

Comparing ADL performance in different virtual modalities

Background:

Activities of daily living (ADL) are crucial for leading an independent life and they consist of day-to-day activities such as, preparing meals, handling finances, taking medication, driving or using public transportation and shopping. These ADL require preserved executive functions, prospective and working memory, attention and many other functions. Measures are required to predict the involvement of specific impairments in dysfunction in specific ADL. Impairment in ADL performance have potential early biomarker in many neurodegenerative diseases.

Virtual reality systems, primarily intended for the gaming industry, have great potential for 3D visualization in different sectors. Head mounted displays, for instance, allow a precise measurement of performance and visual exploration behavior during virtual activities of daily living, in a naturalistic scenario. The use of virtual reality (VR) technology to design training programs will play a large role in growing aging population. However, more research is required before this technology can be incorporated in rehabilitation plans. A novel serious game has been developed in our group, which has the possibility to allow testing and quantifying the ADL performances in a safe daily living virtual environment (Serious Games). We would now like to extend the Serious games into the VR setup with Head-mounted displays.

Aim: To compare and study the serious game and oculus rift setup for measuring ADL performance cum training.

Materials and Methods: ADL tasks (similar to the serious games tasks) will be implemented for the VR setup using Oculus rift. The two modalities will be used to evaluate the degree of human-machine interaction. A set of healthy young and healthy elderly subjects will be recruited for the system evaluation. The participants will be requested to choose from one of the several tasks proposed to them, e.g. navigating a virtual environment, shopping, preparing tea or laying a table. Different aspects of the participant's behavior and performance (gaze behavior with an eye tracking system, index of performance, behavioral assessment) will be investigated during the tasks. After completion of the tasks, participants will be interviewed to rate the game and performance. The results of this study will be used to develop further VR studies for training purposes.

Nature of the Thesis:

Development: 50%

Evaluation study: 20%

Data analysis and documentation: 30%

Requirements:

Background in Biomedical Engineering or Computer Science

Good programming skills

Basic knowledge in Unity 3D is preferable

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Figure 1- Shopping task from the serious game application