Presentation of feel-pp:

Feel++ is environment which allows users to modelize and resolve different physics problems in the case of scientific studies or in more factual situations of engineering. This tool can solve complex cases by starting with monophysic and all the way to Multiphysics problems.

The use of these tools does not require any profound knowledge nor a complete one of the equations and the theory behind all the calculus. But a solid knowledge of the situation and physics parameters which allow users to adapt the simulation to their particular case. With all this, and given the right simulation is chosen, the simulation done will be realistic and will illustrate as best as one can, the situation.

To add to diversity of the equations available, the users can use different method to obtain the results. By default, the method uses the finite element method with a lot of numerical solvers but, if required, some more advanced methods are implemented and can be use as well.

Presentation of the project: contribute to the feel-pp documentation

The project which was given to our group is to complete the documentation on several cases on the feel-pp website. The documentation is mainly about the fluid flows in given geometries and the effort reactions on particular solid. The documentation is enhanced by simulations where users can change some physicals parameters. This provides a large choice of possibilities that can be created by the same equations.

1) Fluid:

The fluid part allows to modelize a bunch of situations in 2d or 3d:

- Stokes flow
- Laminar incompressible flow
- Steady and unsteady simulations
- Bdf time schemes up to order 4
- Moving domain support using Arbitrary Lagrangian Eulerian (ALE) formulation
- Support high order geometry including in context of moving domain
- Stabilization pressure and advection dominated using Galerking Least Square
- Boundary conditions: no-slip, slip(symmetry), inflow (not necessarily aligned with an axis), pressure, outflow

2) Solid:

The solid part allows to modelize the effects on effort on solids in 2d or 3d:

Every solid has a different geometry and different physical parameters by changing them anyone can simulate with any material and can see how they will react with given efforts.

Bibliography:

- http://docs.feelpp.org/toolboxes/0.108/

- https://en.wikipedia.org/wiki/Computational_fluid_dynamics