Applied Mathematics Seminar
INSCC 110, 4:00pm Monday
March 26, 2001

A numerical method for nonlinear composites with complex microstructure

by

Pierre M. Suquet

Laboratoire de Mecanique et Acoustique, Centre National de la Recherche Scientifique, Marseille, France

Abstract

Computational micromechanics investigates numerically the response of a volume element composed of different mechanical phases. This lecture will describe a numerical method based on Fast Fourier Transforms which has been developed in Marseille in the past few years. The method is based on the periodic Green's function of a homogeneous medium. Nonhomogeneous, nonlinear media can be handled by transforming material inhomogeneities or nonlinearities into polarization fields. The basic scheme makes use of an iterative procedure which has a rate of convergence directly proportional to the contrast between the phases. The method's performance deteriorates as the constrast increases. Acceleration schemes and methods based on augmented Lagrangians have to be used to handle composites with high or infinite contrast.

One of our motivation for developing this scheme was to produce reference results for checking nonlinear predictive schemes that has been recently developed. We will present comparisons between the predictions of some of these schemes and numerical simulations.