



# An LMI Approach to $H_\infty$ Filtering for Linear Parameter-Varying Systems with Delayed States and Outputs

H.R. Karimi<sup>1\*</sup>, B. Lohmann<sup>2</sup> and C. Buskens<sup>3</sup>

<sup>1</sup> *Control and Intelligent Processing, Center of Excellence,  
Department of Electrical and Computer Engineering,  
Faculty of Engineering, University of Tehran,  
Tehran, Iran*

<sup>2</sup> *Institute of Automatic Control, Technical University of Munich,  
D-85748 Garching-Munich, Germany*

<sup>3</sup> *Centre of Industrial Mathematics,  
Faculty of Mathematics & Computer Science, University of Bremen,  
D-28359 Bremen, Germany*

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**Abstract:** This paper considers the problem of delay-dependent robust  $H_\infty$  filtering for linear parameter-varying (LPV) systems with time-invariant delay in the states and outputs. It is assumed that the state-space matrices affinely depend on parameters that are measurable in real-time. By taking the relationship between the terms in the Leibniz-Newton formula and a suitable change of variables into account, some new parameter-dependent delay-dependent stability conditions are established in terms of linear matrix inequalities so that the filtering process remains asymptotically stable and satisfies a prescribed  $H_\infty$  performance level. Using polynomially parameter-dependent quadratic functions and some multiplier matrices, we establish the parameter-independent delay-dependent conditions with high precision under which the desired robust  $H_\infty$  filters exist and derive the explicit expression of these filters. A numerical example is provided to demonstrate the validity of the proposed design approach.

**Keywords:** *LPV systems;  $H_\infty$  filtering; delay; LMI; polynomially parameter-dependent quadratic functions.*

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\* Corresponding author: hrkarimi@ut.ac.ir

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