

Therapeutic Presence

Virtual illusions for Neurorehabilitation

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Abstract: The poster presents a PhD-project in which a virtual environment (VE) for mirror therapy will be developed and its applications explored. The development draws on recent findings in research on the concept of presence.

Introduction: In recent years, systems have been proposed for neurorehabilitation that transfer the idea of mirror therapy [1] to virtual reality [2,3]. The visual illusion of a moving limb is used to relearn lost functionality after a stroke or to reduce pain in a phantom limb. The degree to which the illusions are experienced as real plays an important role in the effectiveness of this treatment.

In research on VEs the term "presence" refers to the subjective experience of an agent that perceives and reacts to sensorial stimuli of a VE in a way similar to real life. In the framework proposed by [4], presence is related to *the (prereflexive) perception of successfully transforming intentions in actions*. For a strong experience of presence in relation to a VE, a correspondence between actions and intentions is more important than visual realism. Even a perceptually poor VE may constitute a strong experience of presence if it successfully supports an agent in carrying out his/her intended actions.

Implications for neurorehabilitation: Following this understanding when designing a VE for neurorehabilitation, it is particularly important to support the execution of all behavior that can possibly be intended by patients. This can be a sheer impossible task when patients have to control humanoid limbs in a realistic VE. Especially low-level operations are highly subjective and individual. Moreover, the recording of real-world movement of the patients is limited by hardware needs. Patients will experience low presence in these VEs and thus will have difficulties to believe the illusion to be true.

A fictional VE consisting of simple objects that are controlled by natural movement of patients will not lead to these problems. The illusionary movement of the arm itself does not need to be displayed in order to feel that the observed behavior was initiated by such a movement. Such fictional VE may still be based on mirror therapy principles and display bilateral behavior that is controlled by unilateral movement. This seems promising for the purposes of neurorehabilitation.

References

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