



FULL ORDER UNKNOWN INPUTS OBSERVER FOR MULTIPLE TIME-DELAY SYSTEMS

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Abstract- In this paper, a design of a full-order observer for linear time-invariant (LTI) multivariable systems with multiple time-delays and unknown inputs (UI) is proposed. The main idea is to reduce the problem of the unknown input observer (UIO) for systems with multiple time-delays to that of a standard one. To that purpose, the orthogonal collocation method is used to transform the infinite dimensional model of the delayed system described by a set of linear partial differential equations (PDEs) to a finite dimensional one described by a set of linear ordinary differential equations (ODEs). Even using an approximation method, the asymptotic stability of the UIO is well proven. The efficiency of the proposed algorithm is shown using the quadruple-tank benchmark. The two cases of minimum and non-minimum phase models are considered.

Index terms: Asymptotic stability, Delay systems, Observer, Unknown Inputs.