Proposal of contribution to present in the Minisymposium “EU--MATHS--IN: Success Stories of MathematicalTechnologies in Societal Challenges and Industry”

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EU-Maths In National Network: Spanish Mathematic Network (math-in)

Involved companies: Robert Bosch GmbH (Germany).

Abstract:

The numerical simulation of induction machines by using finite element methods requires the solution of a non-linear system of partial differential equations derived from Maxwell’s equations coupled with electric circuits. The resulting mathematical model is a transient eddy current problem which usually needs a large time of simulation to reach the steady-state solution. The objective of this contribution will be to present a novel methodology to reduce the time needed to reach the steady-state in the simulation of induction machines with squirrel cage rotor. This methodology, based on approximating suitable initial currents in the rotor bars of the squirrel cage, would represent a great advantage in terms of competitivity when incorporated as a pre-computation to any motor-oriented transient simulation tool.

The research was developed as a result of a contract stablished between Robert Bosch GmbH and ITMATI (Technlogical Institute for Industrial Mathematics). In the presentation, we will

address the motivation of the problem, describe the mathematical tools developed for its resolution and show some numerical results to illustrate the applicability of the proposed methodology.

Keywords: Induction motor; Finite element methods; computational efficiency; steady-state solution;

Societal Challenges: Secure, clean and efficient energy

Economic Activities: Mechanics and Mechatronics, Electronics

Brief description of the real benefits in terms of Societal Challenge/ Economic Activities/Company

Under the idea of energy sustainability, the design of more economical and efficient electrical machines is a current challenge. In this framework, the development of advantageous numerical tools plays an important role to reduce the time needed to introduce new designs and ensure the rentability of them. The proposed methodology contributes to the development of efficient numerical tools in the field of induction electrical machines which can be used in several economical activities.

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