



SEMINAR

APPLIED MATHEMATICS AND MECHANICS

FS998

4 June 2024

A DCAMM seminar No. 776 will be presented by

Research Scientist Pierre Jolivet
CNRS – Sorbonne University,
Paris, France

The title of the lecture is

FreeFEM + PETSc: easy and efficient large-scale finite element simulations

Abstract:

On the one hand, FreeFEM is a domain-specific language (DSL) used to perform finite element analyses with a high level of abstraction. Once the weak (or variational) form of a partial differential equation is known, users are not bothered by cumbersome tasks inherent of the finite element method such as vector or matrix assemblies, mesh adaptation, and such, as these can be performed efficiently within FreeFEM DSL with an expressive syntax. On the other hand, PETSc is an algebraic backend used in many scientific libraries around the world that has been deployed on various architectures, from laptops to large exascale systems. In this talk I will present some new features of FreeFEM and its interface to PETSc and SLEPc (its sister library for eigenvalue computations). Coupled together this ecosystem offers a flexible infrastructure to deal with coupled and/or high-dimensional systems of equations using MPI for distributed-memory parallelism. I will showcase some examples from fluid dynamics (Schur complement preconditioners for Oseen or Navier—Stokes equations), computational mechanics (smoothed-aggregation algebraic multigrid methods for elasticity), radiative transfer (matrix-free solver with user-defined preconditioning) and boundary integral equations (nonlocal — a priori dense — operators with hierarchical matrices and on-the-fly compression).

DATE: **Wednesday, 19 June 2024**

TIME: **10:00 – 10:45**

PLACE: **TEK Benz Seminar room, (Ø31-605-2), Moseskovvej 67, Odense**
SDU, University of Southern Denmark

REGISTRATION for virtual participation at the following link:

<https://syddanskuni.zoom.us/j/66355975591?pwd=TektzuTG3OUD6iLiXUuTnk3ezwOQaT.1>

Cake, coffee and tea will be served 15 minutes before the seminar starts.

All interested persons are invited.

Jan Becker Høgsberg

DANISH CENTER FOR APPLIED MATHEMATICS AND MECHANICS

• TECHNICAL UNIVERSITY OF DENMARK • AALBORG UNIVERSITY
• AARHUS UNIVERSITY • UNIVERSITY OF SOUTHERN DENMARK