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A PARALLEL APPROACH TO COMPUTING LOAD FLOW EQUATIONS*

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Abstract. Computation of load flows is the most fundamental power system operation and planning problem. In order to study its parallel algorithms, improve operation efficiency, and enhance real-time control and just-in-time decision support, two new parallel algorithms are developed. They are fully parallel and are parallelized in iterative level while the nonlinear equations are linearized. In other words, our parallel schemes are that while solving load flow equations using the standard Newton method or the simplified Newton method, the iterative steps are paralleled other than the system of linear equations or the Jacobian matrix. The new methods are tested with the IEEE 118-bus system and the IEEE 662-bus system. The numerical results show that they can achieve good performance, and be more efficient than Newton method and simplified Newton method.
Keywords. load flow equations; parallel computation; power system.

1. Introduction

As we know, availability of parallel processing hardware and software presents an opportunity and a challenge to solve power system problems. An excellent survey of parallel processing applications in power system analysis appeared in [1]. The work presented here focuses on parallel algorithms for computation of load flows which is the most fundamental power system operation and planning problem. The underlying impetus for the research is to improve the performance of electrical power system applications to provide real-time control and just-in-time decision support in an economical way.

In nature, the calculation of load flows in power system can be considered as solving nonlinear equations. There are a lot of algorithms for solving the problem. Newton method (also referred to as Newton-Raphson method) and the fast decoupled method are basic and used in practice. The others

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