Non-Contact versus Contact-based Sensing Methodologies for In-Home Upper Arm Robotic Rehabilitation

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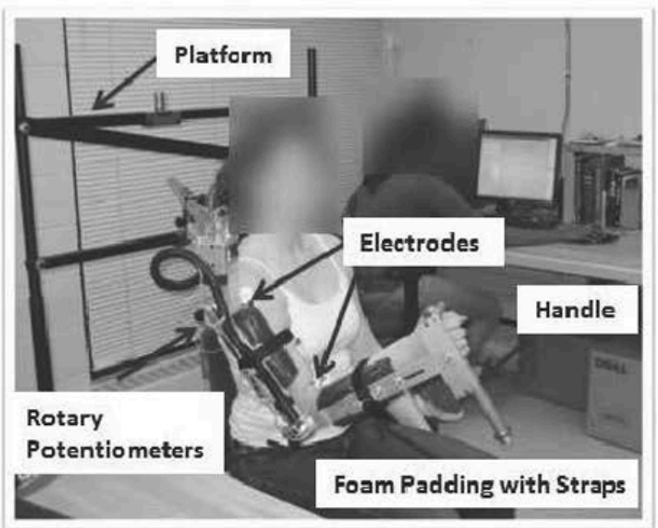
- Two sensing methods have been developed for extracting upper-arm movement characteristics through robot interaction
- The physical contact method utilizes EMG sensors coupled with a Hidden Markov Model (HMM) algorithm
- The non-contact method uses off-body camera data coupled with image-processing techniques
- Preliminary results compare the advantages and limitations of each approach as applied to an in-home rehabilitation scenario



Contact Based Sensing

Non-Contact Based Sensing

Podium 1.1

Arm support in sub-acute stroke rehabilitation

- **ROBAR implementation study:**
  - Application of arm support in 7 stroke rehabilitation centers

- **RCT of arm support training ↔ conventional therapy:**
  - Arm function ↑ in both groups
  - Gains after equal intensity training: arm support = conventional therapy
  - User acceptance positive by both therapists and patients

Assessment of upper limb motor function in patients with Multiple Sclerosis using the Virtual Peg Insertion Test: a pilot study

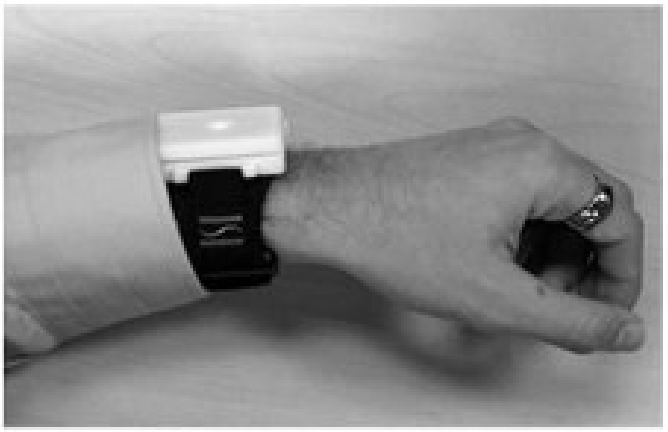
O Lambercy, M-C Fluet, R Gassert: ETH Zurich, Switzerland
I Lamers, P Feys: Hasselt University, Belgium
L. Kerkhofs: Rehabilitation & MS Center Overpelt, Belgium

- 10 multiple sclerosis patients were evaluated on the Virtual Peg Insertion Test, a haptic/VR assessment tool, and compared to performance of 8 healthy subjects
- Nine out of ten patients could perform the test, illustrating feasibility
- Execution time correlated well with clinical measures, and intention tremor was quantified using a frequency analysis

The Manumeter: A non-obtrusive wearable device for monitoring spontaneous use of the wrist and fingers

J Rowe, N Friedman, M Bachman, D Reinkensmeyer: University of California Irvine (UCI)

- Design and pilot testing of a novel device for unobtrusive monitoring of wrist and hand movement called the manumeter.
- Magnetometers in a watch-like unit sense the field produced by a magnetic ring to estimate wrist and finger joint angles.
- Joint angle estimates were found to be within roughly 6° of their actual values.



Podium 1.4

Effort, performance, and motivation: Insights from robot-assisted training of human golf putting and rat grip strength

JE Duarte, B Gebrekristos, S Perez, JB Rowe, K Sharp, DJ Reinkensmeyer:
University of California, Irvine, US

- Robotic devices were used to modulate the success rates and required effort levels in training humans in a virtual game of golf putting and rats in a grip strength task.
- Robotic assistance in golf putting increased participants feelings of competence and sense of effort but had mixed effects on learning.
- Reducing required effort led rats with SCI to practice the grip strength task more frequently but not exceed gains achieved by rats who exercised less frequently but at higher forces.

Podium 1.5