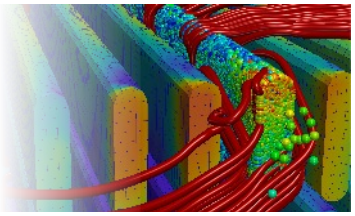
CastNet News April 2020

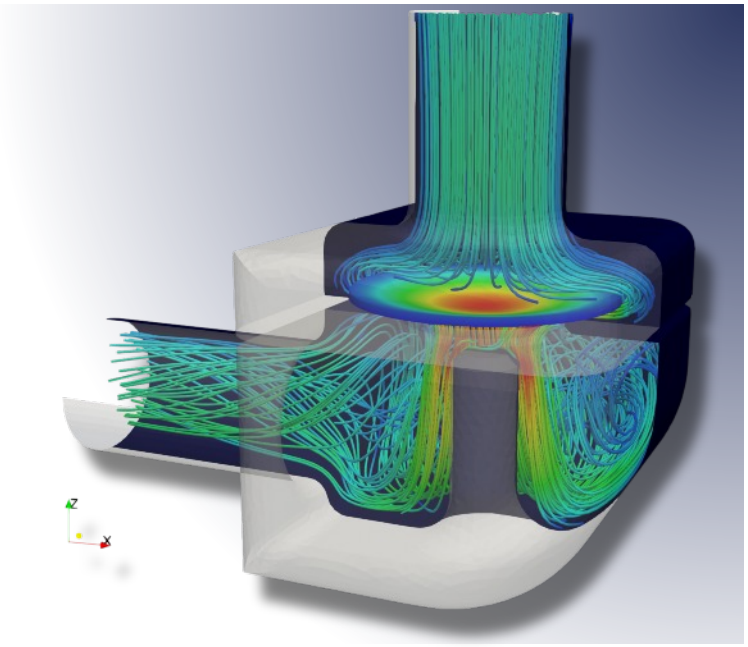


preCICE FSI-coupling with OpenFOAM/CalculiX in CastNet

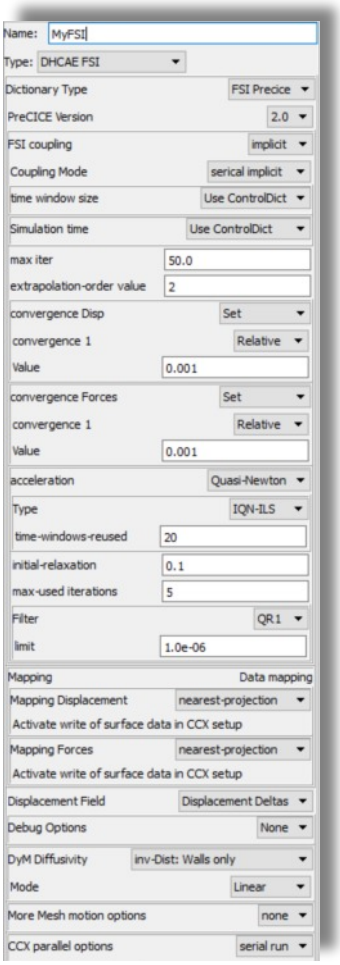
DHCAE Tools is proud to announce a support for coupled flow and structural applications in CastNet based on preCICE as coupling system using OpenFOAM (CFD) and CalculiX (CSM) as solvers.

The outstanding features of the preCICE coupling are

- Implicit and explicit coupling. Implicit coupling can be used in serial or parallel mode
- Wide range of accurate data mapping options
- Advanced coupling accleration with constant, Aitken and quasi Newton relaxation for a fast FSI simulation
- Flexible time stepping allowing subcycling for the solvers
- Powerful OpenFOAM integration for all solvers with dynamic meshing (incompressible/compressible, multiphase…)



Valve case: Elastic membrane deformation by increasing pressure



preCICE setup in CastNet

CastNet enables the user to setup a complete simulation case for OpenFOAM, CalculiX and the preCICE coupling, based on a single CAD geometry input. Meshing and analysis definitions are completely GUI based and associated with the CAD geometry.

In the CFD domain, hybrid meshing with structured mesh regions in areas of high mesh deformation during the FSI coupling are easily realized. For CalculiX linear or curved second order elements are available.

The OpenFOAM and CalculiX solver setups are defined in a GUI based manner. There is no need to have a detail knowledge of the solver specific keywords or to be familiar with the text-file structure of the solvers.

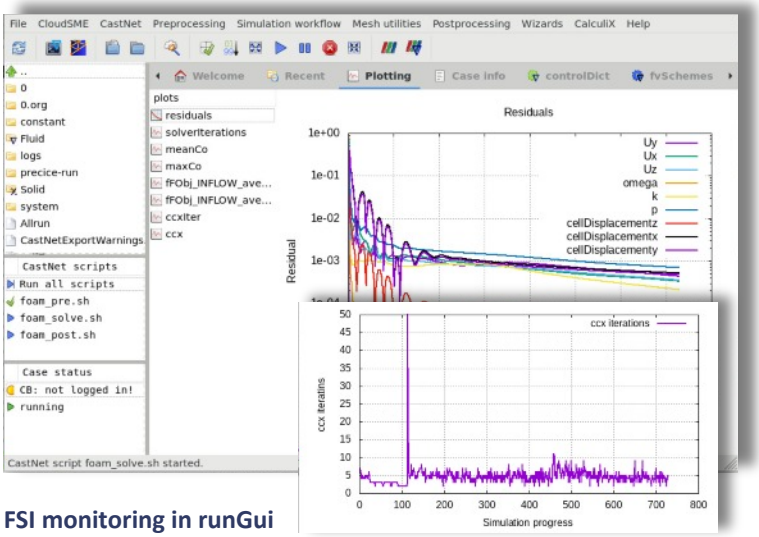
The preCICE coupling setup is realized by an additional GUI entry for the coupling procedure and mesh motion. A wide range of coupling and mapping options in preCICE are supported. The FSI-interfaces in the fluid and structural domain are defined by associating the CAD geometry faces with the boundary conditions. The case setup is simplified by pre-defined templates for the solvers and the coupling.

The case files, including xml-files and OpenFOAM dictionaries, are exported based on the GUI entries. The output is fully compatible to OpenFOAM, CalculiX and preCICE coupling files.

In runGUI the case is executed and monitored. Beside the typical residual, probes and surface value plots, additional information for the coupling (e.g. number of coupling iterations) are plotted.

The fluid and structural results can be visualized together in a single Paraview session using DHCAE's vtk-data translator for CalculiX results.

For more information about preCICE see www.precice.org



FSI monitoring in runGui

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