Bat Search Algorithm Based Hybrid PSO Approaches to Optimize the Location of UPFC in Power System

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Abstract: FACTS devices plays a significant role to control the power flow of power transmission system. In this paper, a hybrid PSO algorithm is proposed to optimize the location of UPFC in power system. The proposed hybrid PSO algorithm has solved the formulated multiobjective optimization problem. This paper, five objective function to be considered in the form of minimization such as the fast voltage stability index (FVSI), fuel cost, power loss, voltage deviation and UPFC cost respectively. To improve the non satisfied solution of PSO algorithm, bat search optimization is used and the performance of PSO algorithm is enhanced. The proposed hybrid technique is implemented in MATLAB working platform which is tested with IEEE 14 bus bench mark system. Here, two load cases are considered to evaluate the proposed method and compared with traditional PSO algorithm. The comparative analysis are conformed the effectiveness hybrid PSO algorithm for solving multiobjective optimal power flow problem.

Keywords: Line flow control, multiobjective algorithm, hybrid PSO, bat search method.

1. Introduction

Current electric power system network experiences astonishing fast changes in terms of demand generation arrays and trading actions that hold back the system operation and security [1]. For the operation of power system, control of active and reactive power flow is very significant [2]. The variables and parameter of the transmission line, which comprise line reactance, voltage magnitude, and phase angle are capable to be controlled by means of FACTS controllers in a rapid and successful way [3-5]. The advantages obtained from FACTS consist of improvement of the stability of power system networks, such as voltage stability, line stability, small signal stability, transient stability, and hence improve system dependability [6] [7]. The Unified Power Flow Controller (UPFC) is one of the most luminous of FACTS controllers which is capable of offering active and reactive power control separately [8-10]. UPFC offers improved voltage control as compared to Static Var Compensator (SVC) and Static Synchronous compensator (STATCOM) [11].

UPFC have gone up amongst researchers in power systems as it presents important multifunctional flexibility necessary to work out different problems in power system and can control voltage magnitude, phase angle and impedance at the same time [12] [13]. The UPFC, the most adaptable of these tools, joins shunt current injection with series voltage injection to make it competent of simultaneously controlling active and reactive power flows in a transmission line, and offer series and shunt compensation as required [14]. As different UPFC placements can cause important variations in the transient behaviour of the system, placements must be selected with care [15]. On the other hand, with the suitable parameter setting, it is extremely significant to find out the optimal location of this tool in the power system to attain such functionality of UPFC [16].

An optimal UPFC placement must integrate not only each feasible system topology (line

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