PowerTech 2009

28 June - 2 July 2009, Bucharest, Romania

- Innovative ideas toward the Electrical Grid of the Future -

Home

Invitation

On behalf of the International Steering Committee and the Local Organizing Committee we invite you to attend the IEEE BPT2009. The Bucharest PowerTech Conference continues the tradition of the Power Tech Conferences held in odd years in Athens, Stockholm, Budapest, Porto, Bologna, St. Petersburg and Lausanne.
PowerTech is the anchor conference of the IEEE Power & Energy Society in Europe It is intended to provide a forum for scientists and engineers interested in electric power engineering to share ideas, results of their scientific work, to learn from each other as well as to establish new friendships and rekindle existing ones.
The PowerTech Conference provides a bridge between generations. The interest from enthusiastic young practicing engineers and PhD students wishing to publish their work increased from event to event. The most valuable IEEE student work is recompensated with the Basil Papadias award, which has been also an important ingredient toward the event's success.

The event is sponsored by the IEEE Power & Energy Society and will be organized by University POLITEHNICA of Bucharest, National Power Grid Company TRANSELECTRICA S.A. and IEEE PES Romania Chapter.

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IEEE Bucharest PowerTech Conference

28 June – 2 July, 2009

Provisional*)

Technical Program

*) Some sessions may shorten in case of non-registration

Session: Protection Systems VI
Chair:
Room: "Drepturile Omului" Hall – HR
Time: Wednesday, July 1, 14.00 – 15.45

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Eugeniusz Rosolowski (Wroclaw University of Technology, Poland), Jan Izykowski (Wroclaw University of Technology, Poland), Murari M. Saha (ABB, Sweden)

275 **Faults Analysis Theory and Schemes of Four-Phase Power Systems**
Francesco Della Torre (Politecnico di Milano, Italy), Alberto Dolara (Politecnico di Milano, Italy), Sonia Leva (Politecnico di Milano, Italy), Adriano P. Morando (Politecnico di Milano, Italy)

293 **Modern Fault Location Technique for the Utility**
Andrei Podshivalin (Research Centre BRESLER, Russia), Irina Klimatova (Research Centre BRESLER, Russia), Eduard Terentyev (Kolomenskie ES MOESK, Russia)

423 **Assessment of Fault Location Algorithms in Transmission Grids**
Marcel Istrate (Technical University "Gheorghe Asachi" of Iaşi, Romania), Mircea Guşă (Technical University "Gheorghe Asachi" of Iaşi, Romania), Ştefan Ţîbuliac ("Transelectrica" S.A., Romania)

499 **Transient based Single Phase to Ground Fault Distance Computation**
Seila Gruhonjic Ferhatbegovic (Elektroprivreda BiH ED, Bosnia and Herzegovina), Ante Marusic (University of Zagreb, Croatia)

549 **New Genetic Algorithm Method for Optimal Coordination of Overcurrent and Earth Fault Relays in Networks with Different Levels of Voltages**
S.S.H. Kamangar (Amirkabir University of Technology, Iran), H.A. Abyaneh (Amirkabir University of Technology, Iran), R.M. Chabanloo (Amirkabir University of Technology, Iran), F. Razavi (Tafresh University, Iran)

678 **Comparing Measured Impedance by Distance Relay in Presence of Resistive and Inductive Fault Current Limiters**
Hossein Shateri (Iran University of Science and Technology, Iran), Sadegh Jamali (Iran University of Science and Technology, Iran)

A New Genetic Algorithm Method for Optimal Coordination of Overcurrent and Earth Fault Relays in Networks with Different Levels of Voltages

S. S. H. Kamangar, H. A. Abyaneh, R. M. Chabanloo, F. Razavi

***Abstract*-- In this paper, a new genetic algorithm (GA) method is presented to solve the optimization problem in coordination of overcurrent and earth fault relays. In addition to optimal coordination of overcurrent relays, earth fault relays are also coordinated by GA, considering critical fault condition for the relays located in two sides of network's transformers. The objective function is developed by adding new terms that are the constraints related to the coordination of overcurrent and earth fault relays in critical fault conditions considering different winding arrangements of transformers. The paper concluded by the results of a study carried out on a sample power network. The results demonstrate that the method can obtain feasible and effective solutions and, it is a promising approach for optimal coordination in practical power networks.**

***Index Terms*-- Coordination, Earth Fault Relay, Genetic Algorithm, Overcurrent Relay.**

I. Introduction

OVERCURRENT and earth fault relays are commonly used for protection of power systems. In many references the optimal coordination of overcurrent relays has been performed using linear programming techniques, including simplex [1], two-phase simplex [2] and dual simplex [3] methods. In reference [4] also, optimal solution is made by constraints only. The disadvantage of the above optimization techniques is that they are based on an initial guess and may be trapped in the local minimum values [5]. Intelligent optimization techniques such as genetic algorithm (GA) can adjust the setting of the relays without the mentioned difficulties. In these methods the constraints are included in objective function (OF) [5]. The optimal coordination in reference [6] has been done by a method based on GA and in reference [7] by an evolutionary algorithm. These methods have two problems. One of them is miscoordination and the other is not having the solution for relays with both discrete and continuous time setting multipliers (TSMs). In reference [5] the mentioned problems have been solved.

In this paper, in addition to overcurrent relays, earth fault relays have been coordinated optimally using a new GA method. The OF is improved by adding some new terms that are the constraints related to the coordination of overcurrent and earth fault relays for critical fault conditions. By studying different winding arrangements of the network's transformers, the critical fault type will be determined for coordination of the relays which are located at both sides of the mentioned transformers.

II. Review of GA for Optimal Relay Coordination

GA like all other optimization methods needs initial values which are chosen randomly. TSMs of overcurrent and earth fault relays are the unknown quantities in the optimization problem. Therefore, the TSMs in respect to the number of relays are considered as the genomes of the chromosomes in GA. In other words, some TSMs' sets, i.e. (TSM_1, TSM_2, TSM_3, …, TSM_n), (TSM'_1, TSM'_2, TSM'_3, …, TSM'_n), … belonging to relay set (R_1, R_2, R_3, …, R_n) are initially randomly selected. The number of TSMs' sets is referred as the population size. Then, after each iteration, the new TSMs' sets belong to relays R_1 to R_n are given to the algorithm. The process is terminated when the number of iterations becomes equal to the generation size. To evaluate the goodness of each chromosome, it is essential to define an OF. The purpose of optimization is to minimize the OF. The chromosomes are evaluated regarding the OF and the chromosomes which have more effectiveness will be used for producing new generation of chromosomes [5], [8], [9].

Mutation in each iteration will cause the algorithm not to trap in local minimums. After a fixed number of generations, the process will be terminated. Increasing the number of generations will lead to the better solutions and on the other hand, will increase the run time. The required number of

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