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## **“Body balance with light touch – human individuals and pairs and robots”**

### **Seminar Presentation**

Our skin is a complex sensory organ and touch is our window to the physical world as every interaction with our environment involves an exchange of forces. As touch takes place in our body's immediate vicinity it is highly relevant to avoiding injury or damage to objects in the environment. The subtle and timely control of contact forces during tactile exploration normally incorporates predictive processes based on our internal representations of “world-knowledge”. An example is our expectation of whether an object is soft or hard and how much pressure it can withstand. Interpreting any registered touch, therefore, very much depends on the context. Probably more than any other sensory modality, touch will entail active involvement leading to processes of action control and perception being tightly coupled. A specific context, in which the versatility of touch is expressed, is the augmented sensorimotor control of body balance and posture during light contact with some external reference point which provides only minimal physical support. For posture, the benefit of touch, may be even greater than that for vision, as demonstrated in healthy individuals and neurological patients. On the other hand, keeping light touch also imposes specific constraints on the individual. Such constraints, can however, be exploited therapeutically, as when deliberately light interpersonal touch between a therapist and her patient is used during balance and gait exercises and in more routine clinical activities. Finally, if the care staff become fewer in our ageing society, the negative consequences on the quality of care for the coming generations of elderly will be severe. Robotic systems may be one solution to growing demand for individualized care. Providing robotic light touch to humans, to increase mobility in small homes, will be one of many technological, therapeutic and social challenges we face.

### **Brief Biography**

Leif completed his degree in psychology at the University of Potsdam, Germany, in 1999. He worked as a neuropsychologist and researcher at the Hertie Institute for Clinical Brain Research, Department of Cognitive Neurology, in Tübingen, Germany, to pursue his interests in cognitive neuropsychology and neurological rehabilitation. He completed his PhD in Behavioural Neuroscience in 2005. In the following years, he worked as a post-doctoral research fellow at the University of Birmingham, School of Psychology. He returned to Germany in 2011, where he was appointed as a senior researcher and lecturer at the Technical University of Munich, Department of Sport and Health Sciences. Since November 2016, he is a senior lecturer at the University of East Anglia (UEA), Faculty of Medicine and Health Sciences. Leif's research concerns both sensorimotor control of body balance during standing and walking, especially with respect to haptic interactions with the environment and other individuals. He is also interested in the interference between cognitive and motor processes in neurological movement disorders such as stroke, Parkinson's disease and cerebral palsy, the benefits of physical activity on cognitive functions in older adults and neurological patients, as well as the consequences of repetitive head impacts on sensorimotor and neurocognitive functioning.

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