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Non intrusive 3D fluid structure code coupling

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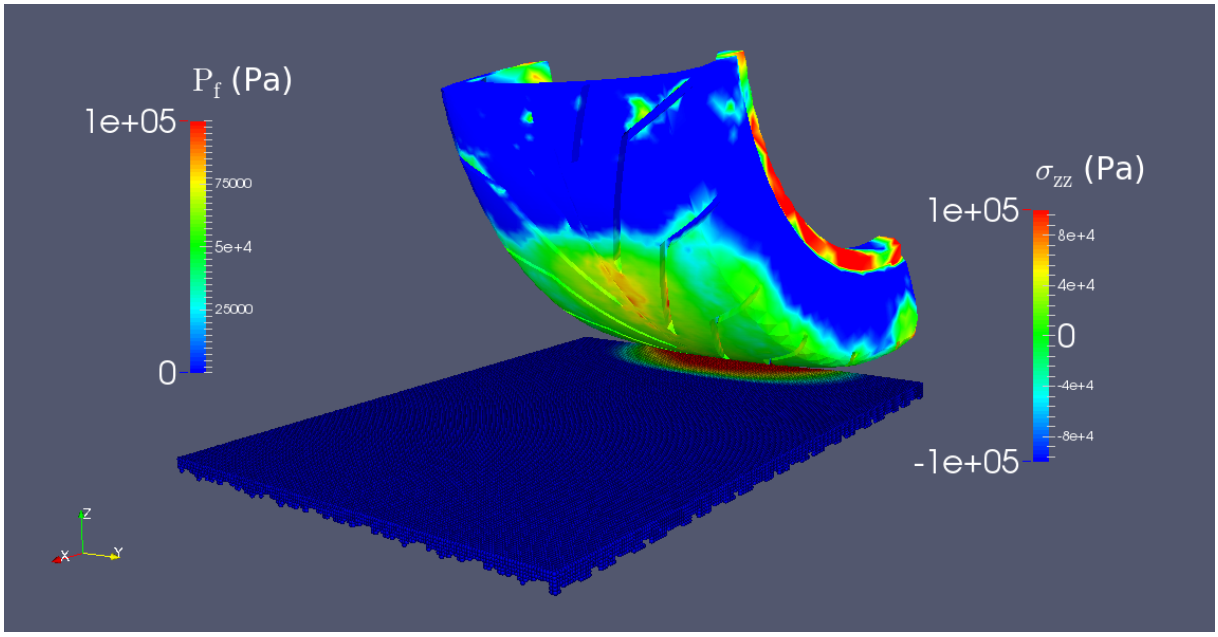
This presentation will be devoted to the presentation of a non-intrusive code coupling method for FSI which is energy and momentum conserving. The method is based on a simplectic formulation of the numerical interface energy. The proposed method is also able to cope with incompatible time steps in the parts or sub domains [1][2]. As the interface energy is perfectly controlled, one is sure that the interface terms do not inject or remove any energy as time passes.

The method shall be used to couple a purely SPH fluid code ASPHODEL to two different finite element codes. The quality of the coupling shall be studied on simple examples. It will be shown that the proposed coupling strategy is stable as well as does not spoil the time order of convergence of each code. The coupled problem hence keeps the properties of the worst integrator. ASTER or Europlexus codes shall be used for he prediction of the solid response.

Two types of application examples shall be presented:
-the first series will compare the results of the coupled ASPHODEL-ASTER simulations to published results. One will for show on one example that the choice of the modelling of structural elastic potential law is an important input for the quality of the simulation. An other example will be devoted to the simulation of water transient flow between the tire and a road which takes into account the road roughness as well as the tires precise design.
-the second will concentrate of SPH-FEM coupling for very small fluid objects. It will be shown how one can model superficial tensions as well as adhesion forces which have a crucial role for small scales. The method shall be illustrated on a challenging experiment.



3D computation of FSI fluid flow under a rolling tyre (ASTER – ASPODEL)

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