VIBES toolbox for MATLAB

Experimental modelling // Dynamic Substructuring // Transfer Path Analysis

The VIBES toolbox for MATLAB offers unique capabilities for Experimental Modelling, Dynamic Substructuring and Transfer Path Analysis. The latest scientific advancements in structural dynamics have been implemented in an easy-to-use toolbox for MATLAB. The toolbox comprises a powerful 3D environment, allowing to pick and place your measurement instrumentation on CAD geometry. The object-oriented workflow unlocks a wide range of Frequency Based Substructuring and TPA methods, all accessible and adaptable from the command-line. Save time by automating repetitive processes in simple scripts and generate plots conveniently using intuitive commands for data selection. Create FEM-compatible 'super-elements' from FRF measurements using the Virtual Point Transformation. Combine experimental component models, numerical models and operational data, realising a truly hybrid approach to sound & vibration simulation. Import, manage and share your results using the industry-standard ASAM-ODS format.

VIBES.technology

www.vibes.technology
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Fully integrated with MATLAB

Object-oriented // Extendable classes // Independent from other toolboxes

The object-oriented toolbox provides well-designed classes and functions for analysis and simulation of sound and vibrations. All data (time series, FRF spectra, etc.) and meta-data (channel description, units, etc.) are kept neatly together, which simplifies and accelerates your way of working. This object-based data management is the perfect solution to archive, retrieve and share data with your colleagues that use a variety of tools / software. For the first time, one has the possibility to perform complex substructuring and TPA operations simply by writing out their most basic formulas. The VIBES toolbox assists you along the way and handles all the 'bookkeeping' automatically. A CAD-like 3D experience as well as an audio playback service are offered to further improve your workflow.

Through the object-oriented structure of the toolbox, one is able to extend all classes, which allows you to customise the VIBES toolbox for MATLAB. The implementation of custom version control, routines, methods and algorithms etc. are all possible.

Unique Selling Points

Data management // 3D Environment // Experimental modelling // Scripting

DATA MANAGEMENT

- Import/export data using the ASAM-ODS format
- Interface with 3rd party software (e.g. MSC Software)
- Customise the data management structure to your organisation's needs

UNIQUE CAPABILITIES FOR EXPERIMENTAL MODELLING

- Create 'super-elements' from measurements (FEM compatible)
- Reduce experimental errors using unique quality assurance criteria
- Create hybrid models using FBS coupling and decoupling
- Experience ultimate freedom in applying a wide range of TPA methods

INTUITIVE 3D ENVIRONMENT

- Import and visualise CAD geometry (e.g. *.stl)
- Drag & drop measurement equipment
- Define impact positions for FRF measurements
- Use the 3D environment for visual guidance during impact measurements

EASE OF SCRIPTING

- Perform Dynamic Substructuring and TPA by writing simple formulas
- Save time by automating repetitive processes in simple scripts
- Easy access to measurement data by querying upon names, quantities etc.
- Reduce time using built-in plot functions (spectra, Nth-octave, db(A), etc.)

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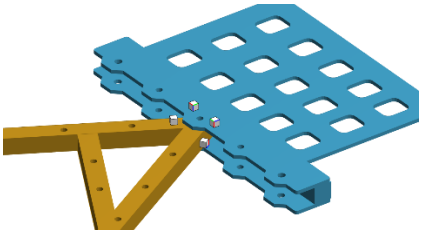
Dynamic Substructuring

Analyse the dynamics of mechanical systems



Dynamic Substructuring (DS) has proven to be a powerful engineering tool for a wide variety of industries. It allows a complex dynamic system to be modelled and analysed as separate components. The components may be coupled from either numerical (FEM) or experimental nature.

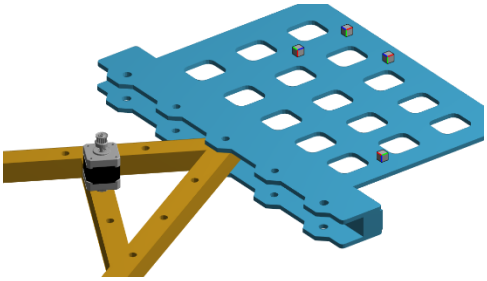
DS allows identification of local dynamic problems, as well as efficient local optimisation of the structure with respect to its assembly. It enables sharing and combining substructures from different suppliers and design groups.

Transfer Path Analysis

Quantify and qualify structure-borne and airborne vibrations

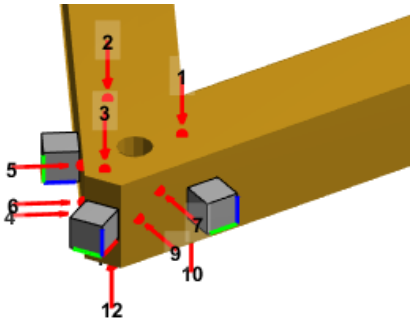
Transfer Path Analysis (TPA) has been a valuable engineering tool for as long as noise and vibrations of products have been of interest. A TPA concerns a product's actively vibrating components (such as engines, gearing systems or turbochargers) and the transmission of these vibrations to the connected passive structures.

TPA is particularly useful when the actual vibrating mechanisms are too complex to model or measure directly, as it allows us to represent a source by forces and vibrations displayed at the interfaces with the passive side.



Experimental Modelling

FE compatible models from measurements



A key factor in successful Dynamic Substructuring and Transfer Path Analysis efforts, is proper coupling of component models. For a complete and accurate model of the dynamics at the interface, both translational and rotational degrees of freedom are required.

The Virtual Point Transformation allows the translation of measured Frequency Response Functions in the vicinity of a coupling point to FRFs with six degrees of freedom per coupling point, resulting in FE-compatible models.

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All available in 3 comprehensive modules

Base licence | DS module // TPA module // FEA module

The VIBES toolbox for MATLAB consists of a base license with three optional modules: a base licence with data management and data viewing capabilities, the DS module for experimental modelling and substructure coupling/decoupling procedures, the TPA module for operational data manipulation and a wide range of TPA methods and the FEA module to bring measurements and FEA simulations closer together.

Base licence

- Data management
- Import/Export ASAM-ODS
- Import/Export CAD geometry
- Data viewer
- Virtual measurement set-up in 3D environment
- Signal processing functionalities
- Audio playback

Module: Dynamic substructuring (DS)

- Substructure coupling
- Substructure decoupling
- Virtual Point Transformation
- Automated matching of Degrees of Freedom
- FRF quality indicators: reciprocity, channel consistency checks

Module: Transfer Path Analysis (TPA)

- Classical TPA
- Component TPA
- Operational TPA
- Source characterisation (interface force, blocked force determination)
- Easy operational data selection
- Conversion of time data to compatible frequency blocks

Module: Finite Element Analysis (FEA)

- ANSYS import (via APDL scripting)
- FRF synthesis
- Modal parameter calculations
- Operational Deflection Shape animation
- Virtual Experiments

Please inquire for pricing and licensing options.

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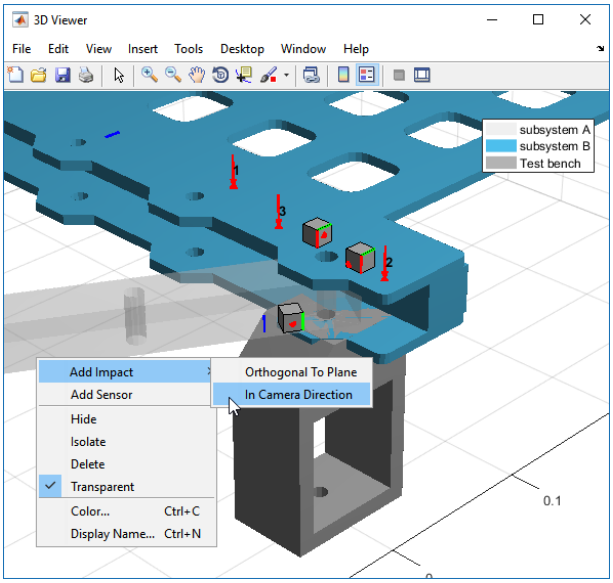
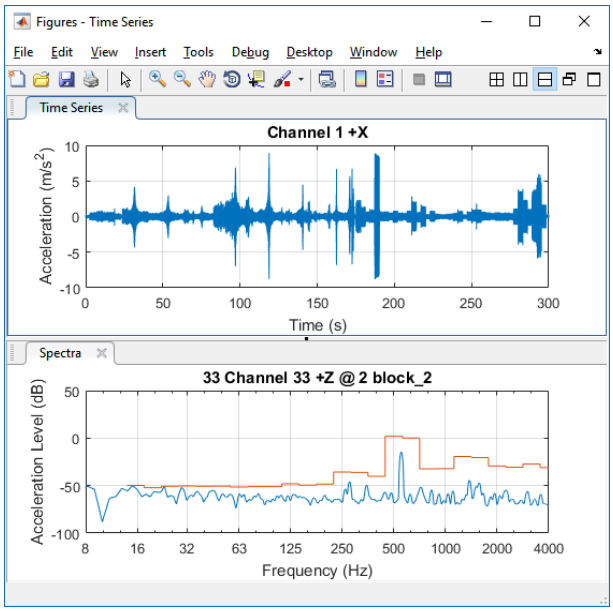
Impressions of the software

Efficient workflow // Experimental modelling // Scripting

Powerful 3D environment





Convenient plot generation

Intuitive arithmetic

Automatic bookkeeping

```
YA = vibes.load('datasets','YA.FRFMatrix.mat');
YB = vibes.load('datasets','YB.FRFMatrix.mat');

f = vibes.load('datasets','TB.FreqBlocks.mat');

% Couple using DS
YAB = YA + YB;

% Predict and plot 3rd octaves using TPA
TPA = YAB * f;
TPA.plot('Microphone left','oct3dba')
```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