International Journal of Innovative
Computing, Information and Control
Volume **6**, Number **12**, December **2010**

 ISSN 1349-4198
pp. 5771–5784

ROBUST STATE ESTIMATION FUSION IN POWER SYSTEM

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Received August 2009; revised February 2010

Abstract. *State estimation is the core function of energy management system. In the deregulated power industry, power transactions need to be monitored across a large system consisting of several subsystems. To estimate the state of the large system, distributed state estimation approach has recently become popular with coordination algorithm that combines local estimates obtained from distributed energy management systems. In this paper, we propose an estimation scheme based on the hierarchical structure of the distributed state estimation. The proposed scheme allows a central energy management system to run several estimation components simultaneously: distributed state estimation, integrated state estimation and parallel state estimation. The outputs of these estimation components are then fused using a robust procedure, resulting in a robust and accurate estimation of the system state.*
Keywords: Power system state estimation, Robustness, Outliers, Estimation fusion

1. **Introduction.** In order to monitor and control a modern power system, the energy management system (EMS) has a function to estimate the system state (voltage angle and voltage magnitude at each node) from noisy measurements obtained through supervisory control and data acquisition (SCADA) system [1]. In the deregulated power industry, power transactions should be monitored across a large system consisting of several subsystems [2]. Hence, to have a global view of the large system, a system-wide state estimation is needed. There are different approaches for this estimation problem, each approach has its own advantages and disadvantages. In this work, we aim to provide a solution to this problem with higher reliability.

The traditional system-wide state estimation uses an integrated state estimation (ISE) approach. System measurements from SCADA system are pooled at the system control center. As the state estimation problem is solved with global optimization, it has generally better accuracy than other approaches [1]. However, this approach may require a prolonged convergence time due to computational burden.

Parallel state estimation (PSE) is another approach of system-wide state estimation. This estimation is based on parallel processing [3, 4]. Similar to ISE, the information