TECHNISCHE UNIVERSITÄT MÜNCHEN
HUMAN-CENTERED ASSISTIVE ROBOTICS
UNIV.-PROF. DONGHEUI LEE

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F O R S C H U N G S P R A X I S
for
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Evaluating the Effects on Human Balance of a Light Haptic Feedback provided by a Wearable Device

Problem description:

A voluntary light contact with an earth-fixed point leads to a reduction in body sway improving human balance control capabilities [1]. Recent work [2, 3] suggest that an unintended light interaction, provided by an external contact provider, also reduces the body sway of the contact receiver. The reduction in body sway has been observed when the contact occurs between two humans [2] and when the contact provider is a robotic manipulator [3]. However, it is not clear if the improved human performance in case of unintended interactions depends only on the haptic feedback or also on the leader–follower relations between contact provider–receiver.

In this Forschungspraxis work the student has to investigate the effects on human balance of a light haptic feedback provided by a wearable device. The device can be attached to the human wrist to provide a light external force (about $1\,\mathrm{N}$) in an unstable standing situation. Being the device attached to the human body there is no relative dynamics between contact provider (the device) and receiver (the human), allowing us to derive conclusions on the effects of light haptic feedback on human balance.

Work schedule:

- Set up the user study (control of the wearable device, sensors set-up).
- Perform experiments with about 10 subjects.
- Analyze collected data and evaluate the results.

Bibliography:

[1] M. Holden, J. Ventura, and J. R. Lackner. Stabilization of posture by precision contact of the index finger, in *Journal of Vestibular Research*, 1994.
[2] S. M. Steinl and L. Johannsen. Interpersonal interactions for haptic guidance during maximum forward reaching, in *Gait & Posture*, 2017.
[3] K. Potwar, L. Johannsen, M. Saveriano, M. Langer, and D. Lee. Light touch postural guidance through a robotic system, in *AsiaHaptics*, 2018.

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