Mathematics Department University of Fribourg

Tuesday, 3.5.2016

Time: 17:15
Physics building
Lecture room 2.52

Colloquium

Prof. Hans Josef Pesch

Uni Bayreuth

Optimal Control of Dynamical Systems Governed by Partial Differential Equations

Abstract: *When analyzing mathematical models for complex dynamical systems, their analysis and numerical simulation is often only a first step. Thereafter, one often wishes to complete the analysis by an optimization step to exploit inherent degrees of freedom for optimizing a desired performance index with the dynamical system as side condition. This generally leads to optimization problems of extremely high complexity if the underlying system is described by (time dependent) partial differential equations (PDEs) or, more generally, by a system of partial differential algebraic equations (PDAEs). In the talk we will report on some of the lastest achievements on the field of optimization with PDEs and exhibit the challenges we are facing and have to cope with to solve such tasks. In the introduction three problems from engineering sciences are presented:*
1. Hot cracking in welding of aluminium alloys.
2. Intercontinental flights at hypersonic speeds.
3. The optimal control of certain fuell cell systems for an environmentally friendly production of electricity.
After this motivation an outline of the mathematical theory of optimal control problems for one elliptic equation is given to depict the purpose of solving optimal control problems by first order necessary conditions. Thereafter two numerical concepts, namely first optimize then discretize and First discretize then optimize are discussed with respect to their pros and cons as well as an overlook on the mathematical toolbox from the literature is given. The main part of the talk then deals with the results for optimal load changes when applying the two aforementioned methodologies including a method for the practical realisation of the computed optimal solutions based on model reduction techniques.

Tea and coffee

Time: 16:30
Mathematics building
Coffee room

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Invitation by Jean-Paul Berrut

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