

# Master's / Engineering degree internship: Advanced numerical acoustic methods development (multiple topics)

## Free Field Technologies:

Free Field Technologies (FFT) is a leading global company focused on acoustic simulation and engineering services based in Belgium near Brussels. Actran, FFT's software product, leads numerous technology trends of vibro-acoustic and aero-acoustic modeling. FFT is a subsidiary of MSC Software Corporation, a global leader in helping product manufacturers enhancing their engineering methods with simulation software (such as MSC Nastran, Marc or Adams) and services.

Working at FFT is a unique opportunity to be in contact with a wide variety of topics for different industries (space, aeronautics, automotive, shipbuilding...) and the most prestigious actors such as Airbus, Renault, Bose, Snecma or Ferrari. Within the young, dynamic and passionate teams of FFT you will have the opportunity to work in a very creative and inspiring atmosphere, and learn something new every day.

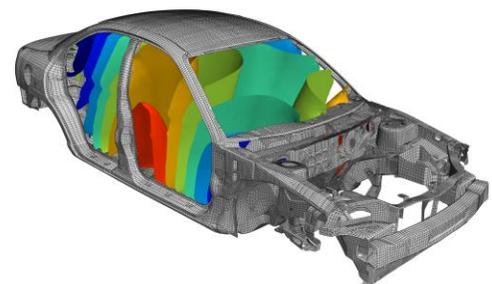
## Context and job description:

Four different topics are proposed. These topics concern the application to simple and industrial cases of new numerical methods recently developed in Actran.

### Topic 1 : Vibro-acoustic simulation of trimmed car body based on hybrid modal-physical approach

Noise and Vibration are important contributors to the comfort of car passengers. The trim components (such as carpet, headliner or seats) play an important role in the global vibro-acoustic performance of a car body. In this framework, all majors automotive OEM are interested in simulation solutions to accurately and efficiently assess the performance of trim package ahead of production.

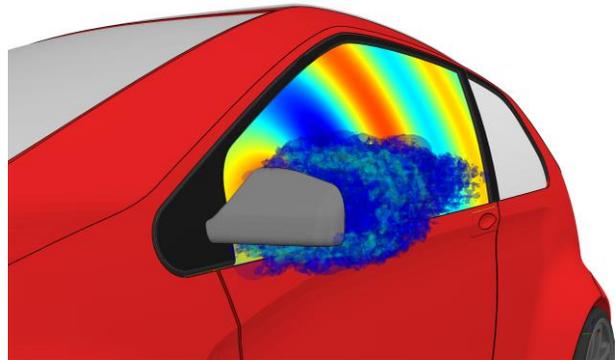
In this internship, the trainee will setup innovative technology to account for the trim components in a complex vibro-acoustic analysis. Methods using technologies such as automatic meshing and locally reacting transfer admittance will be investigated in collaboration with the development and application teams. The objectives of the internship are to understand the sensitivity of the results and the performance obtained following the set of parameters selected. These investigations will be performed on simple and on realistic cases.



## **Topic 2 : Aero-acoustic simulation based on innovative Technology**

Aero-acoustic simulations aim at studying the generation and propagation of noise in perturbed flow (e.g. by the presence of side mirror in automotive application). With new generation of engine and electric motor, the contribution of aero-acoustic noise to cabin noise becomes dominant on extended speed range. Therefore there is a need for simulation methods able to predict wind noise through the most simple and performant method possible.

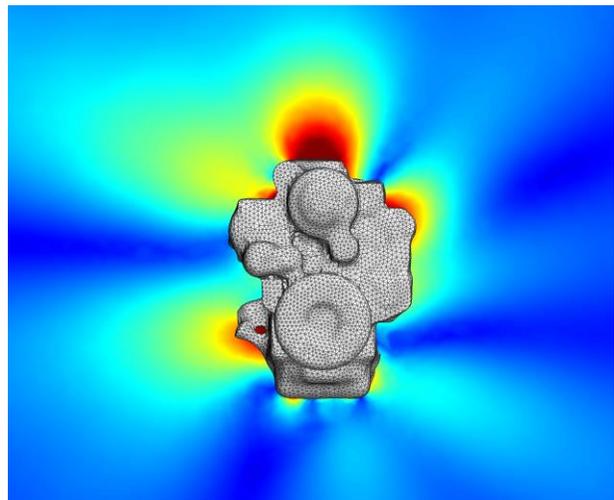
During the internship, the trainee will model aero-acoustic problems such as side-mirror noise and flow noise from air conditioning ducts. The objectives of the internship are to understand the sensitivity of the results and the performance obtained following the set of parameters selected. Innovative technology such as SNGR (stochastic noise generation and radiation) and APE (acoustic perturbation equations) will be used and applied on simple and on realistic cases.



## **Topic 3 : Innovative acoustic radiation simulation based on broadband time domain approach**

Acoustic radiation of vibrating components (such as internal combustion engines or gearbox) is an important contributor to the environmental noise produced by road vehicles. In this framework, more and more actors of the automotive industry aim at performing optimized acoustic simulations on always more complex configurations (e.g. complete powertrain in engine compartment with all accessories).

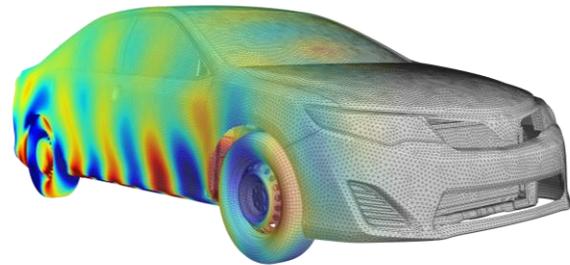
In this internship, the trainee will setup an innovative technology to compute the acoustic radiation of vibrating structures in time domain aiming at reducing the computation time compared to a classical frequency domain approach. He will have access to new version of the software dedicated to this type of application for automotive and aerospace industries. The objectives of the internship are to understand the sensitivity of the results and the performance obtained following the set of parameters selected. These investigations will be performed on simple and on realistic cases.



#### **Topic 4 : Investigations of vibro-acoustic simulation computation time optimization based on adaptive mesh technology**

Finite element software rely on a mesh in order to approximate the continuous solution field. The characteristic of the mesh are defined in order to ensure proper accuracy and CPU efficiency. For acoustics and structure dynamics, the mesh size is directly related to the frequency to solve. In most cases, to limit the pre-processing effort, only one mesh is built based on the most constraining criteria leading to unnecessary long computation time.

In this internship, the trainee will setup innovative technology to perform automatic adaptive re-meshing allowing to optimize computation performance while limiting the pre-processing effort of the user. He will have access to new version of the software dedicated to this type of application for automotive and aero-space industries. The objectives of the internship is to determine the best strategy possible to optimize both accuracy and computation time using the adaptive meshing technology available in Actran. These investigations will be performed on several cases representative of typical acoustic simulation models run in the industry.



#### **Profile:**

Trainee must be in his last year of engineering master degree, preferably in Solid Mechanics, Fluid Mechanics or Civil Engineering. He/she must have the ability to work well with others in a diverse team environment. Good knowledge of English and a taste for numerical simulations are mandatory. Knowing basics of acoustics, structure dynamics, finite elements, meshing tool and numerical methods are assets.

#### **Application:**

To apply to this internship, please send a resume and cover letter to:

- Marie-Laure Lefebvre, Human Resources Manager, [mll@fft.be](mailto:mll@fft.be)
- Alexis Talbot, Senior Application Engineer and Product Marketing Manager, [ata@fft.be](mailto:ata@fft.be)

Please make sure to indicate the topic of interest in your application.

For any question regarding the technical content of the internship, please contact Alexis Talbot (see email address above)