

A Design of Gain-scheduled Congestion Controllers
using State Predictive Observers

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Abstract- In this paper, a design problem of congestion controllers is discussed for TCP/AQM(Transmission Control Protocol/Active Queue Management) networks. The proposed method consists of two control techniques. First one is based on a gain-scheduling technique considering nonlinearities of TCP/AQM networks. But the designed congestion controller is a state feedback controller and it is impossible to embed the congestion controller in real computer networks. To avoid this problem, second one is based on a design technique of state predictive observer for linear time-delay systems. Thus it can be possible to embed the congestion controller in real networks by combining these methods. Firstly dynamical models of TCP/AQM are described as linear systems with self-scheduling parameters, which also depend on information delay. Here it is distinguishing to focus on constraints on the maximum queue length and TCP window-size, which are the network resources in TCP/AQM networks. And a design method of memoryless state feedback controllers is shown for linear system with a self-scheduling parameter and an information delay. But the designed gain-scheduled congestion controller is a state feedback controller and it is impossible to apply this controller to computer networks directly. Thus observers are also designed and the observer-based congestion controllers are derived.