Selective modal analysis with application to electric power systems, Part I: heuristic introduction

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Abstract— Selective Modal Analysis (or SMA) is a physically motivated framework for understanding, simplifying and analyzing complicated linear time-invariant models of dynamic systems, see [1,2]. SMA can accurately and efficiently focus on selected portions of the structure and behavior of the system. the part of the model that is relevant to the dynamics of interest is singled out in a direct manner, and. the remainder of the model is collapsed in a way that leaves the selected structure and behavior Intact. The paper heuristically presents basic concepts and results of SMA and lays the foundations for their application to a number of problems in analysis of power system dynamics. The approach is illustrated with several examples, including a 60-machine model of a dynamic instability occurrence in an actual power system. A companion paper [3] elaborates on specific applications of SMA to power systems, particularly to the Dynamic Stability problem.

Index Terms—