Virtual Reality and Rehabilitation

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Outline

• Definition of rehab
• VR for rehabilitation
• Virtual rehab community
• Examples of applications
• Main challenges (3-5 years)
Definition of Rehabilitation

• Rehabilitation is the process of helping an individual achieve the highest level of independence and quality of life possible - physically, emotionally, socially, and spiritually.

• Rehabilitation does not reverse or undo the damage caused by a injury or illness, but rather helps restore the individual to optimal health, functioning, and well-being.

• Rehabilitate (from the Latin "habilitas") means "to make able again."
Virtual Reality for Rehabilitation

- Variety of technologies:
  - VR platforms
  - Displays
  - Input devices
  - Interaction mechanisms

- Wide range of impairments and disabilities
- Diversity in the way the technology is applied
- Multi-dimensional nature of R&D issues

(Cobb and Sharkey, 2007)
Virtual Rehabilitation Community

- Conferences have emerged since early 90’s:-
  - ICDVRAT [http://www.icdvrat.rdg.ac.uk/](http://www.icdvrat.rdg.ac.uk/)
Example applications

(Brown et al., 1999)

(Cobb and Brown 1997)

(Cobb et al., 2002)

(Hilton et al., 2007)

(Millen et al., 2011)
Blue/Green screen technology for motor coordination

University of Haifa - IREX System
(Kizony et al., 2002; Weiss et al. 2009)
Comparison of reaching and grasping kinematics in virtual & physical environments.

3 grasp types:
- Spherical - can
- Power - screwdriver
- Precision - nail

Mindy F. Levin, McGill University, Montreal
Wii Fit Balance Board

(Lange et al., 2010)
Webcam Tracking

(Lange et al., 2010)

(Shefer et al., 2010)

(Rizzo et al., 2005)
Key Features of Rehabilitation tools

• Tailored to individual’s level of ability
• Flexible options to individualize exercises to meet specific therapy goals
• Option to increase level of challenge at appropriate rate
• Reliable and Valid user sensing hardware
• Appropriate and timely feedback
• Quantitative performance data
Main challenges 3-5 years

- OUTCOME STUDIES!!
  Can clinicians and patients use these applications? → User testing
  Are these technologies as good as or better than standard care? → Clinical trials

- How do we build applications that move beyond a novel technology and become integrated into standard clinical practice or home-based care?

- Can we encourage users to adhere to exercise programs?
Public perception

• “The University of Nottingham is hosting the event which aims to show how specialist technology can improve our lives.”

• “This system could be used in hospitals to keep vulnerable patients in touch but not in direct physical contact with visitors. We’re both at the conference but in different rooms!”

(BBC East Midlands Today 20th September 2011)
References


