

عنوان مقاله:

Combined Neural Network Feedforward and RISE Feedback Control Structure for a 5 DOF Upper-limb Exoskeleton Robot with Asymptotic Tracking

محل انتشار:

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خلاصه مقاله:

Control of robotic systems is an interesting subject due to their wide spectrum applications in medicine, aerospace and other industries. This paper proposes a novel continuous control mechanism for tracking problem of a 5-DOF upper-limb exoskeleton robot. The proposed method is a combination of a recently developed robust integral of the sign of the error (RISE) feedback and neural network (NN) feed-forward terms. The feed-forward NN learns nonlinear dynamics of the system and compensates for uncertainties while the NN approximation error and nonlinear bounded disturbances are overcome by the RISE term. Typical NN-based controllers generally result in uniformly ultimately bounded (UUB) stability due to the NN reconstruction error. In this paper to eliminate this error and achieve asymptotic tracking, the RISE feedback term is integrated into the NN compensator. Finally, a comparative study on the system performance is conducted between the proposed control strategy and two other conventional control methods. Simulation results illustrate the effectiveness of the proposed method.

کلمات کلیدی:

Robust integral of the sign of the error (RISE) feedback, Neural network (NN), Feed-forward compensation, 5-DOF upper-limb exoskeleton robot, Asymptotic tracking

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