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A NOVEL TECHNIQUE FOR DESIGNING DECENTRALIZED STABILIZERS FOR ROBUST CONTROL IN POWER SYSTEMS USING AN H_∞ CRITERION

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Abstract. *This paper addresses the problem of excitation control for damping the electromechanical oscillation modes (EOM) in power systems with decentralized stabilizers (PSS) of reduced order to ensure robust stability and good performance of a power system under disturbances and uncertainties. Good stabilizer coordination is achieved by simultaneously designing all PSS. A frequency domain H_∞ mixed sensitivity optimization approach is proposed. The proposed technique is not affected by the pole-zero cancellation problem associated with the conventional mixed sensitivity techniques.*
Keywords: Power systems stabilizers, H_∞ control, Decentralized control

1. **Introduction.** Large scale, interconnected power systems are ubiquous in present days. As a consequence, quality indexes based on reliability [1], frequency and magnitude of voltage [2] among others are strictly required. Low frequency electromechanical oscillations have been a problem of great concern and continuous interest for interconnected power systems. These oscillations are mainly associated with local and interarea EOM. It is known that the operating conditions of the system changes continuously. Thus, for secure operation of power systems, it is required that the EOM must be sufficiently dampened at all common operating conditions. This means that the PSS must be robust for these changes [3, 4]. Conventional lead-lag PSS have been successfully applied to dampened EOM over decades. Its use is consolidated in power industry all over the world. However, its application in multimachine power systems have been carried out by independent designs or by a sequential design, which, due to interactions, may not provide the optimal settings. Moreover, the conventional PSS design does not take into account the disturbances, measurement noises and uncertainties due to nonlinearities, neglected dynamics in the model, changes in operating conditions, etc [4]. Recently, some researchers have been concerned in providing sufficient damping for the EOM in spite of uncertainties. The techniques most used for robust design of controllers in power systems are: linear matrix inequality [4, 5, 6] and mixed sensitivity optimization [7, 8, 9]. All these techniques have a common limitation of resulting into large centralized controllers when directly designed in a multimachine power system model. In order to minimize this problem, the model order is reduced and then controller order is also reduced [8].