

Homogenization for Multi Field Modelling

Part I: Theories and FEniCS

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In this student project, Homogenization Method is utilized to investigate behaviour of composites under multiple fields. Many applications can be found in the field of Material Modelling, specifically for coupled problems of composites, e.g. Electroactive Polymers. A novel Finite Element framework, FEniCS, is employed to achieve this goal. FEniCS is a collection of libraries and modules and uses Python (or C++) as interface language. Regarded as a dynamical language, Python stands out as a fast language for prototyping. Another important feature about FEniCS is its specialization in code generation with respect to bilinear forms, linear forms and function spaces in the formulation of computational problems, which translates directly the mathematical language into codes and accelerates the trial process of new models and new computation methods. With this powers, a Unit Cell module is realized, where the calculation (include homogenized properties) of composites in micro scale could be performed.