XIX Winter School on Continuum Mechanics. Perm. February 24 - 27, 2015. Abstracts. Ekaterinburg: Ural branch of RAS, 2015. P. 51. (ISBN 978-5-7691-2416-7)

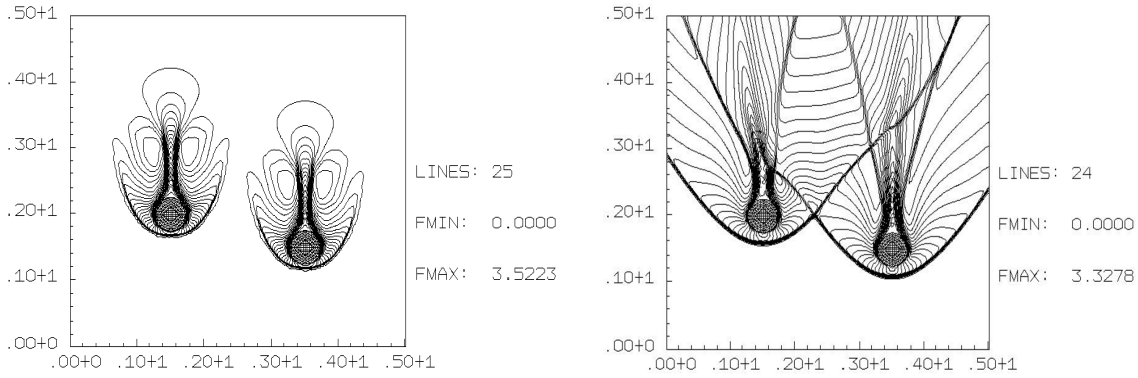
METHOD OF OVERLAPPING ARBITRARY MOVING ADAPTIVE GRIDS FOR CONTINUUM MECHANICS PROBLEMS[1]

[1]Burago N.G., [2]Nikitin I.S.

[1] *Institute for Problems in Mechanics of RAS, Moscow, 119526, Russia*
[2]*Institute for Computer Aided Design of RAS, Moscow, 123056, Russia*

It is shown in the lecture how to solve problems of continuum mechanics in a complex time-varying geometry reaching a sharp increase of calculation accuracy and at lower cost of computation. This may be achieved with help of through calculation methods in the combined use of the following components: 1) the method of overlapping grids and / or continuous / discrete markers to describe the moving boundaries between immissible media; 2) the method of arbitrary moving adaptive grids to minimize approximation errors in the vicinity of the shock waves, boundary layers, contact discontinuities and moving boundaries; 3) Matrix free implementation of effective iterative and explicit-implicit finite element methods; 4) methods of equilibrated artificial viscosity (SUPG FEM clone) and an exponential correction of the physical viscosity 5) procedures to ensure monotonicity and conservation properties.

The effectiveness is checked in solutions of various problems in continuum mechanics for solid, liquid and gaseous media. Below the calculation results for problem of ideal gas flow about two obstacles are presented (used ~ 8000 moving adaptive grid nodes, adiabatic ratio 1.4).



t=0.45 t=7.0

Isolines of local Mach number.

Details can be found at URL: http://ipmnet.ru/~burago or at URL: http://nikitinis.ucoz.ru/

[1] The work is supported by Russian Foundation for Basic Research project No. 15-08-02392-a