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Data-Driven Magnetic Field Simulation

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In standard finite-element methods, the behaviour of magnetic materials is represented by a material model, of which the parameters need to be retrieved from measurements by regression. As an alternative to this procedure, in the talk, I will develop and explain a finite-element method refraining from using a material model but considering the raw measurement data instead. Essentially, the technique amounts to minimising the distance between the material behaviour at the finite-element quadrature points and the measurement points, using a suitable norm in the so-called phase space. Physical constraints are enforced as symmetries in the phase space. The Maxwell equations are added as constraints by the Lagrange multiplier method. The data-driven magnetic field solver will be illustrated for examples from electrical engineering and accelerator technology.

Kurzbeschreibung zum Vortragenden, Hrn. De Gersem:

Herbert De Gersem received the M.Sc. and Ph.D. degrees in electrical engineering from KU Leuven, Belgium, in 1994 and 2001. From 2001 to 2006, he was with TU Darmstadt, Germany as a postdoc. Since 2001, he is Associated Professor in Accelerator Physics at KU Leuven. Since 2014, he is Full Professor at the Institute for Accelerator Science and Electromagnetic Field, TU Darmstadt. His research interests include finite-element electromagnetic field simulation for electrotechnical devices and particle accelerators, as well as FDTD and FETD techniques for electromagnetic and ultrasonic wave propagation.