

Model Free Terminal Sliding Mode with Gravity Compensation: Application to an Exoskeleton-Upper Limb System

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Abstract : This paper deals with a robust model free terminal sliding mode with gravity compensation approach used to control an exoskeleton-upper limb system. The considered system is a 2-DoF robot in interaction with an upper limb used for rehabilitation. The aim of this paper is to control the flexion/extension movement of the shoulder and the elbow joints in presence of matched disturbances. In the first part, we present the exoskeleton-upper limb system modeling. Then, we controlled the considered system by the model free terminal sliding mode with gravity compensation. A stability study is realized. To prove the controller performance, a robustness analysis was needed. Simulation results are provided to confirm the robustness of the gravity compensation combined with to the Model free terminal sliding mode in presence of uncertainties.

Keywords : exoskeleton- upper limb system, model free terminal sliding mode, gravity compensation, robustness analysis

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