

Physical interpretation of state feedback controllers to damp power system oscillations

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Abstract— This paper presents a physical interpretation of two state feedback controllers for damping power system electromechanical oscillations. They have been developed by Electricité de France (EDF). The first one is called the desensitized four loop regulator (DFLR) and it is designed to damp local electromechanical oscillations. It is a robust controller which offers good performance despite the variations of the generator operating conditions. The second controller is called the extended desensitized four loop regulator (EDFLR) and it is designed to address both local and interarea oscillations. The physical interpretation is accomplished converting the state feedback scheme to the standard structure formed by an automatic voltage regulator (AVR) plus a power system stabilizer (PSS). Two widely used PSS design methods based on eigenvalue sensitivities and frequency response are reviewed to obtain the interpretation. The DFLR can be interpreted as a controller which provides the suitable phase compensation according to these two PSS design methods over a wider frequency range. The EDFLR can be interpreted as a controller which maximizes its robustness under uncertainties at both PSS output and the input of the plant.

Index Terms— Classical PSS design, desensitization method, interarea oscillations, physical interpretation, robust controllers.

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