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Optimal Coordination of Directional Overcurrent Relays Using PSO-TVAC

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Abstract

This paper presents an efficient variant of particle swarm optimization (PSO) algorithm named Time Varying Acceleration Coefficients (PSO-TVAC) to solve the optimal coordination of directional overcurrent relays (DOCRs) in a practical power system, considering the optimum pickup current (Ip) as discrete parameter and time dial setting (TDS) as continuous parameter, in order to obtain minimum operating time for the relays, while satisfying various boundary constraints. Comparison results with the standard global optimization methods such as GA using Matlab toolbox, PSO and to other techniques showed the efficiency of the proposed variant and confirmed its potential to enhance the solution of optimal coordination of directional overcurrent replays.

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Keywords: Directional overcurrent relay coordination, Particle swarm optimization (PSO), Time Varying Acceleration Coefficients (TVAC), Power system protection,

1. Introduction

Due to the requirement of power systems security, the protective relays must be well coordinated with each other. The problem of coordinating protective relay in electric power systems consists of selecting their suitable settings such that their fundamental protective function is met under the requirements of sensitivity, selectivity, reliability, and speed [1-4]. The coordination between overcurrent relays is performed, in order to remove the faults, by disconnecting the least possible part of the network [5]. In the relay coordination problem, the objective is to minimize a well-known objective function which is the total summation operating time of primary relay. Therefore is the process of determining the exact relay settings (Time Dial Setting (TDS) and the pickup current (Ip) setting or pickup tap setting (PTS) for directional over-current relays) such that the relay primary closes to the fault would

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