Erpel

Institut für Theoretische Physik I

Erpel Finite Element Code

Erpel is a finite-element code computing effective elastic properties of anisotropic multiphase media. It implements a conjugate-gradient scheme on cubic voxels and has been proven to scale to at 768^3 voxels in an MPI environment; it should be good for more.

Erpel was written as a part of my PhD thesis and tested on the FAU's HPC system. It was used to compute elastic properties for a number of research projects and has proven to be reliable so far.

Technical details

The code is a parallel C++ program, using MPI to communicate between instances. A recent C++ compiler, POSIX threads and Boost::MPI are required to build. SSE2 support is optional.

Materials

Supplementary Information from the Biomaterials paper, explaining how the code works; also contains references to useful articles

Tech Report by E. Garboczi explaining the algorithm in greater detail

Documentation of the input format is found elsewhere

Code is at Github.

Publications using Erpel

- Sebastian C. Kapfer, Stephen T. Hyde, Klaus Mecke, Christoph H. Arns, and Gerd E. Schröder-Turk
- Minimal surface scaffold designs for tissue engineering
- Biomaterials 32(29), 6875–6882 (2011)
- [Link] · [BibTeX]

- Gerd E. Schröder-Turk, Varslot Trond, Liliana De Campo, Sebastian C. Kapfer, and Walter Mickel
- A bicontinuous mesophase geometry with hexagonal symmetry
- Langmuir online(early view), (2011)
- [Link] · [BibTeX]

- Susan Nachtrab, Sebastian C. Kapfer, Christoph Arns, Mahyar Madadi, Klaus Mecke, and Gerd E. Schröder-Turk
- Morphology and Linear-Elastic Moduli of Random Network Solids
- Advanced Materials 23(22-23), 2633–2637 (2011)
- [Link] · [BibTeX]