

## **Assistive-as-needed strategy for upper-limb robotic systems: A preliminary evaluation of the impedance control architecture**

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### **ABSTRACT**

Rehabilitation is a necessary restoration process of recovering impaired joint motion and muscle strength. Recent trends of rehabilitation have also moved towards providing more participation of the patient in therapy rather than simple passive treatments as it has been demonstrated to be non-trivial in promoting neural plasticity meant to promote motor recovery process. This paper presents an assistive control strategy based on impedance control technique. Dynamic modelling of upper arm is obtained by utilising the Euler-Lagrange formulation. The proportional-derivative (PD), computed torque control (CTC) impedance based framework is applied to examine its effectiveness in performing joint-space control with objectives specified in rehabilitating the elbow joint along the sagittal plane. A feasibility study through simulation was carried out to investigate the efficacy of the proposed controller on acceleration-based impedance model. The results show that impedance controller is more suitable as it allows the cooperative effort of the patient.

### **KEYWORDS:**

Controllers; Joints (anatomy); Patient rehabilitation; Patient treatment