Institute for Cognitive Systems
Department of Electrical and Computer Engineering
Technical University of Munich

Wrist Design for a Modular Transradial Bypass Socket for Prosthetic Control in Non-Amputees

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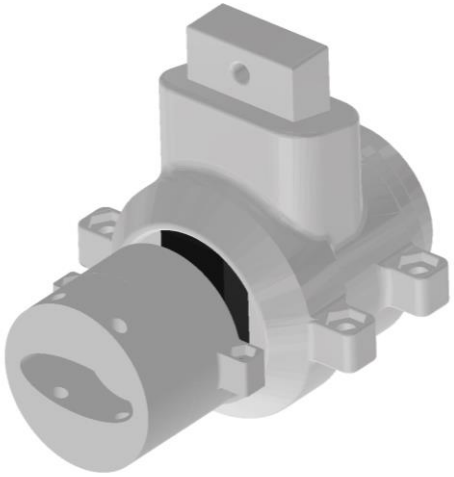

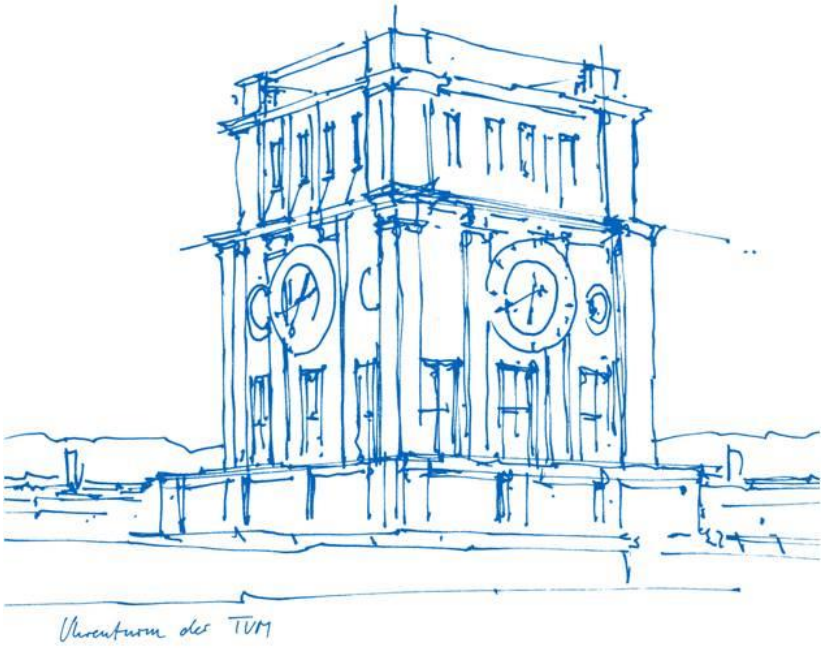

Agenda

Final Design

Inspiration: University of Utah’s bypass socket

Source: Paskett, Michael D. et al.: A Modular Transradial Bypass Socket for Surface Myoelectric Prosthetic Control in Non-Amputees.

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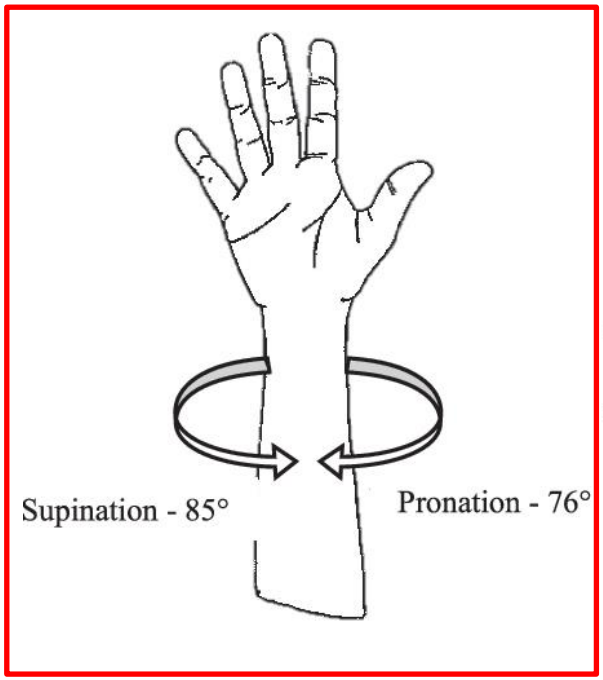
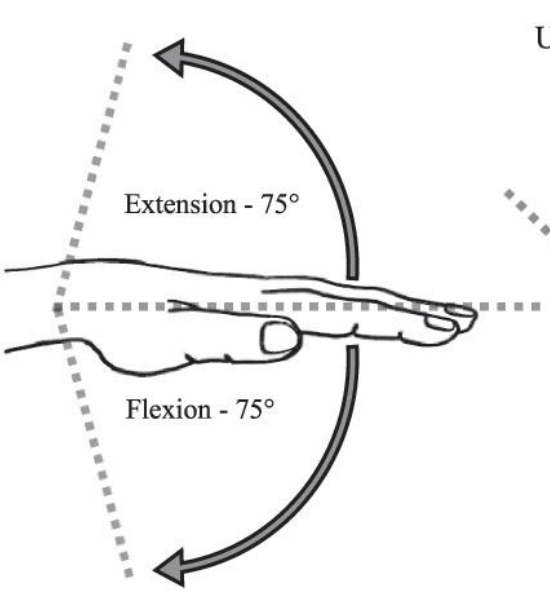
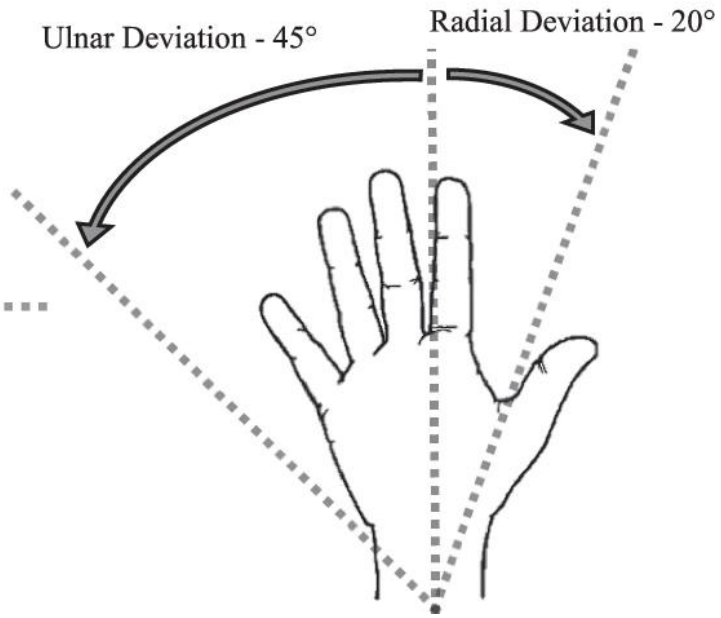
Human Wrist Motion Capability

Degrees of freedom (DOFs) of the human wrist and their ranges







Source: Bajaj, N. M. et al.: State of the Art in Artificial Wrists: A Review of Prosthetic and Robotic Wrist Design.

Types of Prosthetic Wrists

3 categories for upper limb prosthetic systems

1. Passive systems
2. Body-powered systems
3. Active systems /externally powered systems

Torque Analysis

Wrist torque analysis of three different types of handle

	Pronation Torque [kg-cm]	Supination Torque [kg-cm]
Cylinder	60 ± 24	67 ± 23
Screwdriver	58 ± 23	74 ± 25
Doorknob	79 ± 25	101 ± 32

Minimum sufficient wrist torque: 20 kg-cm for pronation and supination

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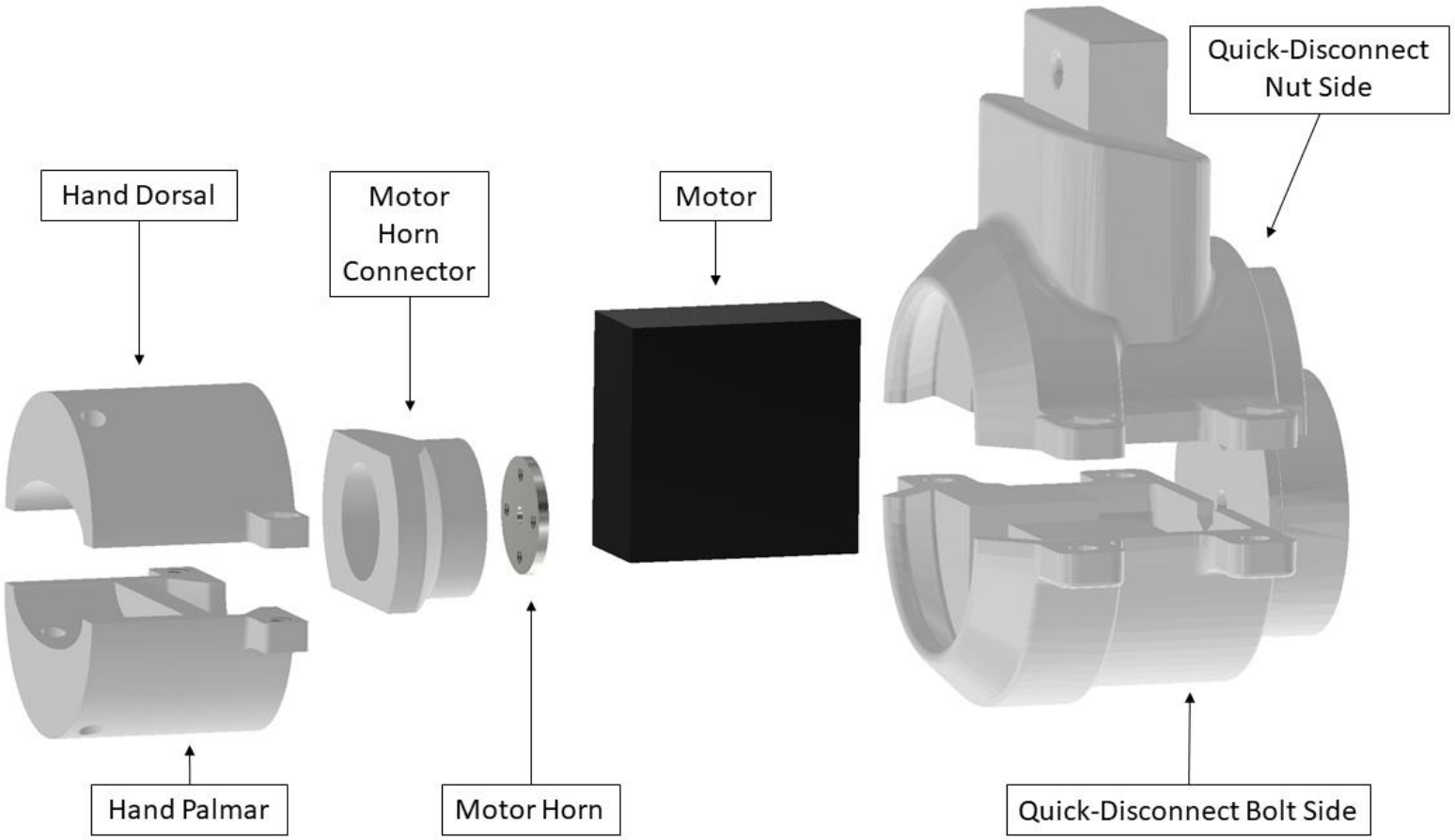
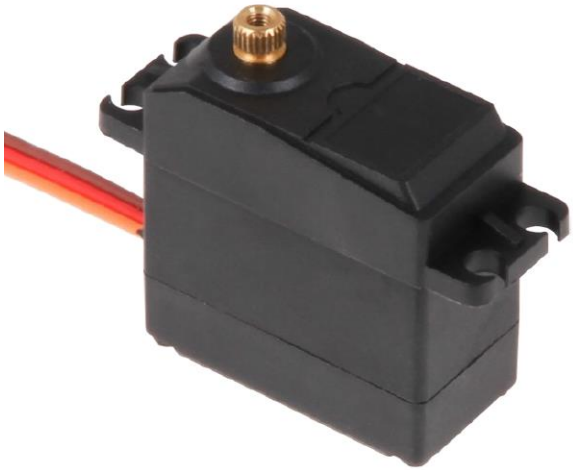
The Design of the Pro/Supination Mechanism



Motor Choice and Control

Joy-it Motor JT-PWM-20kg Specification

Dimensions	40 x 20 x 40.5mm
Operating Angle	180° (500 - 2500µsec)
Maximum Torque (6.0 V) Maximum Torque (7.4 V)	18.3 kg-cm 21.5 kg-cm
No-Load Speed (6.0 V) No-Load Speed (7.4 V)	0.16s / 60° 0.15s / 60°



Source: Joy-it Motor JT-PWM-20kg kaufen

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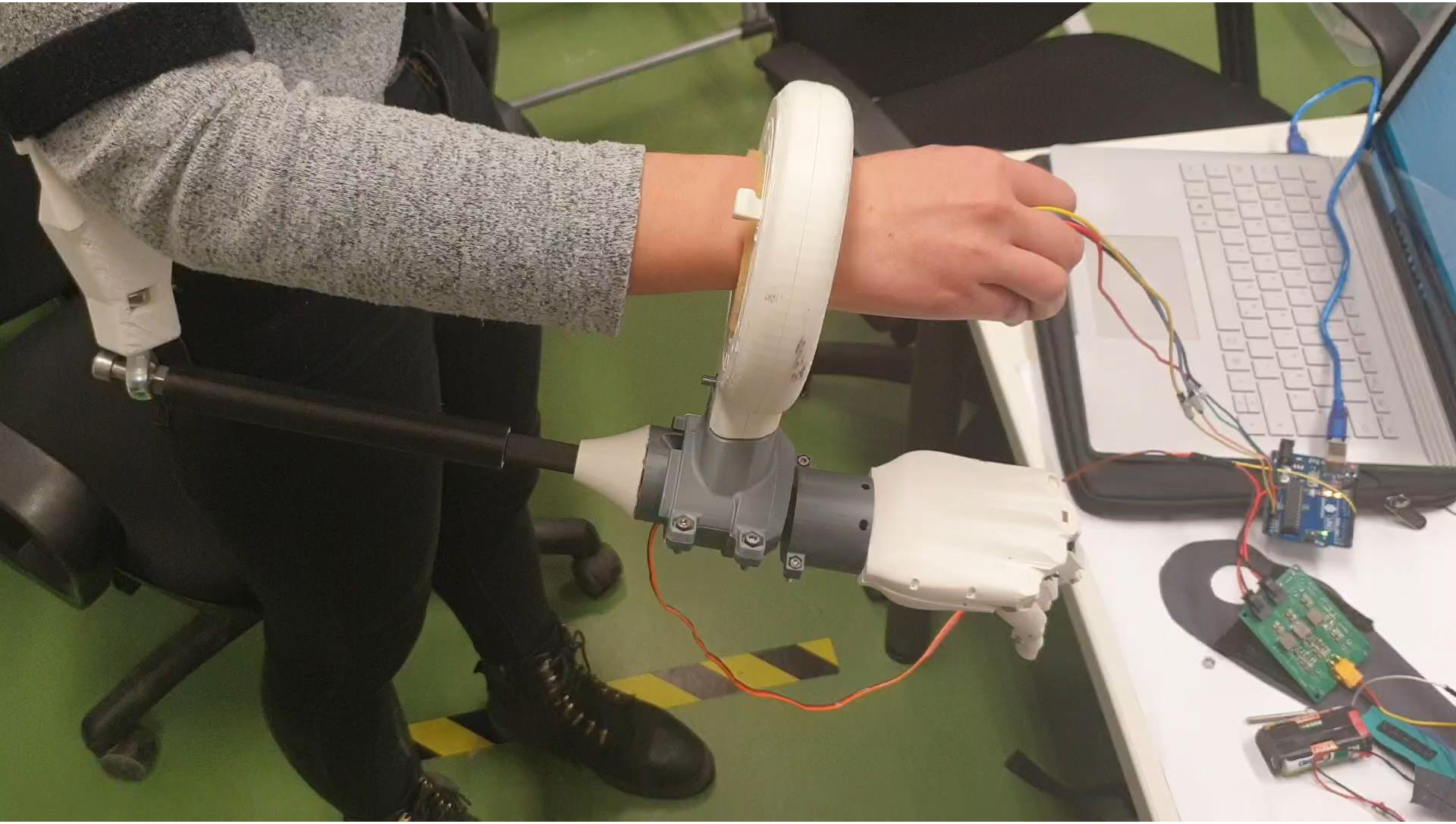

Thank you for your attention!

If you have any questions,
feel free to ask.

Resources

1) Paskett, Michael D. ; Olsen, Nathaniel R. ; George, Jacob A. ; Kluger, David T. ; Brinton, Mark R. ; Davis, Tyler S. ; Duncan, Christopher C. ; Clark, Gregory A.: A Modular Transradial Bypass Socket for Surface Myoelectric Prosthetic Control in Non-Amputees. In: *IEEE transactions on neural systems and rehabilitation engineering : a publication of the IEEE Engineering in Medicine and Biology Society* 27 (2019), Nr. 10, S. 2070–2076. http://dx.doi.org/10.1109/TNSRE.2019.2941109. – DOI 10.1109/TNSRE.2019.2941109
2) Bajaj, Neil M. ; Spiers, Adam J. ; Dollar, Aaron M.: State of the Art in Artificial Wrists: A Review of Prosthetic and Robotic Wrist Design. In: *IEEE Transactions on Robotics* 35 (2019), Nr. 1, S. 261–277. http://dx.doi.org/10.1109/TRO.2018.2865890. – DOI 10.1109/TRO.2018.2865890. – ISSN 1941–0468
3) Joy-*it Motor JT-PWM-20kg kaufen*. https://www.conrad.de/de/p/joy-it-motor-jt-pwm-20kg-1611552.html. Version: 06.06.2021