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STS-10

FreeFEM – the Open Source Multiphysics Toolbox (Part 2)

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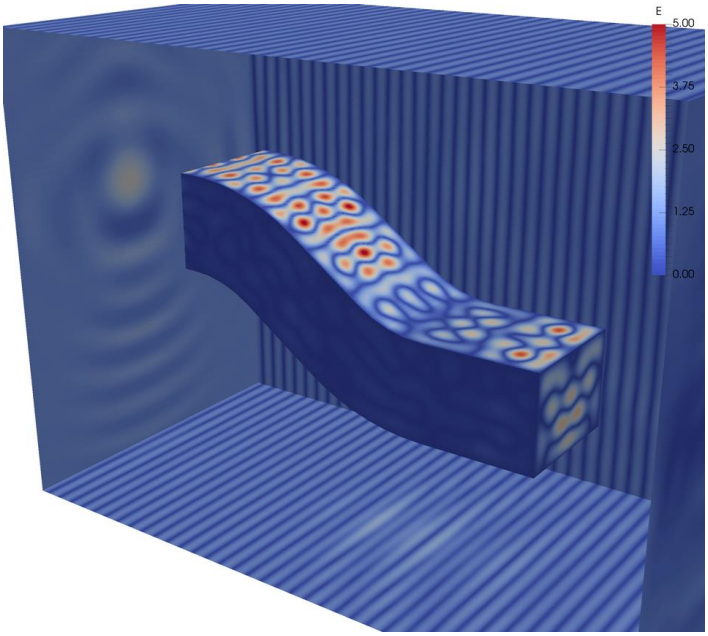
Session Abstract

Keywords: Multiphysics, domain specific language

FreeFEM is a popular 2D and 3D partial differential equations (PDE) solver used by thousands of researchers across the world and by many companies. It allows you to easily implement your own physics modules using the provided FreeFEM language. Numerous physics are pre-built: Incompressible Navier-Stokes (using the P1-P2 Taylor Hood element), Lamé equations (linear elasticity), Neo-Hookean, Mooney-Rivlin (nonlinear elasticity), Thermal diffusion, Thermal convection, Thermal radiation, Magnetostatics, Electrostatics, Fluid-structure interaction (FSI), … . FreeFEM has its own internal mesher, called BAMG, and is compatible with the best open-source mesh and visualization software like Tetgen, Gmsh, Mmg and ParaView. It is interfaced with the state of the art solvers: MUMPS, PETSc, PARADISO and HPDDM. FreeFem is also a language for the manipulation of data on multiple meshes. It allows rapid multiphysics prototyping and can be viewed as a kind of MATLAB for the finite element method. This software is based on an efficient DSL (Domain Specific Language) user language that allows you to define freely your simulation and the post processing analysis.

The papers of this STS will present industrial achievements of Multiphysics modeling using FreeFEM (fluid structure interaction, piezoelectric, thermodynamic energy storage, thermic analysis, glass modelling) as well as its availability on an energy efficient server platform.

Electromagnetic scattering from COBRA cavity



List of tentative session papers and speakers (Part 2):

Data-Assimilation for Aerodynamic Using FreeFEM
Olivier Marquet, DAAA-ONERA, Paris-Saclay University, Meudon, France
Pierre Jolivet, CNRS-IRIT, Toulouse, France
Vincent Mons, DAAA-ONERA, Paris-Saclay University, Meudon, France
Markus Zauner, DAAA-ONERA, Paris-Saclay University, Meudon, France

Qarnot Computing, a Sustainable HPC Platform
Rémi Bouzel, Qarnot Computing, Montrouge, France

Contact Problems in Industrial Applications Using FreeFEM
Houssam Houssein, Airthium, Ecole Polytechnique, Palaiseau, France
Simon Garnotel, Airthium, Ecole Polytechnique, Palaiseau, France
Frédéric Hecht, LJLL Sorbonne Université, Paris, France

Shape Optimization and Additive Manufacturing: The Dehomogenization Method
Olivier Pantz, Laboratoire Jean-Alexandre Dieudonné, Université Côte d'Azur, Nice, France
Grégoire Allaire, Centre de Mathématiques Appliquées (CMAP), Ecole Polytechnique, Palaiseau, France
P. Geoffroy, Procédés et Ingénierie en Mécanique et Matériaux, CNAM, Paris, France