Analysis of robotic data from rehabilitation with MAHI-EXOII after incomplete spinal cord injury

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Background

- Robotic rehabilitation with the MAHI-EXOII device was provided for upper limb training of 6 incomplete spinal cord injury (SCI) patients
- MAHI-EXOII allows wrist flexion/extension, radial/ulnar deviation, forearm supination/pronation, and elbow flexion/extension

Importance

- Efficacy of robotic devices for upper limb rehabilitation of SCI patients has yet to be demonstrated
- Understanding effects of robotic training and role of robotic measures in rehabilitation can play a significant role in enhancing outcomes for this population

Methods

- Position data were collected at 100 HZ and were collected before, during and after 4 weeks of robotic training
- Various objective measures including movement smoothness were used to monitor patient progress
- Data were plotted for each subject for each treated side, using MATLAB
- Existing codes for data analysis were enhanced in order to:
  - Make the calculating codes compatible with data from all subjects
  - Divide and categorize the extensive set of collected data (especially the training data) into manageable blocks to better represent the data

Results

- Evaluation and training data were plotted together to better allow observation of patients' progress over time and after training (see Figure 2)
- Most subjects demonstrated continuous improvement across training sessions for various robotic measures
  - Average smoothness (F_S) and corresponding average velocity increased over time for both training and evaluation sessions
  - Observed progress was consistent over five blocks of each training session

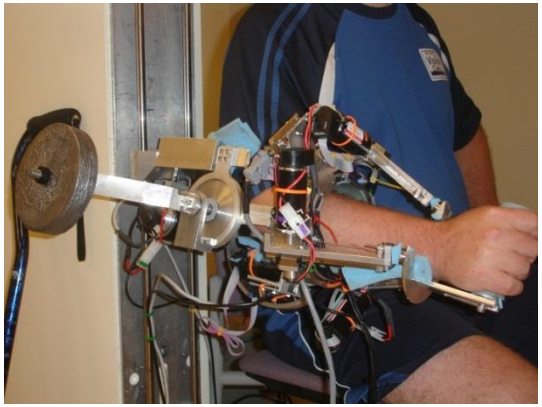

Figure 1. Right hand of an SCI patient in MAHI-EXOII

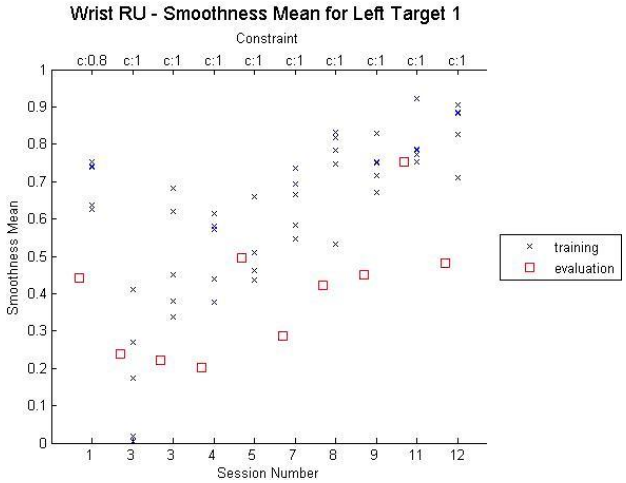

Figure 2. Sample of smoothness measure plotted over evaluation and 10 training sessions

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