Design of Centralized PID Controllers for Multi-Input-Multi-Output Processes

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A new method to design centralized Proportional-Integral-Derivative (PID) controllers is presented for Multi-Input-Multi-Output (MIMO) processes. In the case of highly coupled MIMO processes, the decoupling techniques should be applied to reduce interactions of each control loop. That is, overall transfer function matrix the process must be diagonal matrix to achieve high control performance by removing the interactions. So, in this research, a new tuning method is developed to decouple the interactions with securing the simplicity and the robustness to uncertainties of the PID controller. In the previous approaches to control $n \times n$ MIMO process, n conventional PID controllers are employed to control MIMO processes. However, the proposed method uses n primary PID controllers and n^2-n secondary PID controllers with time delays. The n primary PID controllers are determined by using relative gain array (RGA) and tuned by using conventional tuning rule on the basis of n process models. The n^2-n secondary PID parameters are tuned to make overall transfer function diagonal. And, the proposed method is validated by the MIMO level control systems.