Lattice Boltzmann Solver

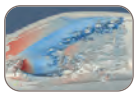
ON GOING PROJECT

Development of a numerical tool for computational fluid dynamics based on Lattice Boltzmann Method and optimized for massively parallel computing.

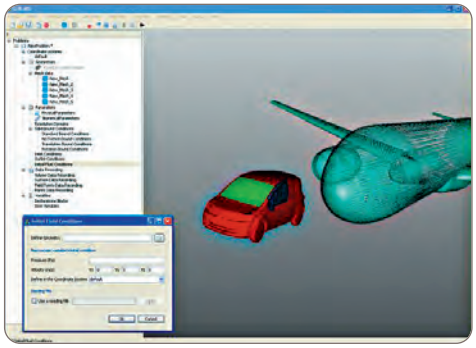
- Application fields: automotive, railway and aeronautic industries.
- Target applications: aerodynamic simulations (calculation and optimization of aerodynamic drag and lift coefficients), aeroacoustic simulations (design optimization for noise sources reduction) and acoustic simulations (porous materials modeling).

One of the key objectives of LaBS is to offer the first commercial software with direct aeroacoustic simulation capabilities (simultaneous simulation of aerodynamic noise sources and their acoustic propagation).

TECHNOLOGICAL OR SCIENTIFIC INNOVATIONS

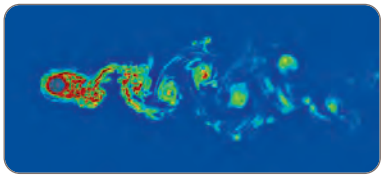


- Immersed Boundary conditions approach and octree-based mesh for full automatic meshing on very complex geometry.
- Code performance optimization for massively parallel computation on very large mesh.
- Development and validation of Large Eddy Simulation turbulence models to capture unsteady flow physics on industrial configurations.
- Direct noise calculation with improved numerical schemes for acoustic propagation.
- Microscopic characterization of porous materials and development of condensed models of acoustic porous materials for the Lattice Boltzamnn Method.



- Development of numerical methods for sensitivity and error analysis, and for aeroacoustic source identification.
- Drafting of the best practices guides for industrial simulation based on extensive software validations.
- Development of a dedicated GUI software and integration of LaBS on a web platform for a commercial distribution based on a CPU-on Demand service.

STATUS - MAIN PROJECT OUTCOMES



- First operational version of the GUI software available.
- Solver under validation on industrial flow configurations.
- Parallel solver available on the Virtual Nodes platform (CPU on Demand) for validation phase.
- First works on acoustic impedance boundary condition and moving solid models done.
- Five publications published in international scientific journals by academic partners: complex differentiation of LB scheme, time-reversal LB model, dispersion an dissipation preserving LB schemes for computational aeroacoustics, improvement of LB.

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PROJECT DATA

Coordinator:
RENAULT

Co-label:
LUTB, MOV'EO, MTA

Call:
FUI8

Start date:
November 2009

Duration:
36 months

Global budget (M€):
3.7

Funding (M€):
1.9

Related Systematic project(s):
CSDL, SCOS