XFlow 2013
Computational Fluid Dynamics

Full Features List

Engine

Solver

- Fully Lagrangian kinetic solver - Lattice Boltzmann Method
- Compressible
- Transient
- 2D / 3D
- Single phase flow: internal / external (Virtual wind tunnel)
- Free surface flow: internal /external (Water channel)
- Multiphase flow: two immiscible fluids / continuous phase + discrete phase (DPM)
- Heat transfer: conduction / convection / surface-to-surface radiation (Monte-Carlo)
- Buoyancy (Boussinesq approximation)
- Turbulent flow – Large Eddy Simulation (LES)
- Subgrid-scale turbulence model: Smagorinsky / dynamic Smagorinsky / Wall-Adapting Local-Eddy
- Acoustics – Direct computation of sound
- Non-Newtonian fluids - viscosity models: Herschel-Bulkley / Power-law / Cross / Carreau / user-defined
- Fluid state-equations: incompressible / ideal gas / Boussinesq model

Fluid Structure Interaction (FSI)

- Rigid body solver fully coupled with fluid solver
- Body motion: 6 DOF / Constrained / Enforced
- Body forces: Restitution / Friction / External
- Automatic collision detection
- Conjugate heat transfer
- Structural analysis: XFlow engine

Boundary Conditions

- Wall models: no-slip / free slip / turbulent boundary layer / universal wall model
- Inlet: velocity / mass flow / gauge total pressure
- Outlet: gauge pressure / convective / velocity / mass flow / gauge total pressure
- Others: fan model / porous jump / porous volume / periodicity
- Thermal analysis: adiabatic / temperature / heat flux / conjugate heat transfer / surface emissivity

User Interface

General

- Integrated working environment: domain generation / pre-process / run / post-processing
- Configurable layout: dynamic windows and toolbars
- Advanced real-time graphics visualization
- Integrated ray-tracing and OpenGL post-processing
- Inputs: drop-down multiple-choice list / switch / user-defined functions / tabular data
- XML project file format

Pre-Processing

- Easy-to-use setup workflow
- Built-in modules for Virtual-wind-tunnel and Water-channel
- Geometry creation tools: basic-shapes generation / create mesh shape / duplicate shapes and faces
- Geometry modification tools: translation / rotation / scale / symmetry / split / heal
- Geometry import – compatible standard formats: IGES / STEP / STL / BREP / NFF / NFB / CSFDB / OFF / BDF
- Automatic tessellation for parametric geometries
- Domain initialization from previous XFlow computations
- Graphic function viewer for user-defined input laws
- Symbolic function parser

Domain Generation

- Automatic domain generation (mesh-less technology) – octree-like grid
- Multi-resolution scheme, refinement criteria: walls / curvature adapted / wake adaptive / user-defined region
- Low geometry requirements ("watertight" only)
- Geometry motion – domain is adaptive (mesh-less technology)

Run

- Start-Stop-Resume computation
- Advanced computation dialog box to submit remote jobs and MPI jobs
- Batch mode available – command line
- Efficient parallel processing on shared and distributed memory environment
- Distributed computation (MPI) compatible with moving parts

Post-Processing

- Visualization mode: volumetric field / surface field distribution / particles / isocontours
- Visualization utilities: cutting planes / vectors / isosurfaces / stream tracers / plot lines / sensors
- Function viewer for the monitoring of: stability parameter / mass-momentum integrals / forces / moments / sensor data
- Post-process operations: surface integral / volume integral / custom field calculation
- Export data to other formats: raw / ParaView / Ensight Gold
- Animation tool – to save an image sequence that can be assembled in a video file