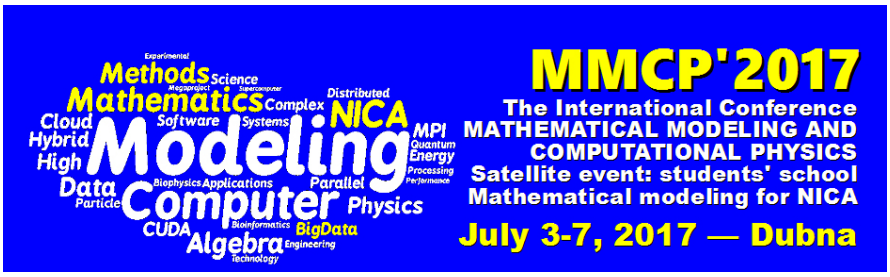


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# The Disrete-Continual Finite Element Method in Engineering

*Monday, 3 July 2017 14:15 (15 minutes)*

Development, research and verification of correct mathematical models and methods of structural mechanics are the most important aspects of ensuring safety of structures and buildings. Finite element method (FEM) is the most popular method of structural analysis. The field of application of discrete-continual finite element method (DCFEM) comprises structures with regular (in particular, constant or piecewise constant) physical and geometrical parameters in some dimension ("basic"direction). Considering problems remain continual along "basic"direction while along other directions finite element approximation is presupposed.
After discretization within DCFEM we obtain resultant multipoint boundary problem for system of ordinary differential equations with piecewise constant numerical coefficients. Solution of such problems is accentuated by numerous factors. They include boundary effects (stiff systems) and considerable number of differential equations. Moreover, matrices of coefficients of a system normally have eigenvalues of opposite signs and corresponding Jordan matrices are not diagonal. Special method of solution of such multipoint boundary problems of structural analysis has been developed. Its major peculiarities include universality, computer-oriented algorithm, computational stability, optimal conditionality of resultant systems and partial Jordan decomposition of matrix of coefficient, eliminating necessity of calculation of root vectors.
Combinations of DCFEM and FEM are considered as well.

## Short biography note

References
1. Akimov P.A., Belostotskiy A.M., Mozgaleva M.L., Mojtaba Aslami, Negrozov O.A. Correct Multilevel Discrete-Continual Finite Element Method of Structural Analysis. // Advanced Materials Research Vol. 1040 (2014), pp. 664-669.
2. Akimov P.A., Mozgaleva M.L. Method of Extended Domain and General Principles of Mesh Approximation for Boundary Problems of Structural Analysis. // Applied Mechanics and Materials, Vols. 580-583 (2014), pp. 2898-2902.
3. Akimov P.A., Mozgaleva M.L., Mojtaba Aslami, Negrozov O.A. About Verification of Discrete-Continual Finite Element Method of Structural Analysis. Part 1: Two-Dimensional Problems // Procedia Engineering, Vol. 91 (2014), pp. 2-7.
4. Akimov P.A., Mozgaleva M.L., Negrozov O.A. About Verification of Discrete-Continual Finite Element Method for Two-Dimensional Problems of Structural Analysis. Part 1: Deep Beam with Constant Physical and Geometrical Parameters Along Basic Direction. // Advanced Materials Research, Vols. 1025-1026 (2014), pp. 89-94.
5. Akimov P.A., Mozgaleva M.L., Negrozov O.A. About Verification of Discrete-Continual Finite Element Method for Two-Dimensional Problems of Structural Analysis. Part 2: Deep Beam with Piecewise Constant Physical and Geometrical Parameters Along Basic Direction. // Advanced Materials Research, Vols. 1025-1026 (2014), pp. 95-103.
6. Akimov P.A., Mozgaleva M.L., Sidorov V.N. About Verification of Discrete-Continual Finite Element Method of Structural Analysis. Part 2: Three-Dimensional Problems // Procedia Engineering, Vol. 91 (2014), pp.14-19.

7. Akimov P.A., Sidorov V.N. Correct Method of Analytical Solution of Multipoint Boundary Problems of Structural Analysis for Systems of Ordinary Differential Equations with Piecewise Constant Coefficients. // Advanced Materials Research Vols. 250-253, 2011, pp. 3652-3655.
8. Zienkiewicz O.C., Taylor R.L. The Finite Element Method for Solid and Structural Mechanics. Volume 2. Butterworth-Heinemann, Sixth Edition, 2005, 736 pages.

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