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**Abstract.**

A power system is a complex network used for generating and transmitting electric power. It is expected to operate with consumption of minimal resources giving maximum security and reliability. The Optimal Power Flow (OPF) is an important problem to be solved to help the operator to achieve these goals (minimal resources consumption with maximum security and reliability) by providing the optimal settings of all controllable variables. Optimal Reactive Power Dispatch (ORPD) is a special case of OPF problem in which, control parameters are the variables which have a close relationship with the reactive power flow, such as generator bus voltages, output of static reactive power compensators, transformer tap-settings, shunt capacitors/reactors, etc[1]. Because of its significant influence on the secure and economic operation of power systems, ORPD has received an ever-increasing interest from electric utilities. The objective is to minimize the network real power loss and to improve the voltage profile, while satisfying a given set of operating and physical constraints. Because that outputs of shunt capacitors/reactors and tap-settings of transformers are discrete variables while other parameters in ORPD are continuous, the reactive power dispatch problem can be modeled as a mixed integer non-linear programming problem [2].

To solve the ORPD problem, meta-heuristics has been widely used [3]. Among these meta-heuristics, the Particle Swarm Optimization (PSO) is used in many papers, see for example [4,5,6]. The PSO was also hybridized with other method to avoid its premature convergence. However, a survey made on relevant published papers has

shown many lacks, especially regarding the implementation of the algorithm, the definition of the problem objectives and the considered constraints, the experimental design and the comparison of the proposed algorithms with other techniques.

In this paper, a critical overview of the papers using PSO to solve ORPD problem is first realized. A methodology to model this problem and to fix objectives and the different constraints is then defined and a new approach to solve the ORPD problem based on hybridizing the Particle Swarm Optimization and Tabu-search (PSO-TS) is proposed. This hybridization has never been used for the ORDP problem. We test and analyze different tuning of PSO-TS parameters. A comparative study is finally implemented on different IEEE network systems with other evolutionary algorithms to show the consistency and the performances of the proposed hybridization.

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