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Development of power system dynamic equivalents toolbox for digital type power system simulator

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This paper proposes an alternative method that utilizing the parametric identification technique for the construction of power system dynamic equivalents. This large-signal model is formulated in the time domain, and therefore it is compatible with standard models of power system components. The approach uses only measurements of some parameters at nodes where internal (retained study system) and external (reduced system) systems are interfaced, and requires no knowledge of parameters and topology of the external sub-system. The procedure consists of four conceptual steps: system definition, steady-state preservation, transient/dynamic simulation, and parameters identification. The first step is to define the study system (retained) and external system (reduced). After the system has been clearly defined, the steady-state preservation in term of power balancing is then analyzed in load flow study. Comes to the third step, dynamic analysis is applied to both the study and the external systems. This is done by applying of any type of disturbance in the study system in order to obtain the dynamic responses of the power system networks. In the final step, the dynamic responses obtained in step three are used as inputs to the parameters identification procedure. The parameters identification procedure will involved algorithms such as state estimation and optimization using Levenberg-Marquardt algorithm. These approaches are developed as Matlab Graphic User Interface (GUI) Toolbox for the sake of its users. The capabilities of the approach has been verified and tested on a multi-machine benchmark example derived from the IEEE test case system.