MEGHÍVÓ

Az ELTE Matematikai Intézetének
RENDKÍVÜLI
intézeti szemináriumára
Előadó: Gustaf Söderlind – Lund University

Az előadás címe:

Finite Difference Methods on Nonuniform Grids. Convergence, stability and grid regularity.

Időpont: 2016. szeptember 20., kedd,
14.00 órai kezdet
Helyszín: Déli épület - 3.719-es terem

Absztrakt:

Beginning by reviewing the meta-theory of stability and convergence behind the Lax equivalence theorem applied to ODE's, we investigate the convergence of difference methods on nonuniform grids. From the theoretical point of view, very little is known about how grid smoothness affects stability and convergence. We take the approach of constructing a grid deformation map, which maps an equidistant grid to a non equidistant grid. The deformation map is smooth, and allows grade refinement in terms of a single parameter, essentially the number of grid points, N. Thus convergence is defined in terms of the limit as N tends to infinity.

We first look at elliptic boundary value problems, and compare the grid deformation technique to the classical Shishkin mesh, showing that vastly different convergence properties follow, depending on the regularity of the grid. In particular, for singular perturbation problems with boundary layers, we show how grids constructed from the Lambert W-function can resolve the boundary layer and retain the proper order of convergence even from "small" values of N, say N=100.

We then move to initial value problems and multistep methods. A problem with multistep methods on nonuniform grids is how to compute the method coefficients. Here, this problem is circumvented by keeping the method coefficients fixed, and using a smooth time transformation to generate a regular, varying time step sequence. Examples demonstrate that the proper order of convergence is retained so long as the grid is smooth, but that order reduction occurs when there are irregular variations in the step size sequence.

Minden érdeklődőt szeretettel várunk!