Applied Mathematics

McGill Applied Mathematics Seminar

March 5, 2007, 2:35 pm Monday
At McGill, Burnside Hall 1205

" Efficient domain decomposition methods for problems with discontinuous coefficients."

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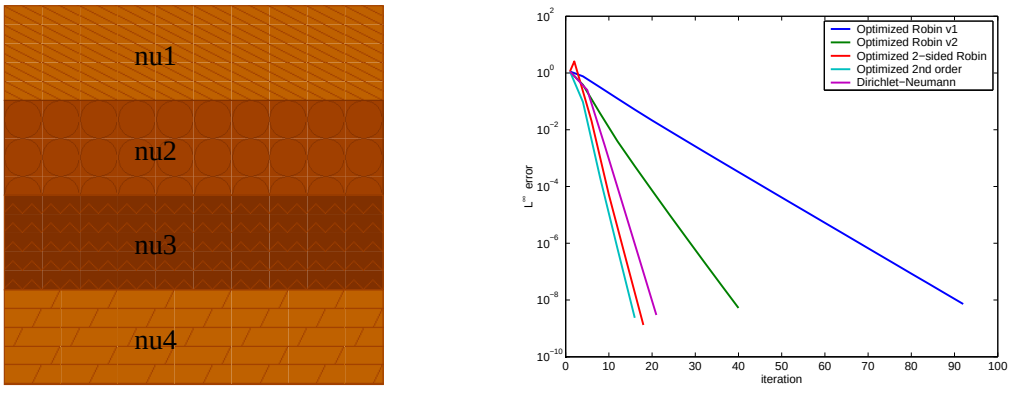
Coffee and refreshments will be served after the seminar

Abstract:

In many applications, very large linear systems (with several millions of unknowns) arise from the discretization of boundary value problems. Parallel preconditioners are essential to solve such systems. In this context, domain decomposition is a very natural idea, and has the advantage of being easy to implement. The domain of computation is decomposed into overlapping or nonoverlapping subdomains, and each processor only needs to solve the problem on a particular subdomain. The coupling between subdomains is then achieved through an iteration.

In this talk, I will review the basic principles behind domain decomposition methods, and introduce two techniques developed to make these methods efficient: optimized transmission conditions and coarse grid corrections. In recent work, we have studied these techniques for a simple diffusion problem with discontinuous coefficient. This problem is particularly relevant for the simulation of flow in highly heterogeneous porous media, where the jumps in the coefficients can be very large.



$\nu_1 = 10^{-1}$ $\nu_2 = 10^{-2}$ $\nu_3 = 10^{-5}$ $\nu_4 = 10^{-3}$ (a) layered heterogeneous media (b) convergence of different methods