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Mathematics Institute of Computational Science and Engineering - MATHICSE

SEMINAR OF NUMERICAL ANALYSIS

➤ **WEDNESDAY 27 MARCH 2013 - ROOM CH B3 31 - 16h15**

Dr. Holger Heumann, (Université de Nice-Sophia Antipolis, France) will present a seminar entitled:

"PDE-constrained optimization for controlled thermonuclear fusion"

Abstract:

An important branch of current research in thermonuclear fusion works towards easy and almost automatically controllable plasma discharges. Since direct modeling of plasma discharge scenarios is well established, methods from optimal control promise to be a valuable means for such objectives.

From a coarse scale perspective, it is sufficient to model the evolution of a plasma in a tokamak, the toroidal reactor, by standard magnetohydrodynamic (MHD) equations. But even though the MHD equations are a lot less complex than those that arise from gyrokinetic models, a PDE-constrained optimization with full 3D MHD constraints is out of reach: large anisotropies of tokamak plasmas will require very sophisticated numerical methods that are not yet developed. Therefore we will have to adapt Grad/Hogans idea of *quasistatically evolving equilibria* that separates MHD for plasma in tokamaks into two, low-dimensional subproblems.

In this talk we will review the basic ideas of Grad/Hogans approach and present an optimal control problem formulation for one of the two subproblems.

We show first results for computing sequences of optimal engineering inputs that ensure that the plasma follows some desired, prescribed trajectory.

Lausanne, 6 March 2013/DK/cr

The seminars taking place at the Section of Mathematics are announced on internet address : [www
http://mathicse.epfl.ch/seminars](http://mathicse.epfl.ch/seminars)