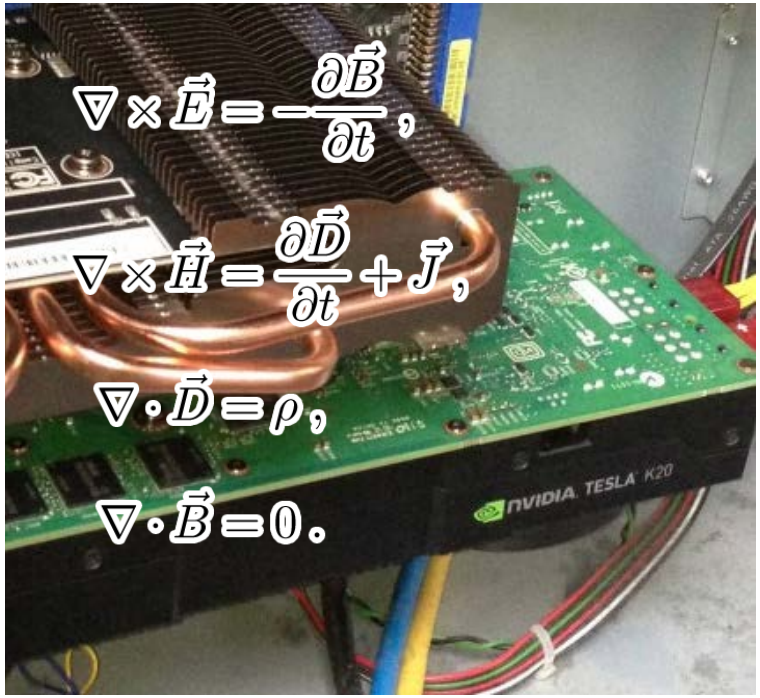
GRADUATE SCHOOL
computational engineering

TECHNISCHE UNIVERSITÄT DARMSTADT

Subject: Parallel and explicit methods for the simulation of eddy current problems

Research Focus/ Cross-sectional Area: Multirate and multiscale methods



Description:

The efficient design of electromagnetic and electrokinetic energy transducers (transformers, motors, generators, actuators and eddy current brakes etc.) requires a profound knowledge of the magnetic fields and fluxes in the devices. The numerical simulation of the quasistatic magnetic fields and their interaction is an important and cheap alternative to measurements („virtual prototyping“).

In this research proposal the fundamentals for new and improved numerical methods shold be developed for the efficient explicit computation of low-frequent electromagnetic fields. The aim is to solve larger problems in less time by using parallel computing architectures. The project shall focus on the combination of Discontinous Galerkin Finite Elements with explicit Runge-Kutta-Chebyshev time-integration methods. This allows to make good use of the computing power of multi-core architectures (e.g. general purpose graphics processor units) because many (parallel) operations can be performed with low data communication.

Requirements:

An excellent Master‘s degree in engineering or mathematics. Knowdledge in basic physics (electromagnetics), space and time discretization methods (e.g. FEM, Runge-Kutta), programming skills e.g. Matlab and interest in GPU programming is beneficial.

Supervisors: S. Schöps, Computational Engineering
J. Lang, Numerics in PDEs