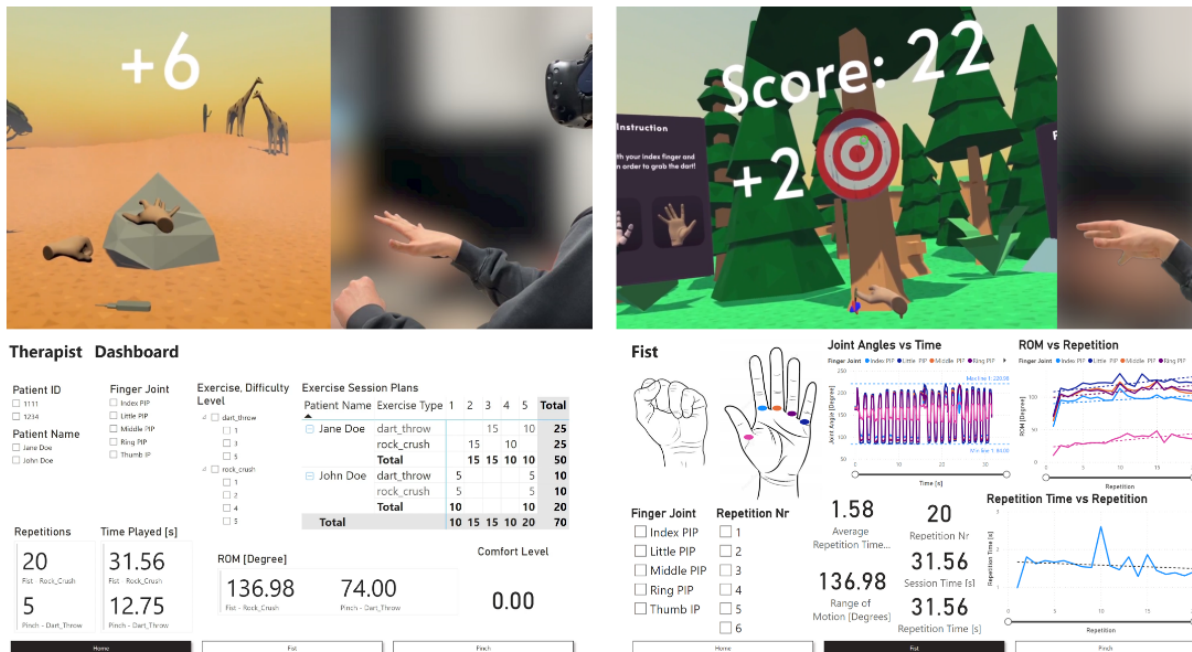


Technical Improvement and Evaluation of Remote Guided VR-Therapy Towards Continuous Patient Care

Project Management and Software Development for Medical Applications



Please send the completed proposal to tianyu.song@tum.de, shervin.dehghani@tum.de and felix.tristram@tum.de. Please note that this proposal will be evaluated by the BMC coordinators and will be assigned to a student only in case of acceptance.



General Info

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Project Abstract

The biomechanically complex hand is crucial to a person's daily life and enables grasping, manipulating objects, and many more tasks. Physiotherapy plays a crucial role after surgical interventions. Enabling support and monitoring for remote physiotherapy is a key future direction of medical care. Virtual reality (VR) has been shown to be able to support the rehabilitation of hand motor function. However, an individualized and motivating rehabilitation process that allows close interaction and feedback loops with the therapist is crucial to support the affected person until full recovery of the hand function. To address this, this project aims to improve a preliminary VR rehabilitation system that allows for the medical expert to control exercise planning and receive a detailed report on the patient's success. The project concludes with a user study for an empiric evaluation.

Background and Motivation

Physiotherapy and the accompanying rehabilitation process plays an indispensable role in restoring the functionality of musculoskeletal organs such as the human hand. While physiotherapy can support patients to keep these abilities, limiting resources and the shortage of personnel can reduce the amount of physiotherapy sessions for an individual. To increase the support for the specific patient and enable a remote monitoring of correctly executed exercises at home, augmented reality (AR) or virtual reality (VR) can improve the rehabilitation process or support the patient with exercises including gamification aspects [1,6] and automated monitoring [5] This enables a more engaging rehabilitation process and a better monitoring of this process for the therapist.

To address rehabilitation specialist' and patients' needs beyond existing work [2,3,4,5], we seek to optimize an authoring and exercise-analysing

rehabilitation approach for VR-assisted hand rehabilitation. The current VR application offers two games addressing the hand movements of pinching and clenching a fist utilizing discrete time warping. The correct execution of each hand movement is analyzed. The results (feedback and biomechanical statistics) of each run can be interpreted by the therapist's feedback screen.

Student's Tasks Description

The project aims to further optimize an existing prototype technically. The tracking hardware and software will be further optimized and the medical relevance will be worked out, ideally with further feedback from medical users. These should also be consulted for an empirical study. Students have the opportunity to develop an interactive system, and to gain insight into practical application.

Technical Prerequisites

Students should have a strong enthusiasm for the topic and practical experience in AR or VR and experience in development in Unity (C#). Basic knowledge in signal analysis and UI/UX design is desirable. Students should have an open nature to be able to empathize with the requests of patients and medical experts in terms of requirements analysis and conducting a user study.

References

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