TECHNISCHE UNIVERSITÄT MÜNCHEN
Human-centered Assistive Robotics
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M A S T E R ' S T H E S I S
for
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The Effect of Sway Dependent Vibrotactile Directional Feedback Applied by a Haptic Vest on Human Postural Control

Problem description:

Human body balance can be improved by light touch (<1N) with a static surface [2] as well as by being in light touch with another person [4]. Although, in everyday life these methods are not always applicable, as it is hard to provide light touch with a static surface for activities of daily living, as well as to provide enough care givers for interpersonal light touch. Consequently, wearable devices provide a good opportunity for people with postural instability for the application in everyday life [7]. Different devices have been investigated in research of postural control, located at different body parts [3, 6, 7, 8]. Moreover, various types of feedback have been used [8] and applied coupled [7, 10] or uncoupled [6] to the own body sway. When applying (vibro-)tactile feedback, not just the location of the tactile stimulus and the type of stimulus are important, but also what instruction is given to the subjects (to move towards the stimulus or away from it). Although, there is no consensus in literature [6, 7, 9, 1, 5] about how to give the instruction for improving postural control during standing to be also more intuitive.Therefore in this study the following hypothesis will be examined:

1a) Sway-dependent vibrotactile directional feedback applied to the shoulder helps to improve postural control

1b) Sway-dependent vibrotactile directional feedback applied to the shoulder is at least as efficient as light touch

2) Balance control is more intuitive for moving into the direction of the stimulus compared to away from the stimulus

As a secondary endpoint the relationship between Center of Pressure (CoP) and Center of Mass (CoM) data will be analyzed and discussed regarding the application in everyday life.

Tasks:

- Literature research and develop the study design
- Write/adapt scripts for communication and synchronisation of the different hardwares (haptic vest, force plate, IMU, F/T sensor)
- Write/adapt scripts for capturing and saving data with IMU, force plate and F/T sensor
- Adapt script for stimulus generation by the haptic vest
- Define the thresholds for feedback by pilot testing
- Carry out user study with 30 participants
- Data post processing and statistical analysis

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