Design of a Neurorehabilitation System for Patients with Parkinson's Disease, with a Focus on Therapy Outside the Clinical Setting

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Extended Abstract

Parkinson's disease is a progressive, degenerative disorder of the central nervous system that affects around 10 million people worldwide and approximately 100,000 people in Poland. Rehabilitation for Parkinson's disease is a factor that can significantly influence patients' well-being; however, access to rehabilitation is often limited. Development of a system supporting daily rehabilitation outside clinical settings might provide real support for patients with Parkinson's disease. At the same time, the design of such a system may require consideration of the clinical specifics of the disease, the resulting challenges for patients in using the system, the development of exercises that are safe for patients and tailored to the individual progression of the disease, as well as the proposal of technical and manufacturing solutions for such a system. This paper attempts to address the issues raised above, outlining the approach for designing such a system from both a clinical and a technical perspective.

From the high-level functional perspective, the system discussed might enable medical specialists to schedule remote rehabilitation sessions, appropriate to the current stage of the disease. It might also allow medical specialists to receive information regarding the regularity with which patients undertake these session. In the patient's view, the system discussed in the paper might display a schedule of rehabilitation exercises planned for a given day and might allow patients to tick off the exercises as they are completed. Additionally, the application might also provide support for caregivers of patients with Parkinson's disease, provided the patient authorizes the caregiver to view the progress and exercise plan.

Remote rehabilitation sessions are one of a main components of the system, as they have a direct impact on the patient's well-being and facilitate progress in rehabilitation. The paper describes the types of sessions provided for in the system discussed, with a particular focus on remote sessions, their parameters, and methods for monitoring patient progress, while also covering sessions conducted at the clinic, and modification of therapy depending on the patient's current condition.

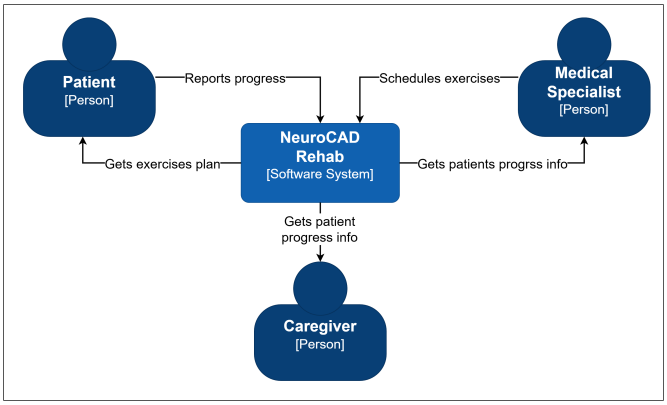

Fig. 1. System context diagram

This paper also outlines selected key challenges related to the use of telerehabilitation application and the conduct of telerehabilitation sessions that may arise for patients with Parkinson's disease, as well as selected strategies for overcoming them.

Furthermore, the study identifies potential minimum functional and non-functional requirements of the system discussed, the technical means and methods used to build the prototype.

Further areas of research include: the full implementation of the system based on the developed prototype; the conduct of usability, security and functional tests; the evaluation of the system with the help of patients with Parkinson's disease in a safe clinical environment; and, should all tests be successfully completed, conducting research to determine the impact of the described telerehabilitation method on the well-being of patients with Parkinson's disease.

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