

# Ivan Georgiev

Institute for Parallel Processing, Bulgarian Academy of Sciences, Sofia, Bulgaria

PhD thesis (in progress):

**”Robust iterative methods for non-conforming finite elements”**

Current scientific interests:

**Numerical methods for partial differential equations, finite elements, iterative methods, preconditioning, multilevel methods, parallel algorithms**

Selected publications:

- [1] I. Georgiev, S. Margenov, DD-MIC(0) Preconditioning of Rotated Trilinear FEM Elasticity Systems, *Computer Assisted Mechanics and Engineering Sciences*, 11, 2004, 197-209.
- [2] G. Bencheva, I. Georgiev, and S. Margenov, Two-level preconditioning of Crouzeix-Raviart anisotropic FEM systems, *Large-Scale Scientific Computing, Lecture notes in computer sciences*, 2907, Springer Verlag, 2004, 76–84
- [3] I. Georgiev, S. Margenov, Element Preconditioning Technique for Rotated Bilinear FEM Elliptic Systems, *Mathematica Balkanica*, Vol.20, 2006, Fasc.1, pp. 39-48.



I systematically attend the following lecture courses of the Special Semester:

- **Non-standard mixed FE-techniques**, by prof. D. Braess
- **Robust parallel algebraic multigrid and multilevel techniques**, by prof. S. Margenov

Given a seminar talk about deriving improved estimates for the condition number of the additive and multiplicative preconditioners for the first pivot block when the minimal angle of the initial triangulation is restricted by a given parameter.

- **Discontinuous Galerkin methods**, by prof. R. Lazarov

Planned a seminar talk about the paper: "A simple non-conforming bilinear elements for the elasticity problem" by P. Hansbo and M. Larson



## Research activities during the Special Semester:

- **Multilevel preconditioning of rotated bilinear non-conforming finite elements** with J. Kraus and S. Margenov

We derive a sufficient conditions for existence of hierarchical basis and estimates of the constant  $\gamma$  in the strengthened CBS inequality which is shown to allow the efficient multilevel extension of the related two-level preconditioner.

- **Locally optimized MIC(0) preconditioning of rotated trilinear non-conforming finite elements**, with J. Kraus, S. Margenov and J. Schicho

We consider 3D anisotropic elliptic problem and a different approaches for construction a locally optimal M-matrix approximation of the element stiffness matrix.

