

Model-Free Tuning of Laguerre Network for Impedance Matching in Bilateral Teleoperation System

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Abstract:

This paper addresses the tuning method to attain symmetry between the master and slave manipulators of a bilateral teleoperation system. In the proposed structure, an equalizer based on the Laguerre network connected in feedback loop to the master manipulator has been introduced. A set of input/output data were first generated and recorded which later be used in two-steps tuning procedure. A fictitious reference signal was formulated based on these data. In addition, a metaheuristic optimization algorithm namely the Particle Swarm Optimization has been employed in seeking the optimal controller parameters. Numerical analyses utilizing Matlab software has been performed. The results exhibited that the dynamic of the master manipulator with the added controller is almost identical to the dynamic of the slave systems. Hence, it is verified that the proposed tuning technique is feasible to achieve symmetry between both sides of the manipulators.

Keywords: Fictitious signal, PID controller, Particle swarm optimization, Twoport networks, Velocity Matching

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