

Stability Analysis and Experimental Evaluation on Maxwell Model of Impedance Control

Authors : Le Fu, Rui Wu, Gang Feng Liu, Jie Zhao

Abstract : Normally, impedance control methods are based on a model that connects a spring and damper in parallel. The series connection, namely the Maxwell model, has emerged as a counterpart and draw the attention of robotics researchers. In the theoretical analysis, it turns out that the two pattern are both equivalents to some extent, but notable differences of response characteristics exist, especially in the effect of damping viscosity. However, this novel impedance control design is lack of validation on realistic robot platforms. In this study, stability analysis and experimental evaluation are achieved using a 3-fingered Barrett® robotic hand BH8-282 endowed with tactile sensing, mounted on a torque-controlled lightweight and collaborative robot KUKA® LBR iiwa 14 R820. Object handover and incoming objects catching tasks are executed for validation and analysis. Experimental results show that the series connection pattern has much better performance in natural impact or shock absorption, which indicate promising applications in robots' safe and physical interaction with humans and objects in various environments.

Keywords : impedance control, Maxwell model, force control, dexterous manipulation

Conference Title : ICIMA 2018 : International Conference on Intelligent Mechatronics and Automation

Conference Location : Kyoto, Japan

Conference Dates : April 26-27, 2018