

A new perspective for Virtual Mirror Therapy

Developing a low-cost-high-convenient environment utilising the Wiimote

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Abstract—The Nintendo Wii-Technology will be used for Virtual Mirror Therapy with stroke patients. A special software-application and a therapy-plan will be developed and analyzed regarding different research aspects.

Keywords—Virtual Mirror Therapy, Stroke, Immersion, Wiimote

I. INTRODUCTION

Proposals have been given previously for enhancing mirror therapy with virtual reality [1, 2]. The ongoing technological advance makes it possible to develop low-cost and high-convenient environments that would be broadly available and could be used without extensive technological skills. The Nintendo Wii introduced a new active interaction method that attracts attention of scientists and therapists motivated by its simple technique and great market share [3]. This work opens a new perspective on virtual rehabilitation. We aim to develop a virtual environment for Mirror Therapy with stroke-patients that utilizes the Nintendo Wii-Controller (Wiimote). Different research methods will then be applied to explore questions regarding applicability and effectiveness of the system.

II. METHOD

A. Development

The technical component of the therapy system consists of a computer with an adequate output device and the Wiimote, which can be connected via Bluetooth-Interface to every computer. We develop a special software-application for this hardware environment that generates a virtual reality for Mirror Therapy. It displays a computer-generated representation of the patients' limbs, which are controlled according to the principals of Mirror Therapy by the patient with the Wiimote. The sensor equipment of the Wiimote allows to record movements of one joint. Hence our development will be continuously synced with the construction of a therapy-plan that fits to the boundaries of the technology in use.

B. Analysis

The developed system will be explored by a pilot-study in cooperation with a local rehabilitation center. We want to gain information regarding the following research aspects:

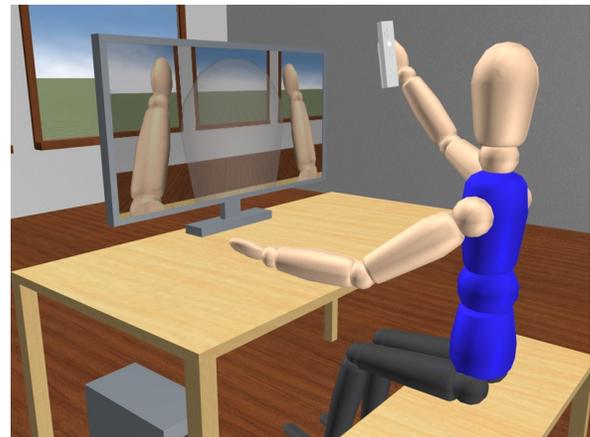


Figure 1. Model of a possible therapy setting

1) *Effectiveness*: Pre- and posttreatment clinical assessments (e.g. Fugl-Meyer Score) are applied, gaining data about the progress of motor skills of the impaired limbs.

2) *Experience*: Patients and therapists are going to be interviewed regarding their experiences with the system during treatment. Our interest is to generate hypotheses about how the system shall be designed for optimal integration in the patient-therapist interaction process.

3) *Immersion*: Eyetracking is used to analyze the immersive character of the generated virtual reality. The data is combined with subjective feedback of the patients.

REFERENCES

- [1] C.D. Murray, E. Patchick, S. Pettifer, F. Caillette and T. Howard, "Immersive virtual reality as a rehabilitative technology for phantom limb experience: a protocol," *Cyberpsychology & Behavior: The Impact of the Internet, Multimedia and Virtual Reality on Behavior and Society*, 9(2), 167-70, 2006.
- [2] K. Eng, E. Siekierka, P. Pyk, E. Chevrier, Y. Hauser, M. Cameirao, L. Holper, K. Hägni, L. Zimmerli, A. Duff, C. Schuster, C. Bassetti, P. Verschure and D. Kiper, "Interactive visuo-motor therapy system for stroke rehabilitation," *Medical & Biological Engineering & Computing*, 45(9), 901-7, 2007.
- [3] J.E. Deutsch, M. Borbley, J. Filler and K. Huhn, "Use of a low-cost, commercially available gaming console (Wii) for rehabilitation of an adolescent with cerebral palsy," *Physical Therapy*, 88(10), 1196-207, 2008.