DESIGN OF SMART ROBOT FOR WRIST REHABILITATION

Ismail Ben Aabdallah[1] (1,2), Yassine Bouteraa[2](1,2) and Chokri Rekik[3](1)
Control and Energy Management Laboratory (CEM-Lab) National School of Engineers of Sfax, Tunisia (1)
Digital Research Center of Sfax, Technopark of Sfax - Tunisia (2)

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Abstract- Generally, the rehabilitation process needs a physical interactions between patients and therapists. Based on the principles governing such human-human interactions (HHI), the design of rehabilitation robots received several attempts in order to abstract the HHI in human-robot interaction (HRI). To achieve this goal, the rehabilitation robot should be smart and provides a useful and comprehensive platform to track the patient status. In this paper, a biofeedback-based high fidelity smart robot for wrist rehabilitation is designed. This robot is intended for repetitive exercises without therapist intervention. Hold the two sets of wrist movement: flexion/extension and radial/ulnar derivation. Distinguished by its compact mechanism design, the developed wrist rehabilitation robot (HRR) offers high stiffness with a total absence of any friction and backlash. Based on EMG signal, the smart robot can understand the patient pain degree. Two features extractions are used to estimate the pain level. A fuzzy logic controller is implemented in the LabVIEW-based human-machine interface (HMI) to determine the desired angle and velocity in real time. Parameters and results of each exercise can be stored and operated later in analysis and evolution of patient progress.

Index terms*:* fuzzy controller; EMG signal; smart robot; HMI; features extraction; physical human-robot interaction.