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Quantitative evaluation of upper limb rehabilitation using an intelligent stacking cone system in a game setting

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People suffering neurological deficits due to sudden onset of occlusion or rupture of cerebral vessels usually develop multiple clinical symptoms such as hemiplegia, dysesthesia, difficulty in speech or comprehension or defect of visual fields after the acute phase. Specifically, functional impairment of the upper extremities is most common in these patients. It is important to design a suitable training program for individual patient to effectively restore physical functions. However, the current training protocols often rely on manual and subjective assessment of upper extreme functions. In this paper we present the implementation of an "Intelligent Stacking Cone System" that was designed to quantitatively evaluate the functional status of the upper limbs during rehabilitation. The design of a video game setting with a console emulating the famous whac-a mole game can significantly improve patient participation in the rehabilitation program. The system is integrated with many optoelectronic position sensors. During the execution, the system can detect five key timings including the reaction time after a picture prompts, palm grip action, upper limb remove action, palm release action and upper limb return action. The timing differences between these five critical activities are used to represent the dynamic status of the upper limb rehabilitation. The therapist could compare with the past training result to assess explicitly quantified patient progress. Intelligent stacking cone upper limb rehabilitation system is a new design and method for rehabilitation. This system aims to raise the efficacy and fun level during diagnostic and therapeutic procedures, thus improve the outcomes.

Biography

Shannon Ya-Hui Chiu has completed her Master's degree in the Institute of Biomedical Engineering at National Chiao Tung University. She has excellent engineering training, and is an expert in system integration and automation. She has participated in the design and construction of various medical devices, including an upper limb rehabilitation device, an emulated laser acupuncture system, and the development of near infrared brain activity recording device.

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