# Changelog

All notable changes to PSD solver will be documented in this file.

# Rolling Release (2.1)

#### Added

- New accurate force calculations via matrix-vector product: new flag -getreactionforce.
- New flag -reactionforce variational-based | stress-based to get reaction force on a surface.
- New flag -plotreactionforce to activate real time pipe plotting using GnuPlot.
- More verbos info on -help
- New flag -mesh to provide the name of mesh to PSD\_Solve.
- New flag -probe to postprocess FE variables at a point.

### Changed

- Moved to FreeFEM 4.7-1.
- Moved to PETSc 3.14.

### Removed

• Flag -pipegnu not supported for damage mechanics (to be further deprecated from elsto/soildynamics)

#### Bugs removed

• Stain vector incorrect numbering in split fuction of GFP

(see hash 5ec7b882494f71984d07f468b518ec886e942d32)

### 2.0 - 2020-08-18

### Added

• New processing via C++, PSD\_PreProcess binary (MAJOR CHANGE).

- New solving via shell wrapper PSD\_Solve instead of FreeFem++ or FreeFem++-mpi.
- New examples of using the solver.
- New Pdf documentation containing tutorials, function definitions, verbos on PSD C++ library.
- New option -nonlinearmethod (Picard|Newton-Raphsons).
- New time discretization option -timediscretization.
- New point boundary conditions.
- New dummy city mesh and analysis 2D for soil dynamics.
- Automatic identification of FreeFEM and Gmsh during ./configure.
- New flags for --with-FreeFEM= and --with-Gmsh= during ./configure.
- New flag -bodyforceconditions [int] to include body force.
- New flag -problem linear-elasticity | damage | elastodynamics | soildynamics to define physics.
- New flag -model to set approximation for damage mechanics hybrid-phase-field | Mazar | pseudo-nonlinear | Hujeux.
- Better energy splitting included Hybrid phase-field compressibility vs tensile energy condition.
- Introduce boundary conditions via -dirichletconditions [int] flag.
- Introduce point boundary conditions via -dirichletpointcondition [int] flag.
- Introduce traction boundary conditions via -tractionconditions [int] flag.
- New folder tests containing unit-tests for modules.
- New Hujeux law (nonlinear soil law) interface using C++ class (Thanks to Evelyne Foerster).
- New pseudo-nonlinear model for solving elastodynamics and soildynamics with nonlinear Newton-Raphsons.
- Introduced double couple earthquake source boundary condition for soildynamics.
- New flag -doublecouple force-based | displacement-based to use double couple source for soildynamics.
- New top-ii-vol parallel meshing via -top2vol-meshing flag (compatible with soildynamics).

#### Changed

- Moved to FreeFEM 4.6.
- Moved to PETSc 13.13.
- Moved to C++ for preprocessing.
- Moved to shell wrapper PSD\_Solve for solving.
- Changes to GFP energydecopostion plugin 'DecompEnergy\_Op', now includes compressibility history.

- Replaced GFPDecompEnergy2D/GFPDecompEnergy3D by a generic 2D/3D function GFPSplitEnergy(Eps1,PsiPlus,PsiMinus,HistPlus,HistMinus,par);.
- Postprocessing flag -postprocess options now support u , v, a , uv, ua, av or uav.

#### Removed

- No more FFINSTALLDIR and GMSH variables during make and make check.
- No more -plot flag now handled by -postprocess.
- No more -nonlinear flag now handled by -problem and -model.
- No more -bodyforce flag now handled by an int valued -bodyforceconditions.
- No more -dynamic flag now handled by -problem and -model.
- No more -soildynamic flag now handled by -problem and -model.
- No more -quasistatic flag now handled by -problem and -model.
- No more -dirichletbc flag now handled by -dirichletconditions.

# Bugs removed

Bug in 3D paraxial loading (see hash 8fcbe7390e526423cd24b5f0ab1c06899b36c67f)

# **1.8** - 2020-01-21

# Added

- New soil dynamic module -soildynamics
- New paraxial element support in 2D.
- New timeplotting support -timepvd
- New -postprocess option for postprocessing u, v, a, or uav.

# Changed

- Moved to FreeFEM 4.4.2.
- Moved to PETSc 13.12.
- New simpler way of plotting savevtk in parallel with append flag for iterative solutions.
- VTU files get stored with a date and time stamp.
- New way of maintaining a logfile for all simulations (date,time,case,..) in simulation-log.csv.

# **1.7** - 2019-11-08

### Added

- New mesh reordering via Reverse Cuthill-Mackee via -useRCM.
- New quasi-static parallel solver (Extension of B.Masseron & G.Rastiello sequential version).
- New GFP plugin for Mazar's damage update for 2D/3D problems GFPMazarsDamageUpdate(...).
- New MPI plotting routine plotJustMeshMPI().
- New option -fastmethod to switch back to default variational formulation.
- New make flag for compiling on supercomputer.

### Changed

- Changed variational formulation now using  $\epsilon(u): A: \epsilon(v)$ .
- Using GFP becomes optional -useGFP.
- Better documentation via .md and .html files.
- Better plotting support for PlotMPI().
- Moved to FreeFEM 4.4.

### **1.6** - 2019-06-11

#### Added

- Dynamic linear solver in 2D and 3D parallel/sequential.
- New finite element variable for partition of unity— for fixing integrals.

#### Changed

- Better documentation via .md and .html files.
- Correct quadrature order for faster computations.
- Major changes/splitting of .script files.

### Removed

 Removed the BoundaryAndSourceConditions.script merged with ControlParameters.script.

### Bugs

• Bug in integrals fixed.

# **1.5** - 2019-05-29

#### Added

- Dynamic linear solver in 2D and 3D sequential.
- New meshes for dynamics tests bar-dynamic.msh.
- Checking modules make check.
- Faster sparsity pattern calculations.

### Changed

- Better documentation via .md and .html files.
- Major restructuring of the codes.
- Moved to automake for solver installation.
- Mesh building via make.

#### Removed

• Removed the manufactured solution codes.

### 1.4 - 2019-05-14

### Added

- Fully vectorial finite element solver for phase-filed -vectorial.
- New -supercomp for avoiding xterm issues on super computers.
- New MatViz() function for matrix sparsity visualization.
- Introduced GFP plugin support (Go Fast Plugins).

# Changed

- Elastic energy decomposition is now optional -energydecomp.
- Force calculation using integrals (Thanks to G.Rastiello).

# 1.3 - 2019-04-08

### Added

- New meshes in 2D/3DNotched-plate, square-crack, etc.
- New fracture mechanics module.
- New -nonlinear flag to activate phase-field model for brittle fracture.

- New -timelog for time logging the solver.
- New -pipegnu for GNUplot piping.

### Changed

- Scripting now performed using .script files:
  - BoundaryAndSourceConditions.script
  - LinearFormBuilderAndSolver.script
  - Macros.script
  - Main.script
  - VariationalFormulation.script
  - . . .
- Move to FreeFEM version 4.0.
- Move to PETSc version 3.11.

# 1.2 - 2019-03-18

#### Added

- Support for Gmsh's .msh or Medit's .mesh meshes in folder Meshes.
- Advance to 3D physics.
- New MPI based parallel solver linear elasticity.
- New approach for solver generation via scripting (PhD thesis MA Badri) with scriptGenerator.edp.
- Integrated Domain decomposition macro (PhD thesis MA Badri).
- Customized .vtk support for ParaView post-processing.
- New point boundary condition macro pointbc(Real[int], fespace, matrix).
- New flags for communicating with the solver: -dimension, -plot, -bodyforce, -lagrange,  ${\rm etc.}$

# Changed

- More advance README.MD.
- Sequential solver now merged within scripting via flag -sequential.
- Move to FreeFEM version 3.62.
- Moved manufactured solutions to validation-test folder.

# 1.1 - 2019-03-04

#### Added

- Initial FreeFEM files for sequential linear elasticity in 2D (case of constrained bar).
- More cases of manufactured solution for linear elasticity in 2D.
- Added README.MD for explaining the solver.
- ParaView plotting activated.

# Changed

- Moved to Tuleap git hosting from CEA.
- Separate folder of manufactured solutions and the linear elastic solver.
- Move to FreeFEM version 3.61.

# 1.0 - 2019-02-15

# Added

 $\bullet\,$  Initial Free FEM files Method of manufactured solution for linear elasticity in 2D.

# Version git tags

Version	Git tag
1.0	8 a 8 e c b 2746 b 7 da 792073358 c 60 df 33 bae 647 f 788
1.1	a 667 e 6085 ba 1f 92 f 8 dd 619 bd 40 e 18 f 85 c 593 bc 0 a
1.2	e48b7b3a30c05ad4c343efa6a17fee386031f437
1.3	39 f 43 24 55 03 65 84 98 52 c 52 64 b 8 d 45 35 aa e 05 e 30 d
1.4	f51 f67 8630 eb9 b2 fed355 e5cedf976 ce8 b5 fa341
1.5	07293 ba 09 a 69 d 3 d 6 a 1 6278220 a 0 b 4 a 7 a 9 f 318 f 9 6
1.6	f359 dd049 fb1 ddde376 e8 ad8 e5177 c663 e430418
1.7	aee9bfec868a70b3d9974d7692bc19f9739ab7dc
1.8	2 f 2 6 2 9 2 6 3 6 c 7 2 4 8 1 3 3 e 3 1 a e 9 1 2 e e 5 8 1 1 3 d e 2 e f 7 1
1.8	6 e 721 e dfa fe 4 e b f 3 acceb ce 0 1 e 29 23 32 a 27 f 980 a