Robustness of reduction method for stabilization of uncertain input-delayed process plant

Abstract

This paper proposes a nonlinear controller for the stabilization of input delayed plants as well as to prove the robustness property of the reduction method. The plants considered are all of Linear Time Invariant (LTI) plants with input delay, which usually appear in process control in the industry. The core of this paper comes from the Dissipativity concept of Functional Differential Equation (FDE) systems. It is shown that FDE dissipativity is a sufficient condition of the solution to be bounded. In this paper, in order to access the non-delayed control law, the reduction method is firstly applied. By considering uncertainty in the delay, the transformed system will be in the form of real FDE. This makes the FDE tool works nicely. It is proved that the controller is robust to the variation of time delay. To verify the effectiveness of the concept, numerical studies on the delayed level system is given in the end of the paper.