Generalized optimal placement of PMUs considering power system observability, communication infrastructure, and quality of service requirements

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Abstract

This paper presents a generalized optimal placement of Phasor Measurement Units (PMUs) considering power system observability, reliability, Communication Infrastructure (CI), and latency time associated with this CI. Moreover, the economic study for additional new data transmission paths is considered as well as the availability of predefined locations of some PMUs and the preexisting communication devices (CDs) in some buses. Two cases for the location of the Control Center Base Station (CCBS) are considered; predefined case and free selected case. The PMUs placement and their required communication network topology and channel capacity are
co-optimized simultaneously. In this study, two different approaches are applied to optimize the objective function; the first approach is combined from Binary Particle Swarm Optimization-Gravitational Search Algorithm (BPSOGSA) and the Minimum Spanning Tree (MST) algorithm, while the second approach is based only on BPSOGSA. The feasibility of the proposed approaches are examined by applying it to IEEE 14-bus and IEEE 118-bus systems.

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