patient@home

Universal Robotrainer – Rehabilitative training, WP1.1

Jacob Nielsen

The Project

Investigate the feasibility of using an off-the-shelf industrial robot for upper limb rehabilitation



UR5 Industrial Robot

Robotique force/torque







Project Setup

- Established collaboration with the Neurorehabilitation department at OUH Svendborg Hospital.
- Investigation and co-development of therapist robot – patient interaction scenarios with therapists at OUH Svendborg.
- No real patients included!
- 1 part-time post-doc, 2 Master Students, 1 student programmer.





Results

- Investigated human robot trust
- Investigated rehabilitation context at OUH Svendborg
- Developed software package to control robot including:
 - Force Torque sensor based movement of robot
 - Touch-based browser interface for setup of patients, recording and training exercises
 - Algorithms for Individualizing standard exercises and adapting to patient progress during training (Patent pending)











ABSTRACT

We demonstrate how a generic industrial robot can be used as a training partner, for upperlimb training. The motion path and human/robot interaction of a non-generic upper-arm training robot are trainferred to a generic industrial robot arm, and we demonstrate that the robot arm can implement the same type of interaction, but can espand the training regime to include both upper-arm and shoulder training. We compare the generic robot to two affordable but castom-built training robots, and outline interesting directions for future work based on these training robots.



Individualised and adaptive upper limb rehabilitation

with

industrial robot

using

dynamic movement primitives

Jacob Nielsen, Anders Stengaard Sørensen, Thomas Søndergaard Christensen, Thiusius Rajeeth Savarimuthu and Tomas Kulvicius











Master Thesis

A human-computer interface for a rehabilitative robotic arm

Author: Dionysios Kakouris Supervisor: Jacob Nielsen

A thesis submitted in fulfilment of the requirements for the degree of Master of Science in Software Engineering

in the

Faculty of Engineering,

Maersk Mc-Kinney Moller Institute

June 2015

Conceptualizing interpersonal trust in the interaction between human patients & medical technology

Trust me, I am a Robot!

Angelina Stoyanova, Jonas Drefeld, Jacob Nielsen & Stoyan Tanev Faculty of Engineering, University of Southern Denmark, Odense, DK







Conclusions and further studies

- We created a flexible and useful basis for rehabilitation with an industrial robot
 - Although still with a few limitations on the control side.
- The system might be suitable for rehabilitation departments not for homes.
- Other types of industrial robots need to be investigated:
 - Preferably with faster feedback loops
 - Medical equipment approval might pose a challenge.
- Next step is a master study on usability and user experience with the developed system as well as consequent adjustments of control software and interface
- Then comes patient and effects studies.







Acknowledgement and Contact

Responsible Researchers

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Collaborators

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