Profiling Finger-Hand Function with Telerehabilitation

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Telerehabilitation is defined as the provision of rehabilitation services remotely through the use of telecommunication technologies [Russ07]. The main benefactors of this type of technology include rural or remote communities, individuals that are unable to travel and those that require long term care that can be at least in part administered remotely. There are many different application areas in telerehabilitation, some examples include neurorehabilitation [DWBN09], speech-language pathology [HTRC06] and physiotherapy [LPRS11].

This presentation will focus on my work that has been done as part of a collaborative effort with the school of medical rehabilitation on a telerehabilitation gaming system in support of a therapeutic rehabilitation program [LPRS11]. The target demographic focuses on early-onset rheumatoid arthritis patients, with the goal of being able to provide a picture of patient finger-hand function/health at a given point in time. This is achieved through developing a set of digital features extracted from tasks given to patients and visual cues derived from still imagery of hand poses.

During a therapy session, the two types of raw data are captured from users interacting with the telerehabilitation system. Movement performance data is acquired from goal-directed aiming tasks completed during each session. The results are stored for post-processing to discover features of interest. To complement movement performance, still images of the hands are captured to provide a source of visual cues. The intent is to look for some of the common symptoms that can occur in early onset rheumatoid arthritis that may not necessarily be detected through examining movement performance data alone. This includes establishing hand structure, considering swelling and redness of joints and looking for early signs of potential deformities associated with inflammatory arthritis. Collectively, all features are gathered and stored in a content management system to provide access to individual session data and for comparing long-term performance over time. This ties together the telerehabilitation system and provides a reporting platform intended to assist in monitoring patient response to a treatment program in between office visits.


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