

OVERVIEW

IMAT is a MATLAB® interface offered by ATA Engineering, Inc. (ATA). Designed for test and analysis engineers, it provides a framework for easily importing finite element (FE) simulation data and measured test data into the MATLAB environment to leverage MATLAB's versatile programming, visualization, and mathematical strengths. With the IMAT toolbox, test and simulation data such as mode shapes, time histories, spectra, and other functions can be viewed and manipulated in MATLAB while preserving all of the native data attributes.

IMAT facilitates the manipulation of test and simulation data in MATLAB by defining datatypes that contain descriptive attributes as well as the data. Numerous methods within IMAT allow powerful and complex operations to be performed directly on these datatypes while preserving the data's descriptive attributes. Selection filters coordinate traces, and groups make selecting, sorting, filtering, and partitioning the datasets straightforward.

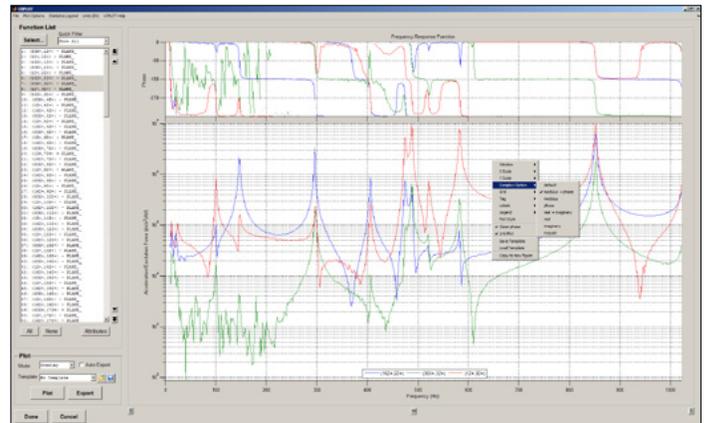
Operations such as matrix multiplications and repetitive data calculations can be performed in the powerful MATLAB matrix language. Many capabilities are available to perform advanced processing in simple steps.

FEA entities such as coordinate systems, nodes, elements, and tracelines can also be imported into MATLAB. IMAT allows the user to perform coordinate transformations and plotting, providing the ability to display and animate mode shapes making sharing results easy by creating AVI or MPEG4 files of your mode shape animations. You can also generate contour plots of stress and other data quantities.

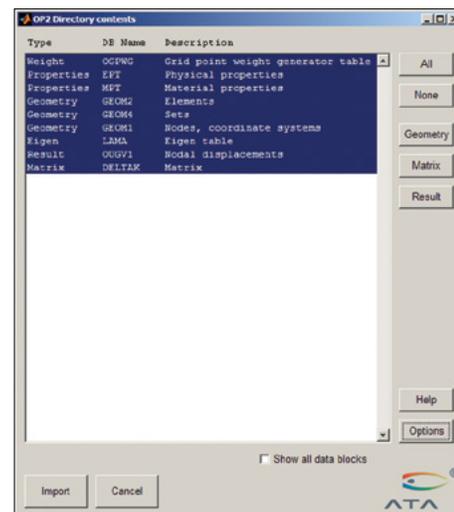
IMAT EXTENDED CAPABILITIES

IMAT offers several add-on toolboxes that are organized according to the capabilities they offer. These toolboxes greatly expand IMAT's core capabilities. The toolboxes include IMAT+FEA, IMAT+Modal, and IMAT+Signal.

IMAT+FEA allows users to import simulation data from Nastran, I-deas, Abaqus, or Femap and then operate on that data using the full capabilities of MATLAB. Nastran users can read data directly from the binary result database (.op2), ASCII bulk data, ASCII or binary output4 (.op4), or the ASCII punch (.pch) file. I-deas and NX users can import and export associated data files (ADFs) or read the Universal files (.unv). Result data from Abaqus simulations are read directly from the output database (.odb), allowing the user to process Abaqus results independent of Abaqus/Viewer. Femap users can import from and export to the Neutral file format or directly to a Femap session via COM. IMAT+FEA also provides a bidirectional interface to the Femap API, so MATLAB users can communicate directly with Femap via COM. IMAT+FEA is a powerful extension to any CAE application.



▲ The UIPLOT interface gives you incredible flexibility in plotting data and formatting plots.



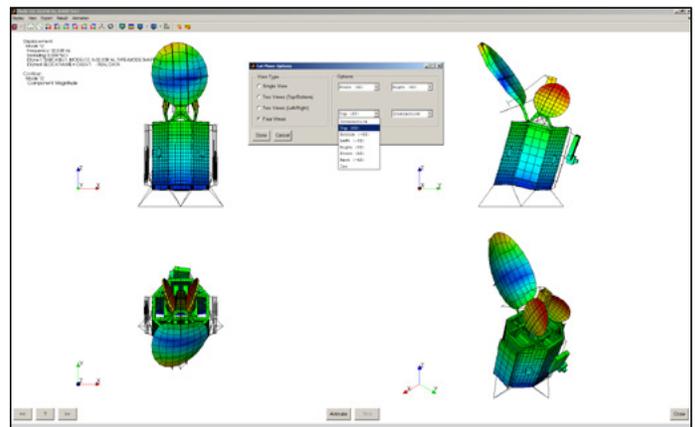
▲ Selectively import Nastran Output2 data into IMAT, previewing the Output2 contents.

IMAT+Modal offers significant functionality that extends IMAT's capabilities for the modal test engineer. IMAT+Modal is a collection of utilities that aids in test planning and postprocessing of test data. It includes methods for pretest analysis, allowing users to optimally select accelerometer locations for a modal test. It also provides procedures for reducing a full finite element model (FEM) down to the test-measured degrees of freedom, as well as parameter extraction utilities for extracting mode shapes from the test data. The IMAT+Modal toolbox comprises several components, including the Test-Analysis Model Toolkit (TAMKIT), the Genetic Algorithm (GA), selectASET, and the Modal Test Kit (MTK). Users can perform modal parameter identification with AFPoly using the Alias-Free Polyreference algorithm, as well as with SDOFit using a single-degree-of-freedom method. The functionality provided by IMAT+Modal makes the entire modal test process more efficient.

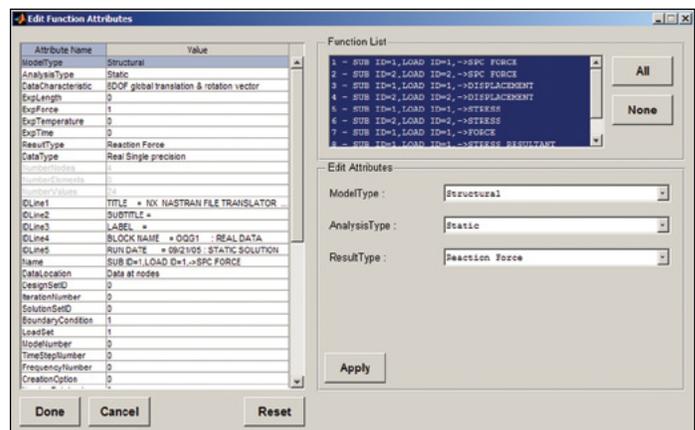
IMAT+Signal extends IMAT's functionality into signal processing, which involves processing data from the time domain into the frequency domain. IMAT+Signal provides graphical interfaces that greatly simplify the task of processing this data. spFRF (signal processing for frequency response functions) is a fully functional GUI for computing frequency response functions (FRF), filtering time-domain data, and creating power spectral density (PSD) and cross spectral density (CSD) functions from time histories. spVIEW facilitates viewing and comparing different measurement datasets. In addition, Rotating Test Kit (RTK) is a GUI that facilitates the analysis of rotational events. IMAT contains the most advanced implementation of order-based Vold-Kalman filtering available in a commercial software product. The IMAT+Signal GUI controls are provided as command-line functions such that any task can be easily scripted within MATLAB.

TOOLBOX COMPONENTS

- ▷ Core **IMAT** provides the basic functionality leveraged by each advanced toolbox
 - Includes data types for XY functions, function filters, coordinate traces, mode shapes, results (stress, strain, etc.), FEM connectivity, groups, and substructures (mass, stiffness, and back-expansion matrices)
 - Includes many methods for math operations, manipulation, and some visualization of the IMAT data types
 - Import and export associated data files (ATI, AFU, and ASH)
 - Import and export Universal files written by I-deas, LMS, ME'Scope, and others
- ▷ **IMAT+FEA** interfaces with several analysis software packages
 - Import Nastran bulk data, punch, Output2, and Output4 files
 - Export Nastran Output2 files and limited bulk data
 - Import Abaqus ODB files
 - Import and export Femap Neutral files
 - Bidirectional connectivity to the Femap API via COM
 - Powerful FEM and result visualization using VTK, the Visualization Toolkit (www.vtk.org)
- ▷ **IMAT+Modal** provides tools for the modal test engineer and analyst
 - Optimal accelerometer selection for modal tests using different methods
 - Test-analysis model (TAM) generation in Nastran
 - AFPoly modal parameter extraction GUI
 - Many utilities for processing, validating, and comparing modal test results
- ▷ **IMAT+Signal** provides tools for the signal processing engineer
 - spFRF GUI for processing time-domain signals to the frequency domain
 - RTK GUI for processing order-tracked data from rotating equipment using Vold-Kalman filtering
 - spVIEW GUI for comparing multiple measurement datasets
 - Command-line functions for calculating power and cross-spectral densities, frequency response functions, and shock response spectra, as well as Vold-Kalman filtering



▲ Display and animate your mode shapes, change the mode shape view, and export your animations to an AVI or MPEG4 file.



▲ Easily review shape, function, and result attributes with the convenient edit_attributes graphical interface.

NEW FEATURES IN IMAT V6.2

- ▷ Supports MATLAB R2014b and higher
- ▷ Migrate to Nastran-centric element types IDs and coordinate system labeling
- ▷ Support newer NX Nastran Output2 datablock types and may additional element types
- ▷ Support exporting some Nastran bulk data entities such as DMIG cards, MPCs, and some FEM entities
- ▷ Support Femap 11.3.x through the COM interface
- ▷ Easily create and modify FEM connectivity using Microsoft Excel
- ▷ Additional control over VTK plots
- ▷ Support additional Abaqus heat transfer analysis results import from ODB files

HARDWARE PLATFORMS

The IMAT toolbox was written primarily in the MATLAB language. Versions are available for 64-bit Windows, 64-bit Linux, and 64-bit Mac platforms. MATLAB R2014b (or higher) is a prerequisite for IMAT v6.2.