Applied Mathematics

McGill & CRM Applied Mathematics Seminar

2:35 pm Monday 22nd March 2004
At McGill, Burnside Hall 1205

"Functional-discrete method with high order of accuracy for eigenvalue transmission problem"

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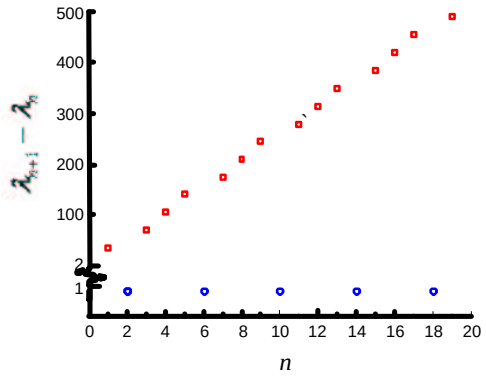
Coffee and refreshments will be served after the seminar

Abstract: We develop a functional-discrete method (FD-method) with high order of accuracy to find numerical solution of differential equations. We propose an FD-method algorithm to find numerical solution of an eigenvalue transmission problem with any desired accuracy. The main idea is as follows. For zero iteration we solve a basic eigenvalue problem, obtained by applying a method of differential equation approximation. For each next iteration step we solve transmission problem for second order differential equation with piece wise constant coefficients and a right hand part which is constructed by using solutions at previous iterations. Contrary to finite element and finite difference methods, this approach has no restriction on the number of eigenvalues, approximations to which can be found. The convergence rate is proved to be not worse than that of geometric series. It is shown that under some conditions on a matching point, two kinds of eigenvalue sequences may exist. For one of them, the convergence rate increases along with the ordinal number of trial eigenvalue. For the other one, the convergence rate is the same for all eigenvalues and does not depend on the ordinal number of trial eigenvalue. For Dirichlet boundary conditions, by using asymptotic behavior of eigenvalues of the basic problem and FD-method, we obtain a qualitative result about the arrangement of eigenvalues of original problem. Numerical examples are given to support the theory.



Joint work with Vladimir Makarov, Institute of Mathematics of Ukrainian Academy of Sciences.