Maximum likelihood ensemble filter state estimation for power systems fault diagnosis

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Abstract

Maximum Likelihood Ensemble Filter (MLEF) is a deterministic filtering approach that employs the ensembles. The method applies low dimensional ensemble space for the computation of a nonlinear cost function Hessian preconditioning and implements the optimization of the cost function. The MLEF is utilized as state estimation instrument that estimates states of dynamic systems and contributes to reliable and safe operation and monitoring of dynamic systems. In this article, MLEF is employed as a state estimation tool to track the states of a nonlinear power system to assist the fault diagnosis and bad data analysis of the system. A three-node benchmark power system model is considered in this study and a disconnection event is implemented as a fault scenario on the system with measurement data which contains some bad data. The scenario refers to a discontinuous problem which has non-derivable points and this is contrary to gradient based techniques. The MLEF practice on the introduced problem is examined and the results are illustrated. The obtained results shows that the estimation convergence of the MLEF technique on the considered benchmark model is satisfactory.

Index Terms

Maximum likelihood ensemble filter, dynamic state estimation, power system fault diagnosis, power system measurements, power systems