Design of MIMO PI Controller Using the Multiple Integration Approach

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ABSTRACT

Process identification is one of the most important tasks in MIMO PI controller design. The resulting closed-loop behaviour critically depends on the derived process model. However, process identification in practice is usually quite a demanding task, since there exist constraints such as limited time of experiment, nonlinearities, and process noise. But, is it necessary to obtain the explicit process model? It has been recognized [4, 5] that developing accurate models for process industry and identifying parameters in them is often not worthwhile; the problem is rather how to design the controller of the process.

Recently, a new and efficient SISO PI tuning method has been developed [6], where tuning of SISO PI controller parameters is not based on the explicit process model, but is calculated merely from three areas obtained from the process open-loop step response. However, the SISO PI controller parameters are calculated according to a considerably demanding frequency criterion known as "magnitude (modulus) optimum" [1, 2]. The MIMO PI parameters are then derived from SISO PI parameters by using the well-known MIMO tuning approach [3].

Even though the proposed tuning procedure is very simple, the simulation results showed comparable or even better closed-loop responses than those obtained by using several other methods, which are based on more demanding process identification (e.g. by using relay excitation).

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