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Genetic algorithm as a tool for modeling calculations of electric power systems

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Abstract. Evolutionary modeling is one of the areas of artificial intelligence, which essence is the computational processes interpretation and the final forms of integral computational algorithms construction from their existence, variability and development the points of view in natural systems. All evolutionary modeling methods are of an optimization nature due to the basic use of the theory of natural selection principles. One of the most common methods of evolutionary modeling is the genetic algorithm (GA). It is the method of adaptive search for solutions based on the principles of the evolution and the natural selection with the preservation of biological terminology in a simplified form theories. Its essence is to determine the most fit individual (solution) by the value of its fitness function during evolution, considering the analysis of the heredity influences and the external environment. Despite the biological terminology, genetical algorithms are a universal computational tool that can be used to solve a wide range of complex problems, including the electric power industry. The authors considered the issue of the genetic algorithm use in the framework of calculating the steady state of the electrical network (SS EN), since the mathematical electrical network model is a system of high-order nonlinear equations, where all the restrictions imposed by the physical properties of the object under consideration are taken into account. Its solution is a rather laborious optimization problem, due to the operating electrical networks complexity. The correct solution of this system is the most critical stage in the calculation of the SS EN. It is the reason for importance and urgency of the search for SS EN calculating optimal methods task. This paper presents the development results of an analytical apparatus that made it possible to search for a solution to the problem of calculating electrical networks steady-state modes using the genetic algorithm based on special software.

Keywords: evolutionary modeling, genetic algorithm, fitness function, electrical networks, mode calculation

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