

□ What is FreeFem++ ?

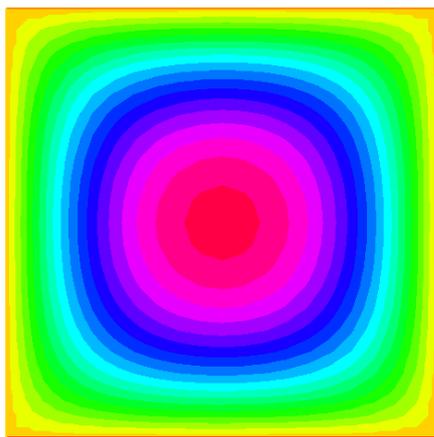
FreeFEM++ is a open source program of the finite element method to solve the partial differential equation developed by the staff of "Pierre et Marie Curie university" of France. The user only describes , 1) Shape of boundary, 2) Boundary condition, and 3) Partial differential equation in the language of the Pascal style that is called "Gfem".

FreeFEM++ does the all of the work, automatic mesh generation and obtaining numerical solutions.

A wide-ranging problem can be solved extremely easily compared with other programs.

FreeFem++ is one of the most popular simulation tools in the field of engineering and science.

FreeFem++ example code for 2D Poisson equation:



```
real NX=20, NY=20 ;
mesh T0h=square(NX,NY,[1.0*x,1.0*y]);
plot (T0h,wait=true);
fespace V0h(T0h,P1);
V0h u0,v0;
solve eq(u0,v0)
=int2d(T0h)(dx(u0)*dx(v0)+dy(u0)*dy(v0))
-int2d(T0h)(1.0*v0)
+on(2,3,u0=1.0); // boundary condition
plot(u0,wait=true);
```

FreeFem++ is written in C++ and the FreeFem++ language is a C++ idiom.

It runs on any Unix-like OS (with g++ version 3 or higher, X11R6 or OpenGL with GLUT) Linux, FreeBSD, Solaris 10, Microsoft Windows (95, 98, 2000, NT, XP, Vista) and MacOS X (native version using OpenGL).

FreeFem++ replaces the older freefem and freefem+.

2D and 3D analysis is now available supporting popular pre/post tools.

FreeFem++ is freely downloaded from FreeFem++ home page (<http://www.freefem.org>) under the GNU public license, GPL.

□ How to run FreeFem++

To run FreeFem++ program, click FreeFem++ program file icon and FreeFem++ starts

automatically. Or from command window, type “FreeFem++ (FreeFem++ filename)”.
Syntax is as follows.

Syntax = FreeFem++ [-v verbosity] [-fglut filepath] [-glut command] [-nw] [-f] filename

- v verbosity : 0 -- 1000000 level of freefem output
- fglut filepath : the file name of save all plots (replot with ffglut command)
- glut command : the command name of ffglut
- nowait : nowait at the end on window
- wait : wait at the end on window
- nw : no ffglut (=> no graphics windows)

Meshfile

FreeFem++ can read gmsh(.msh) or medit(.mesh) mesh files.
Also, it has a tetgen command base surface/volume mesh generator.

Advanced Post Processing

FreeFem++ can plot the simulation results by installed plot command. If you prefer to more advanced post processing, gnuplot or medit is available. For details, please refer to FreeFem++ manual.

FreeFem++-cs

If you want to kick FreeFem++ from GUI, FreeFem++-cs is available and 3D visualization can be done easily from it. It is downloaded from the FreeFem++ site.

Reference.

- 1) FreeFem++ manual : <http://www.freefem.org>
- 2) Gmsh : <http://geuz.org/gmsh/>
- 3) Medit : <http://www.ann.jussieu.fr/~frey/software.html>
- 4) Tetgen : <http://tetgen.berlios.de/>

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