

The ideal complement to ACTRAN TM for aircraft engine exhaust

KEY FEATURES

- > Module based on Linearized Euler Equations (LEE) : ability to solve problems with strong shear layers, temperature gradients or non-homentropic flows
- > Resolution based on a Discontinuous Galerkin Method
- > 2D, axisymmetric and 3D analysis
- > Unstructured mesh with adaptive high order elements (ranging from 1 to 16) : the mesh can be used for several frequencies
- > Automatic and efficient detection of the harmonic regime
- > Far-Field radiation based on a Ffowcs-Williams and Hawkings Formulation
- > Very low RAM consumption
- > Domain parallelism with automatic partitioning leading to high scalability both in computational time and RAM
- > Various boundary conditions available : duct modal basis, absorbing buffer zone (to simulate the far field) and admittance (supplemented with Myers' term if grazing flow)
- > Coupling with standard CFD codes
- > Integration in ACTRAN VI



Product overview

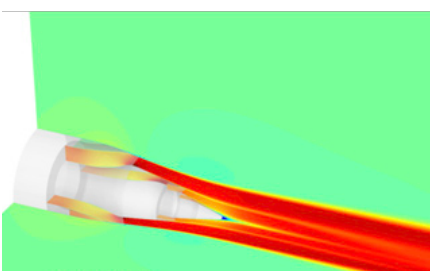
Modeling noise propagation in complex flows using linearized Euler equations and discontinuous Galerkin methods

ACTRAN DGM solves the linearized Euler equations using discontinuous finite elements and is used for predicting the noise propagation in complex physical conditions. It is particularly well suited to solving aero-acoustic problems at the exhaust of a double flux aero-engine, including effects such as propagation through strong shear layers, high temperature gradients and non-homentropic mean flows. ACTRAN DGM can address 2D, 2.5D (axisymmetric with azimuthal order) or 3D problems. It includes all required boundary conditions: decomposition of the engine excitation in duct modes, non-reflective boundary conditions with absorbing buffer zones; liners are modeled using a time-domain translation of the Myers BC (Extended Helmholtz Resonator Model).

The straightforward mesh generation is one of the key advantages of ACTRAN DGM. As an unstructured

mesh method, it is not submitted to the standard constraints of a Finite Difference mesh. As the order of the elements is automatically adapted, the mesh can be "non-homogeneous" (i.e. using very small and large elements in the same model) without any performance degradation. In addition, the same mesh can be reused for frequencies of ratio 1 to 4 (i.e. a mesh that was designed to run at a frequency of 1000Hz can be used for frequencies ranging from 500Hz to 2000Hz).

Thanks to the implementation of a discontinuous spatial scheme for solving the Linearized Euler Equations, the performance is highly scalable in parallel. This scalability of the RAM consumption and computational time makes the solution of very large problems (in terms of kR) possible.



Target applications

- > Exhaust of turbomachines
- > Inlet of large turbomachines
- > All acoustic propagation problems with non-homogeneous mean flow conditions

THE ACTRAN SOFTWARE SUITE

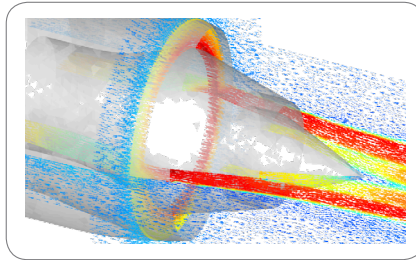
ACTRAN is the most complete acoustic, vibro-acoustic and aero-acoustic CAE software suite. Under a common technological umbrella provided by the finite and infinite element method, ACTRAN provides a rich library of elements, material properties, boundary conditions, solution schemes and solvers. ACTRAN is a high performance, high productivity, high accuracy modeling environment suiting the needs of the most demanding engineers, researchers and teachers and empowering them with the tool they need for solving the most challenging acoustic problems.

FREE FIELD TECHNOLOGIES

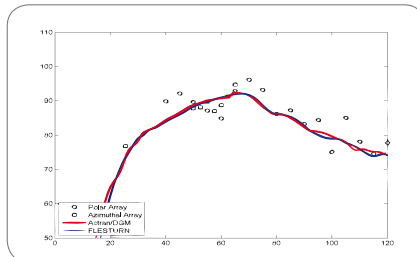
Free Field Technologies develops, maintains, supports and sells the ACTRAN acoustic CAE software suite. The company also provides related support, technology transfer, engineering, technical support, training and customization services.

FFT operates from its headquarters in Mont-Saint-Guibert (Belgium) and from local offices in Toulouse (France) and Tokyo (Japan). ACTRAN is distributed worldwide by a dense network of partners; please contact us for details of your nearest partner.

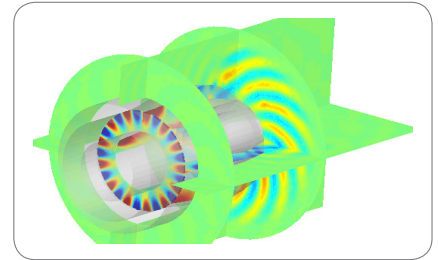
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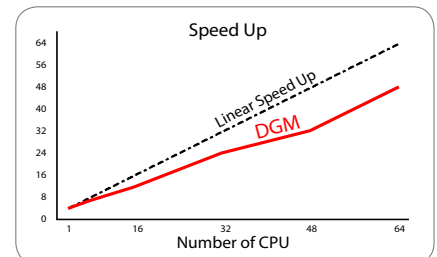
ACTRAN DGM handles complex flows on real life geometries.



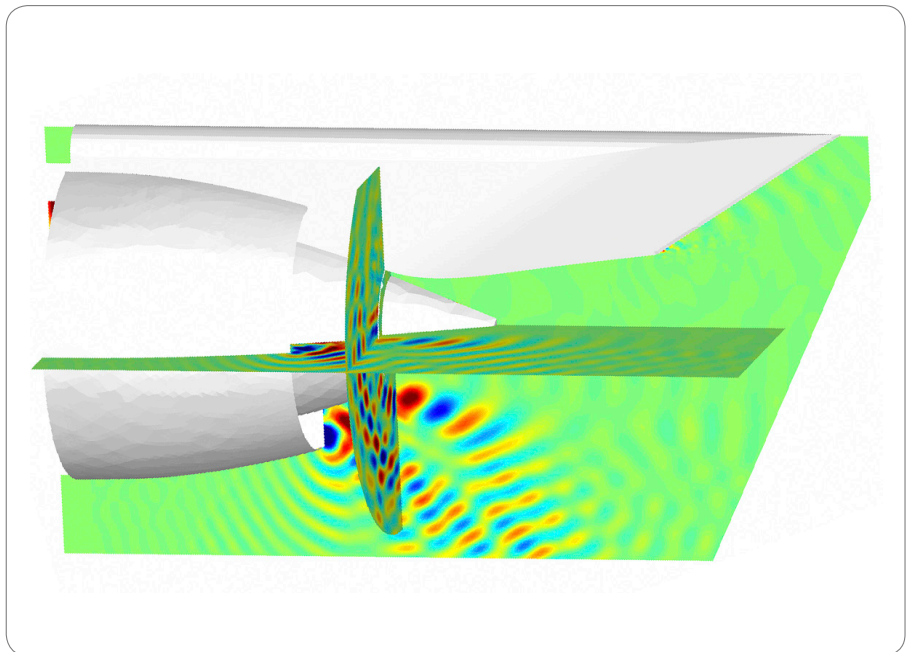
Comparison of measurement data and ACTRAN DGM simulations results (TURNEX EC project).



Acoustic mode propagation from the exhaust of an airplane jet engine.



The ACTRAN DGM parallel solver is highly scalable.



Complex propagation of a high order duct mode through the exhaust of an aircraft jet engine - Model courtesy of Airbus™.