World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

Interactive Winding Geometry Design of Power Transformers

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Abstract : Winding geometry design is an important part of power transformer electrical design. Conventionally, the winding geometry is designed manually, which is a time-consuming job because it involves many iteration steps in order to meet all cost, manufacturing and electrical requirements. Here a method is presented which automatically generates the winding geometry for given user parameters and allows the user to interactively set and change parameters. To achieve this goal, the winding problem is transferred to a mixed integer nonlinear optimization problem. The relevant geometrical design parameters are defined as optimization variables. The cost and other requirements are modeled as constraints. For the solution, a stochastic ant colony optimization algorithm is applied. It is well-known, that an optimizer can get stuck in a local minimum. For the winding problem, we present efficient strategies to come out of local minima, furthermore a reduced variable search range helps to accelerate the solution process. Numerical examples show that the optimization result is delivered within seconds such that the user can interactively change the variable search area and constraints to improve the design.

Keywords : ant colony optimization, mixed integer nonlinear programming, power transformer, winding design
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020