FEMtools™ Framework

An Interactive Desktop and Scripting Environment for Engineering Analysis and CAE Process Automation

FEMtools Framework is a multi-functional interactive environment for advanced engineering application development, integration, and automation. The framework includes data interfaces, database management utilities, mesh generation and manipulation tools, parameter and response management, state-of-the-art data visualization, plus a full featured scripting language and API function library.

Optionally, FEMtools Framework includes a standard finite element library and solvers for linear static and normal modes analysis. Alternatively, standard external solvers like NASTRAN, ANSYS, I-DEAS, ABAQUS or in-house solvers can easily be integrated and piloted as part of larger analysis processes.

This open and flexible CAE application development platform is used by analysts to integrate their tools, and create vertical applications that meet the specific requirements of an industry. A unique capability of FEMtools Framework is the integration of data resulting from experimental static or dynamic testing.

Key Features

- Convert finite element and test data into a uniform, structured relational database
- Analyze, visualize, manage and report your engineering simulation and test data
- Solve for static and dynamic responses using built-in solvers or by piloting external solvers
- Use FEMtools Script with hundreds of built-in math and API functions to access all data and create your own functions and programs

Applications

FEMtools Framework is a software-neutral CAE application development tool mainly used for developing tools that exploit hybrid test and analysis databases. It provides the foundation for all FEMtools products and for products developed by independent partners.

As a stand-alone tool, FEMtools Framework can be used as a utility software for

- Data management, translation and transformation
- Pre- and postprocessing of FEA and test data
- CAE process integration and automation
- Development of vertical applications

Benefits

- Faster and more efficient development
- Re-use of standard components like graphics viewers and data translators
- Customized user interfaces
- Solver-neutral integration with virtually every FEA package
- Integration with virtually all types of test data
- Computing and OS platform-independent applications
- The programming language and API provide a layer between the database and applications. This reduces the risk of corrupting the database

Framework Components

Data Interfaces and Management

- Optional integrated direct, bi-directional interfaces FEA : NASTRAN, ANSYS, I-DEAS , ABAQUS, … Test: Universal File, Custom file formats
- Direct import/export of data tables (Excel, Matlab,…)
- Database explorer using tree-lists
- No limitation on FE model size
- Automatic creation of sets of elements based on topology, material or geometry
- Spreadsheet-style table editing
- Mesh generation and morphing tools
- Mesh quality analysis commands
- Conversion of engineering units
- Support of local coordinate systems
- Modal database normalization, scaling, truncation and expansion
- Creation of element and node sets based on properties or by graphical picking
- Boolean operations on sets
- Verification of FEA database integrity
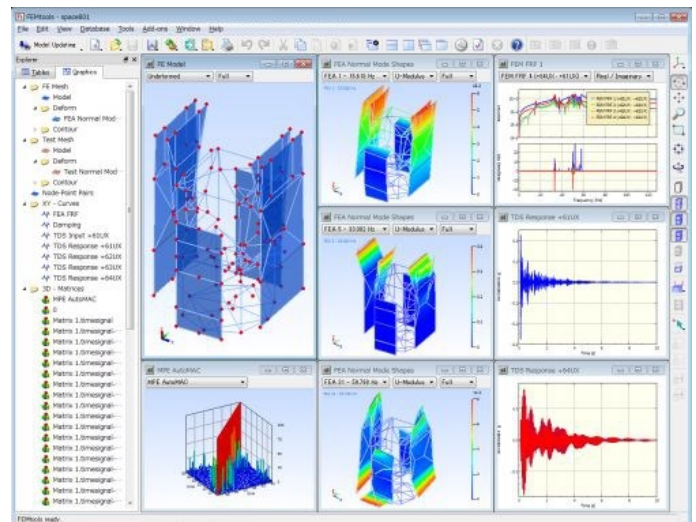
Frequency response analysis of a satellite system.

FEMtools
simulate > validate > update > optimize

Parameter and Response Selection

- Selection of all element material properties, geometrical properties, boundary conditions, lumped masses, and damping factors as parameters

- Selection of mass, static and dynamic displacements, resonance frequencies, modal displacements, MAC, FRFs, and FRF correlation functions as responses

- Lower and upper bound constraints

- Definition of parameter relations

Interactive User Interface

- Customizable menus, toolbars and shortcuts

- Complete online documentation

- Journal and log file for session replay

- Progress indicators, and cancel button

- Report generator (HTML)

- Floating and dockable toolbars

- Multiple graphics, table and editor windows

- Console window for commands and feedback

Graphics Viewers

- XY-curves, matrix and mesh visualization

- Graphical picking of nodes and elements

- Dynamic viewing (rotation, pan and zoom)

- OpenGL graphics rendering

- Color-coded and vector-coded displays

- Animated, side-by-side and overlay plots

- Export of animated shapes as AVI files

- Export graphics to various graphics file formats

FEMtools Script Language

FEMtools Script is a rapid scripting language that is adapted to the needs of simulation engineers. Scripts can be used to add, customize or automate about any imaginable task.

- Compiled byte-code for fast execution

- Integrated script editor with color coding

- Functions for mathematical programming (array operators and functions, sparse matrices, regular expressions, set manipulation, …)

- Functions for integrating with third party tools (exchange of matrices with Matlab or MS Excel, launching and controlling subprocesses,...)

- Functions for user interface development (graphical picking, dialog boxes, explorer,…)

- Script encoding for protecting intellectual property or ensuring source code integrity

FEMtools API Function Library

The FEMtools API is a library of functions that can be used from within script programs to access FEA data or test data, re-use built-in solvers and analysis tools, user interface development, and pilot external CAE or test tools.

Finite Element Library and Solvers

- Internal finite element library (lumped mass, beams, plates, shells, volume elements, damper element)

- Isotropic, orthotropic and anisotropic materials

- Constraint equations (MPC, RBE2, RBAR,...)

- Linear static analysis

- Normal and complex modes analysis (Lanczos solver)

- Use integrated FEMtools or third party solvers

- Upgrade path to FEMtools Dynamics for advanced dynamics simulations

Options

- Upgrade to FEMtools Dynamic, FEMtools Pretest and Correlation, FEMtools Model Updating or FEMtools Optimization

- FE interfaces and drivers (ANSYS, ABAQUS, LS-DYNA, MSC.NASTRAN, NX NASTRAN, SAP2000, Universal File)

- Modal Parameter Extractor (Add-on)

- Rigid Body Properties Extractor (Add-on)

Services

- Regular software maintenance

- Installation, training and customization

- Hotline support by e-mail and phone

- Internet support site

- Custom software development

- Project research

- Engineering services

Supported Platforms

- Windows 7, 8, 10 (64-bit)

- Linux (64-bit)

Licensing

Flexible node-locked or floating licensing of annual or paid-up licenses.

For more information, contact us at

DDS Dynamic Design Solutions

CAE Software and Services

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