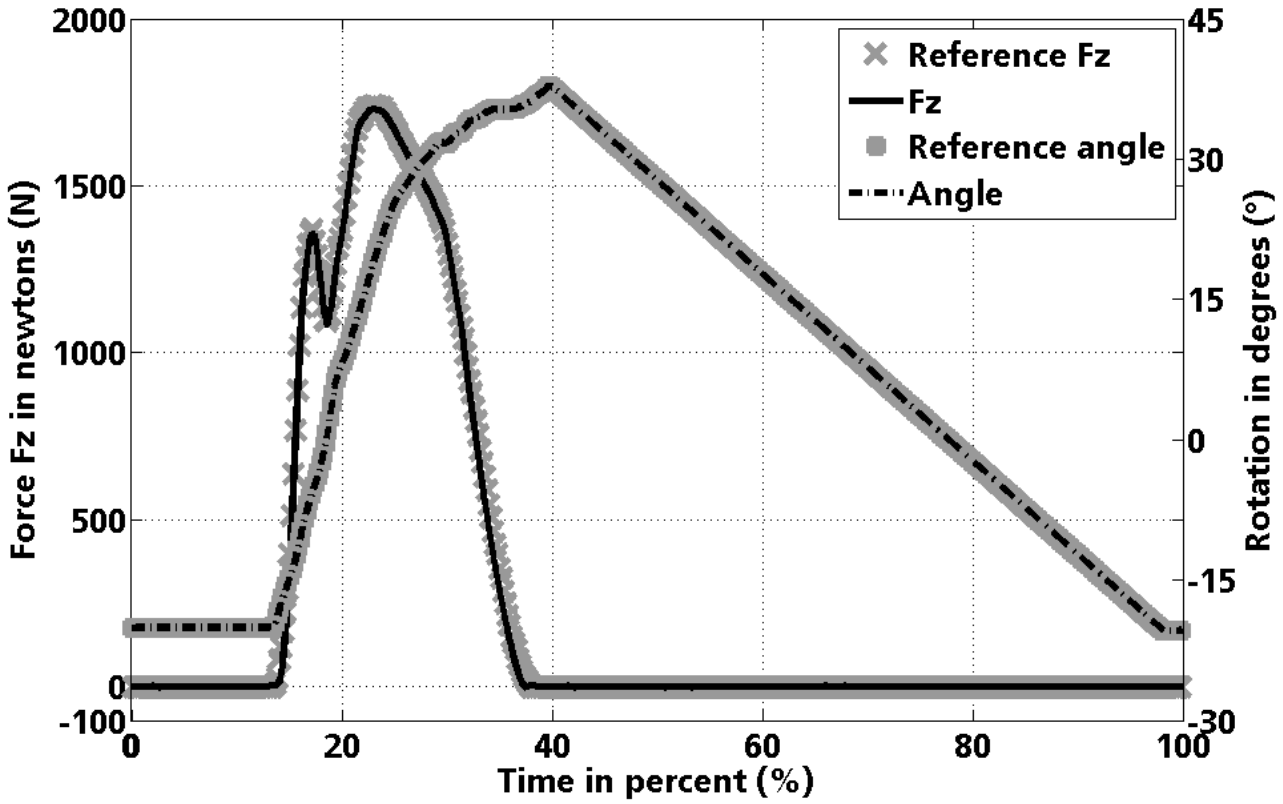
Gait2ISO – Trial Video

Gait2ISO – Trial results 0.2Hz



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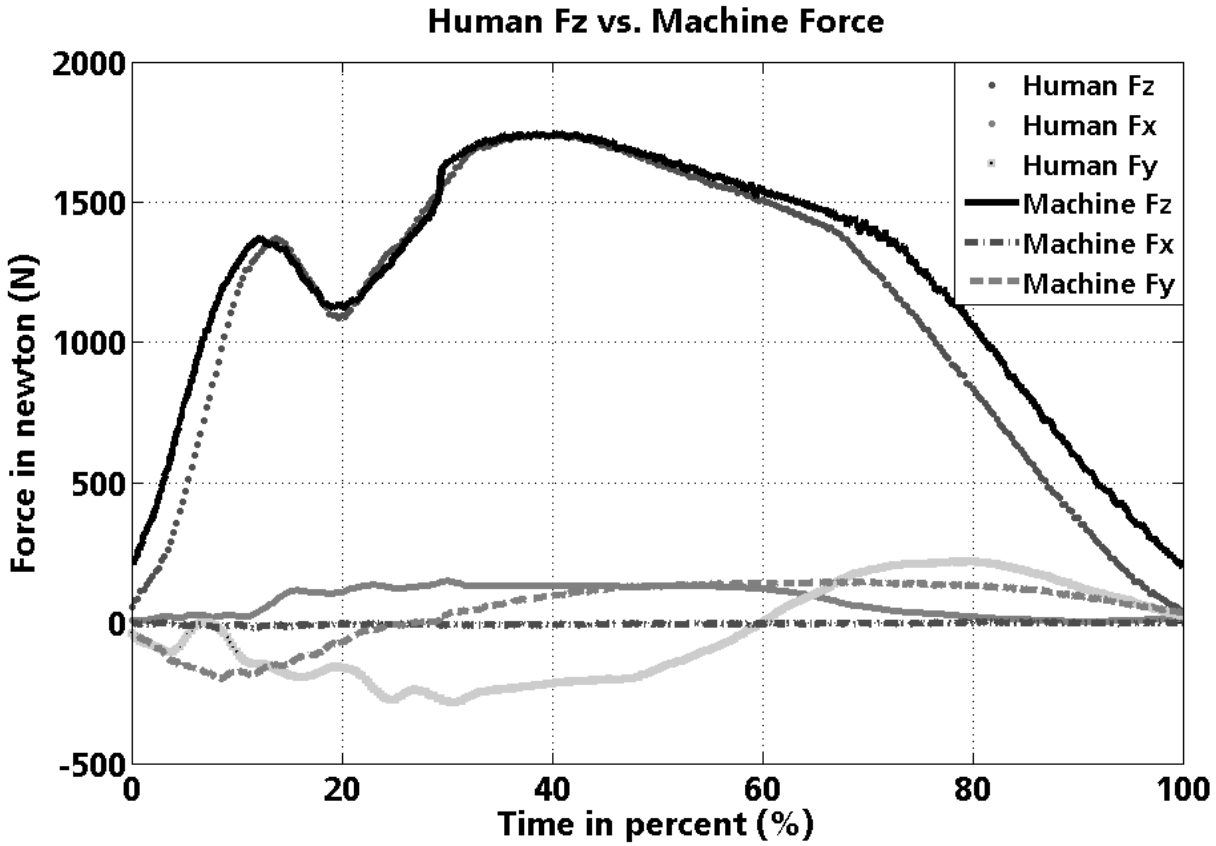
Gait2ISO – Trial results 0.2Hz



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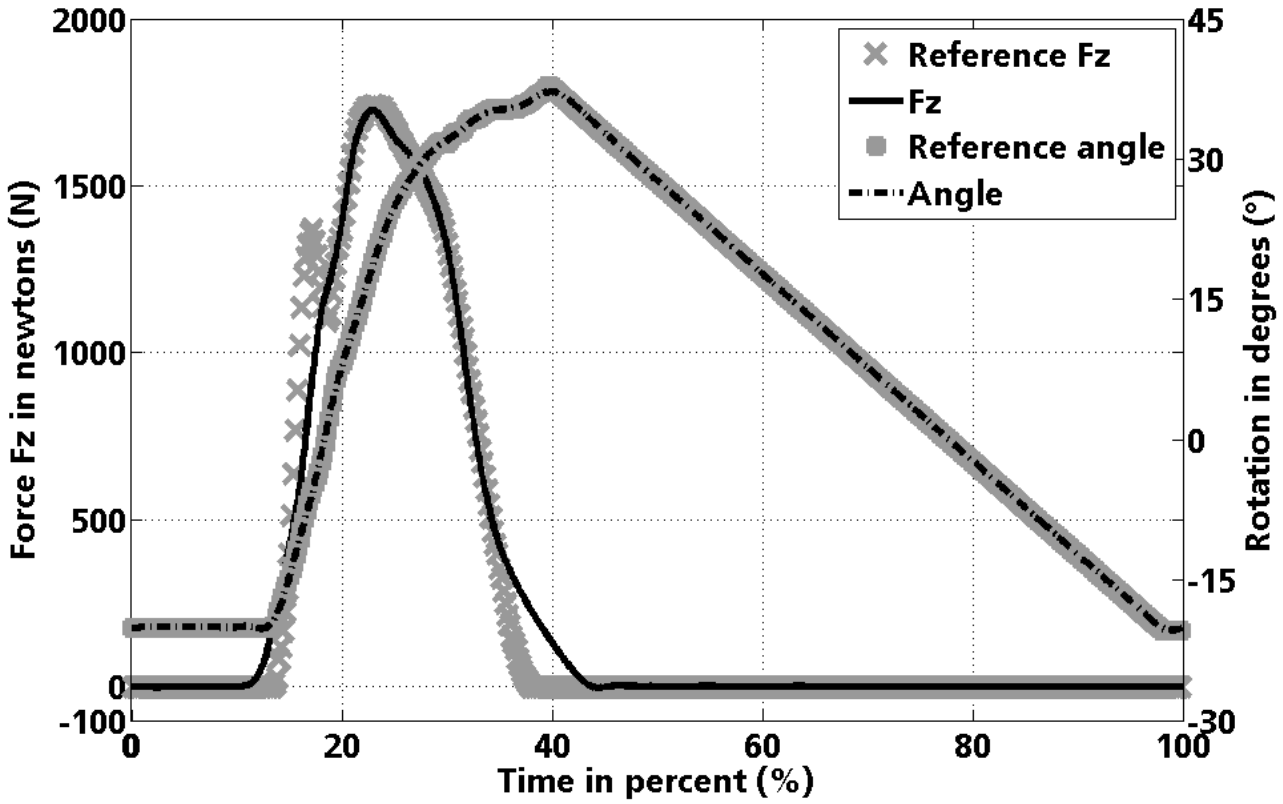
Gait2ISO – Trial results 0.8Hz



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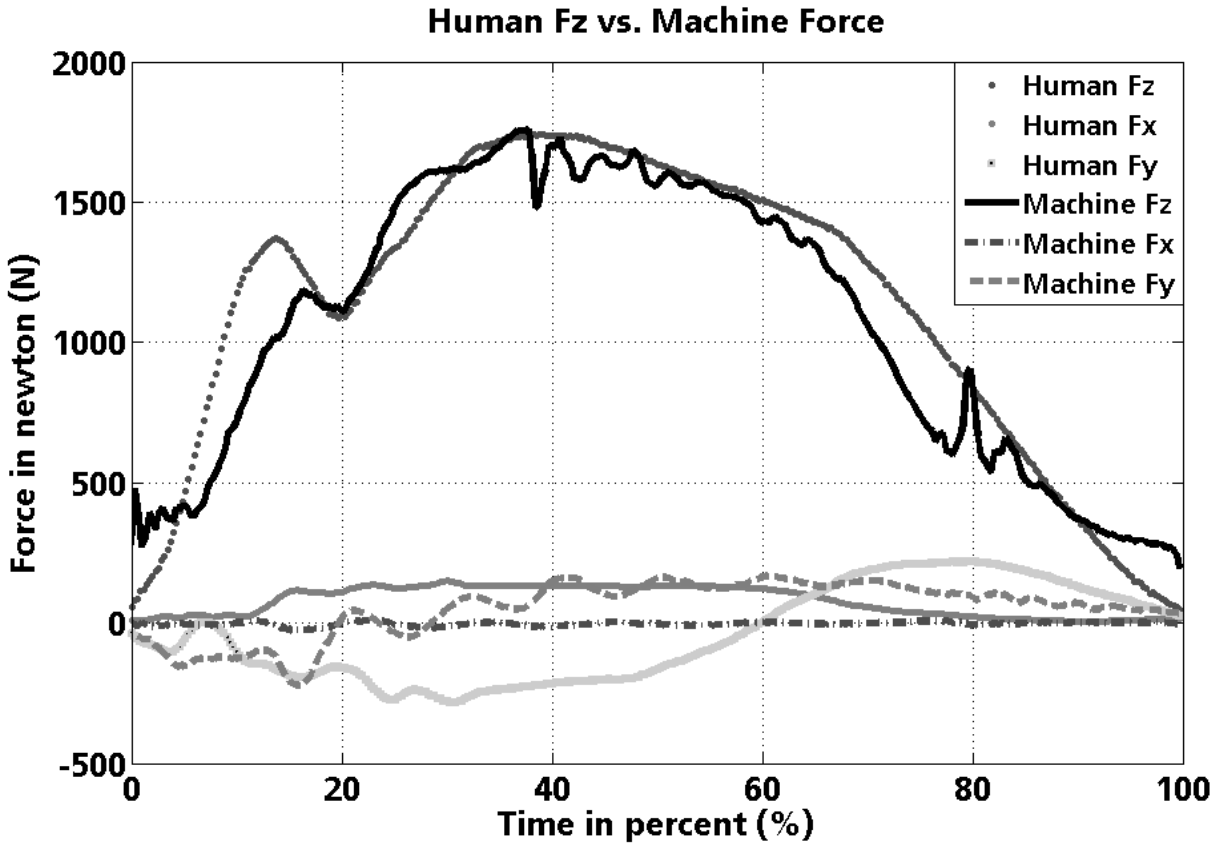
Gait2ISO – Trial results 0.8Hz



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Future Work

- Robot
  - Integration of ABB Force control
  - Hybrid force/position control strategy

    →Accurate force simulation

- ISO testing
  - Minimize hydraulic piston stroke
  - Tilt table modification in form of roll over shape

    → Higher accuracy in real-time trials

Thank you for your kind attention

We look forward to your visit
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