NONLINEAR TRANSIENT MAGNETIC PROBLEMS INVOLVING PERIODIC POTENTIAL DROPS EXCITATIONS

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Abstract. This work deals with the computation of nonlinear 2D transient magnetic fields when the data concerning the electric current sources involve potential drops excitations [2]. First, we will describe the 2D nonlinear transient magnetic problem which arises in the modeling of laminated media [4]. We will use the axial component of the magnetic vector potential as the main unknown and propose an implicit time discretization scheme combined with a finite element method for space approximation. Next, we will focus on developing a numerical method to compute periodic solutions by determining a suitable initial current intensity which avoids large simulations to reach the steady state. This numerical method leads to solve a nonlinear system of equations which requires to approximate several nonlinear and linear magnetostatic problems. The proposed methods are first validated with an axisymmetric example and sinusoidal source having an analytical solution. Then, we will show the saving in computational effort that this methodology offers to approximate practical problems, such us electrical motors, specially with pulse-width modulation (PWM) voltage supply [3].

Keywords: transient magnetic, nonlinear partial differential equations, finite element methods, periodic solutions, voltage drops, pulse-width modulation

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