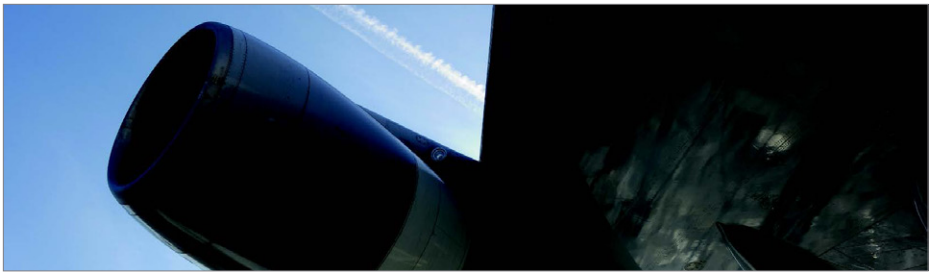
Actran™ DGM

The Ideal Complement to Actran TM for Noise from Aircraft Engine's Exhaust Powerful Solver for Sound Radiation from Large Vibrating Structure at Broad Frequency Ranges



Product Overview

Modeling noise propagation in complex flows with discontinuous Galerkin method solving linearized Euler equations

Actran DGM solves the linearized Euler equations using discontinuous Galerkin method.

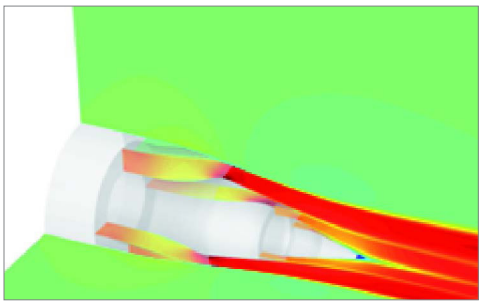
Actran DGM is primarily used for predicting the noise propagation in complex flow conditions. It is particularly well suited to solving acoustic propagation problems at the exhaust of a double flux aero-engine, including effects such as propagation through strong shear layers, high temperature gradients and complex mean flows. Actran DGM can address 2D, 2.5D (axi-symmetric with azimuthal order) and 3D problems. It includes all required boundary conditions: decomposition of the engine excitation into 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 orders of the elements are automatically adapted and the mesh can be "non-homogeneous" (i.e. using very small and large elements in the same model). 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).

Actran DGM is also used for solving sound radiation problems of large vibrating structures, with the structure's vibration calculated by a structure FEA code, such as MSC Nastran.

The performance of DGM is highly scalable in parallel computations, which makes the solution of very large problems affordable, on large number of CPUs but with low requirement of RAM.

Target Applications

- Exhaust of turbomachines
- Inlet of large turbomachines
- Sound radiation from large structures: automotive powertrain, car body, etc.

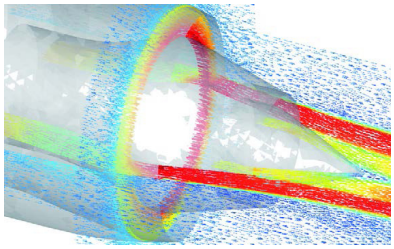


Acoustic propagation from aircraft engine exhaust

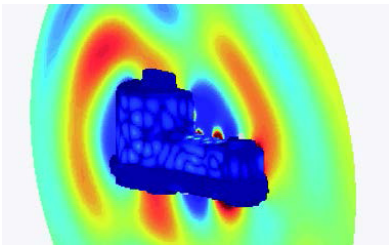
Key Features

- Module based on Linearized Euler Equations (LEE): ability to solve problems with strong shear layers, temperature gradients or nonhomentropic flows
- Resolution based on a Discontinuous Galerkin Method
- 2D, axisymmetric and 3D analysis
- Unstructured mesh with adaptative high order elements (ranging from 1 to 16): same mesh can be used for different frequencies
- Automatic and efficient detection of the harmonic regime
- Far-Field radiation based on a Ffowcs-Williams and Hawkings Formulation
- 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
- Coupling with structure FEA to model sound radiation from large vibrating structure
- Integration in Actran VI

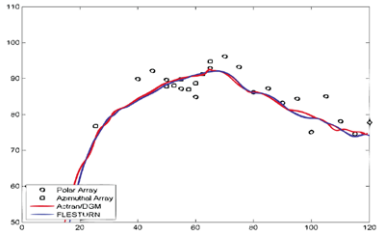
MSC Software



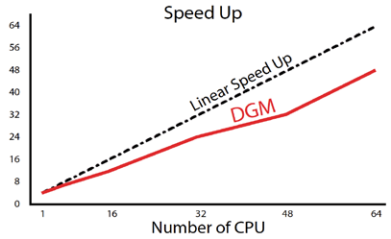
Actran DGM handles complex flows on real life geometries



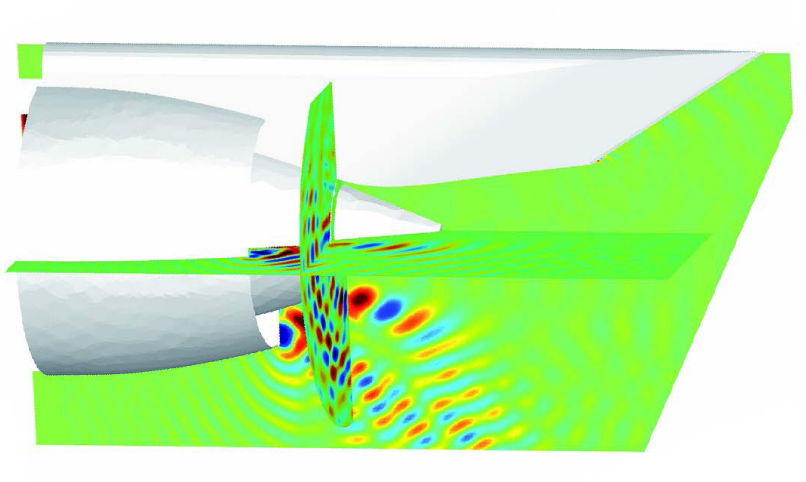
Sound radiation by a vibrating gearbox solved by DGM



Comparison of measurement data and Actran DGM simulation results (TURNEX EC project)



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

Actran Software Suite

Actran is a complete acoustic, vibro-acoustic and aero-acoustic CAE software suite. Empowered by the technologies of finite/infinite element methods (FE/IFE), as well as the Discontinuous Galerkin Method (DGM), Actran provides a rich library of materials, elements, boundary conditions, solution schemes and solvers. Actran is a high accuracy, high performance and high productivity modeling tool suiting the needs of the most demanding engineers, researchers, teachers and students for solving the most challenging acoustic problems.

Free Field Technologies (FFT)

Free Field Technologies is focused on three main areas:

- Developing Actran software for acoustic, aero-acoustic and vibro-acoustic simulation;
- Providing technical services, support, training and delivering acoustic engineering projects;
- Researching innovative technologies and methods of acoustic analysis in order to remain the leader in acoustic modeling.

Free Field Technologies has more than 250 customers around the world active in the Automotive, Aerospace, Shipbuilding, Electronic and Heavy Equipment industries as well as in the Educational and Research sectors.

FFT is a wholly owned subsidiary of MSC Software Corporation.

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