

# Model-agnostic linear estimation of generator rotor speeds based on phasor measurement units

F. Milano, A. Ortega, A.J. Conejo

## Abstract-

This paper focuses on the estimation of the rotor speeds of synchronous machines by means of phasor measurement units. This estimation is aimed at online monitoring of electromechanical transients and transient stability analysis. The proposed technique is based on the concept of frequency divider formula recently published by the first two authors in these Transactions. The dynamic state estimation is formally stated as a convex optimization problem and a thorough discussion of the sensitivity analysis of the optimal solution is provided. The case study considers a dynamic 1479-bus model of the all-island Irish system and discusses the effect of bad data, noise, and latency on the proposed estimation technique.

**Index Terms-** Dynamic state estimation (DSE), optimization, phasor measurement unit (PMU), sensitivity analysis, synchronous machine, transient stability analysis.

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