Multi-Objective Optimal Design of Nonlinear Controls

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The most important part of the control design for nonlinear dynamic systems is to guarantee the stability. Then, the control is quantitatively designed to meet multiple and often conflicting performance objectives. The performance of the closed-loop system is a function of various system and control parameters. The quantitative design using multiple parameters to meet multiple conflicting performance objectives is a challenging task. In this talk, we present the recent results of quantitative design of controls for nonlinear dynamic systems by using the advanced algorithms of multi-objective optimization. The controls can be of linear PID type or nonlinear feedback such as sliding mode. The advanced algorithms of multi-objective optimization consist of parallel cell mapping methods with sub-division techniques. Interesting examples of linear and nonlinear controls will be presented with both numerical simulations and experimental validations.