

2017-798 VIRTUAL REALITY TRAINING TASKS USED FOR STROKE REHABILITATION

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Technology description

SUMMARY

UCLA researchers in the Department of Mechanical and Aerospace Engineering have developed a set of virtual reality training tasks that can be used for rehabilitation for post-stroke patients.

BACKGROUND

Stroke is a leading cause of death and disability around the world, and the majority of survivors experience chronic motor deficits. Considerable amounts of practice are required to induce functional recovery of these motor deficits, however, patients generally perform a very limited number of movement repetitions in traditional therapy sessions. One proposed method for optimizing the effects of therapy is the use of virtual reality (VR), which implements real-time simulation of an activity or environment allowing user interaction via multiple sensory modalities. VR therapies are appealing because they can provide patients and therapists with additional feedback during therapy, increase patient motivation, and dynamically adjust the difficulty of therapy.

INNOVATION

The inventors have developed a set of eighteen (18) virtual reality (VR) training tasks based on seven degrees of freedom of human arms to rehabilitate post-stroke patients. A guideline is included to make the training tasks comparable and outcome of which quantifiable. The training set maps the patient's high-dimensional arm movement to a task with lower-dimension requirement, in order to train single joint mobility and alleviate abnormal multiple joint musculoskeletal synergies. Graphical user interfaces (GUIs) and artificial intelligence (AI) are key components to this innovative training pipeline. The GUI is designed so that physical therapist and engineers could modify and monitor the parameters applied to all games intuitively. The prototype software is developed to include tasks with static and dynamic targets that require 1D, 2D and 3D motions of the patient's hand to complete. Patient's motions during these training tasks are continuously analyzed as a feedback to the AI algorithm to adjust training difficulties. The algorithm always increases the training difficulties to slightly outside of the patient's comfort zone to challenge and improve patient's movements.

Application area

Virtual reality/augmented reality/mixed reality training task design

Exercise gaming development
Training in rehabilitation for stroke patients

Advantages

Multiple modes and direction- providing different training for different joints
Quantifiable results
Easy to modify and monitor
Interactive for users/patients

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