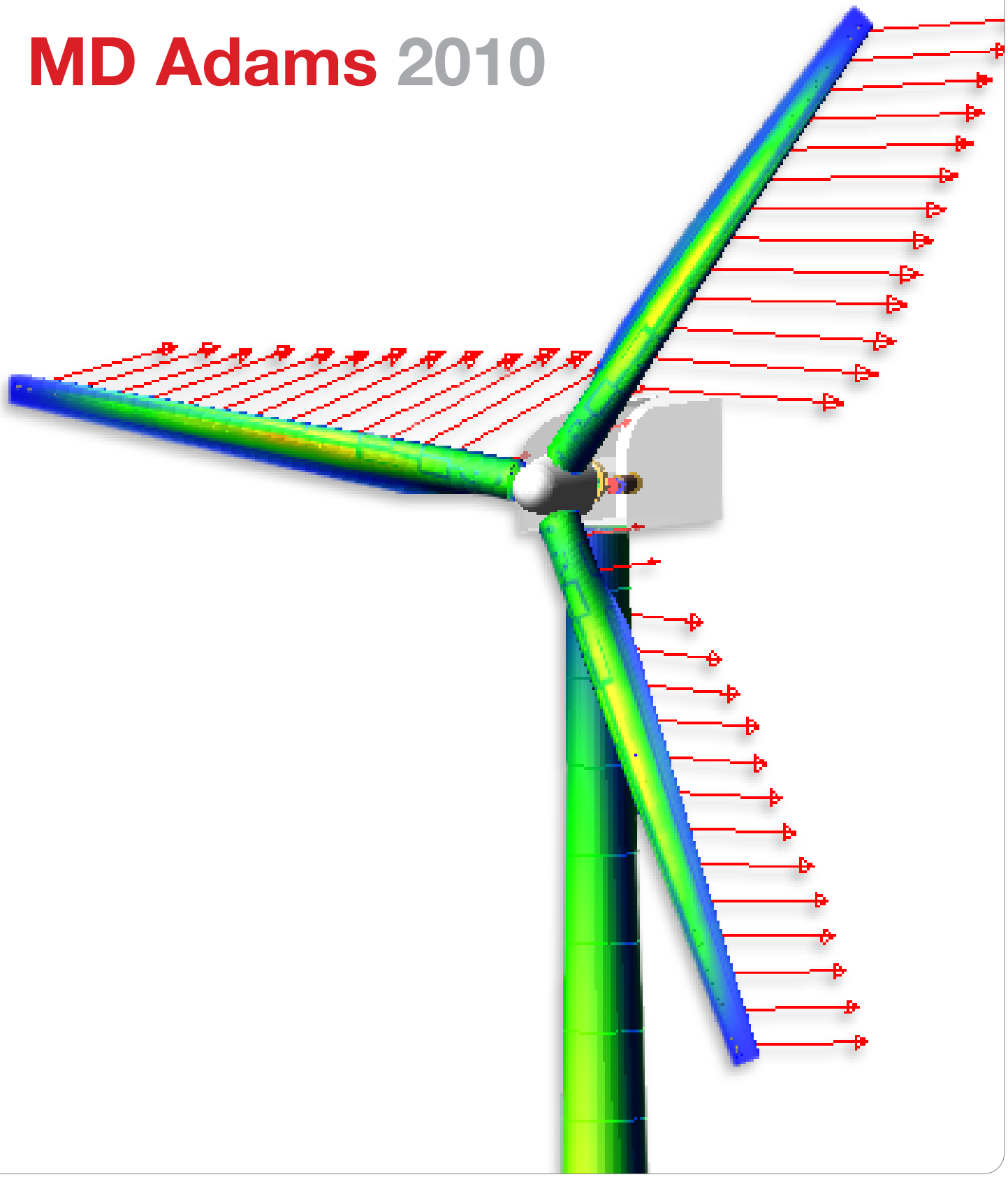
PRODUCT BRIEF

MD Adams 2010



MSC Software

Welcome to MD Adams 2010

With this release of the Adams product family, MSC.Software proudly presents extensions to recent innovations, exciting new capabilities and continued speed of use improvements. Major areas of focus for this release include the following:

Capability Extensions

New or extended capabilities are included in this release for both general core functionality, like new contact modeling extensions, and for application specific functionality, like the MD Adams/Car Truck plugin and the MD Adams/Car tools to easily define model parameters from test data for tires and isolators.

Usability and Productivity

Working with flexible bodies is made easier. This release provides a quicker means to copy and paste flexible bodies within a model and to control flexible body modal content.

Significant enhancements to MD Adams/Car post-processing have been made allowing for automation of more sophisticated plot configurations. Furthermore, this post-processing automation functionality is now available to MD Adams/View users for the first time.

Performance

Some of the new modeling functionality will result in models which solve faster. Additionally this MD Adams/Solver (C++) release includes a new linear solution option for faster run times on very large models, and includes powerful new static equilibrium methods.

Multidiscipline Solution Integration

Significant customer-driven enhancements for the Adams-to-Nastran functionality have been made. Among them, the export can now be performed from dynamic operating points and Adams force elements are now represented in the Nastran model.

Support for MATLAB/Simulink models continues to be updated and expanded. With this release Adams/Controls adds support for embedding Simulink S-Function models via an External System Library.

In summary, this MD Adams release combines functionality extensions and enhancements with new capability innovation all aimed at enabling you to do more, faster with your multibody dynamics simulation investment.

Thank you very much for your continued support of MD Adams.

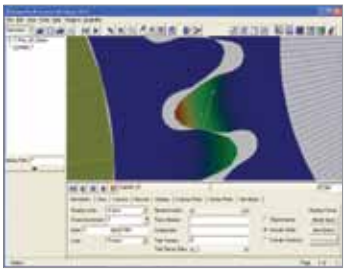
The MSC.Software Product team

Capability Extensions

Core

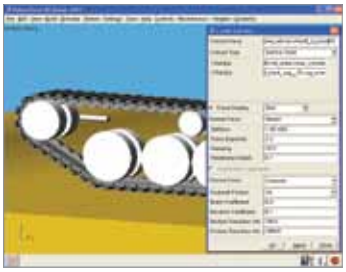
Support for Shell Elements in Flexible Body Contact

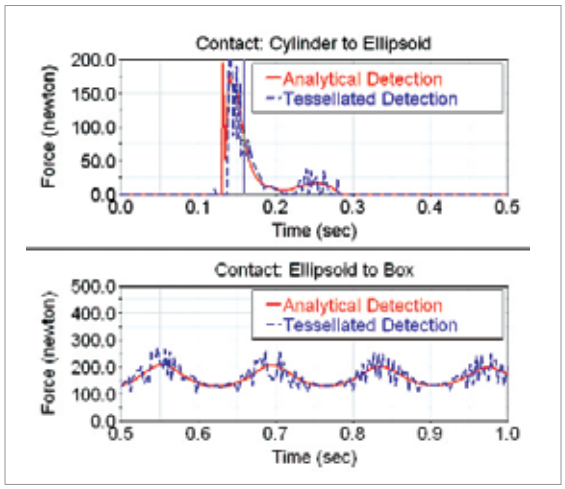
In the previous release, the ability to directly model contacts with flexible bodies was introduced. This supported only solid finite elements. The new release supports flexible body contact with 2D shell elements as well. This uses the same trusted modal formulation as the existing solid flexible body contact and it supports all combinations of contact types: flex edge to plane, flex edge to curve, face contact with a rigid body and flex edge to flex edge contact. Similar to the rigid body and solid flex body contacts, the selection of geometry and setup of the contact forces are very easy to use, there is no need to predict and predefine so-called "contact regions" and the same post-processing capabilities are available – most notably plotting and animation of node incidents and exporting loads to FEA via the FEMDATA utility. This has broad applicability including mechanism design and performance and anywhere 2D rolling and sliding contact is important to represent.



Native Contact Extensions

The native contact detection method, introduced in the previous release for spheres only, has now been expanded to support cylinders, ellipsoids and boxes. This method takes advantage of the characteristic dimensions of simple geometry and employs an analytical approach for the detection of contact and the calculation of the intersection volume and, therefore, the contact force value itself. The previous default relied on surface tessellation. While results are always highly model dependant, it's expected that this method provides improvements in both calculation speed and contact force response smoothness. This makes for a very attractive alternative to the trade-off of speed and smoothness seen between the current two methods: the RAPID library's tessellation method and the parasolid method. Anyone employing many contacts with these geometry types in their models could benefit. Example applications include general mechanisms, tracked vehicles, roller and ball bearings, belts and cables.

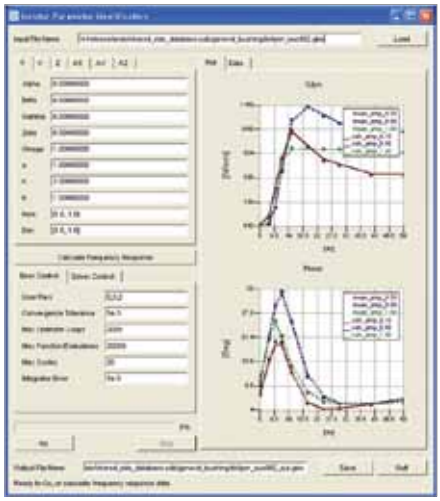




Application Specific

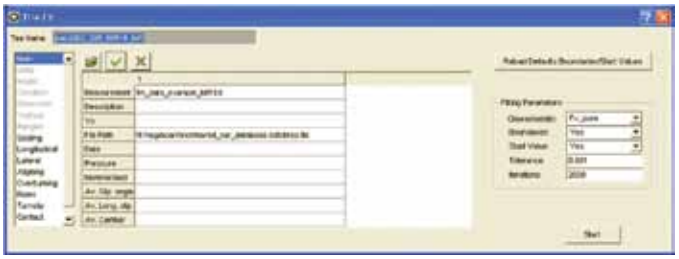
Isolator Component Improvements

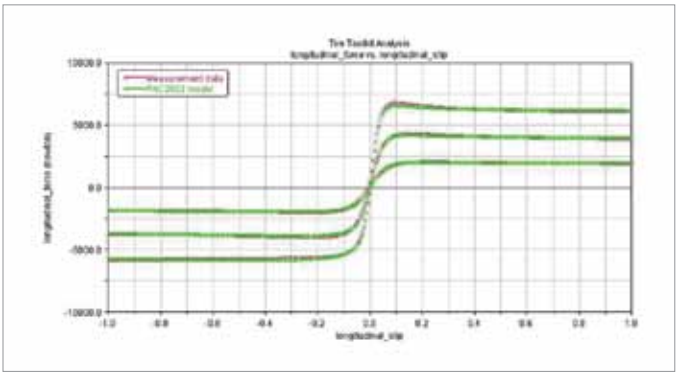
MD Adams/Car isolators, frequency-dependant bushings and hydromounts, have been improved on two fronts. The sophistication of the models has been enhanced by the introduction of a general visco-elastic material model and other components like hysteresis for simulation of vibration behavior. And, a parameter identification tool is now available to more quickly and easily derive isolator model parameters from physical test data. With this tool the transfer function and Bouc-Wen model parameters are identified by an iterative solving method aimed at minimizing the difference between measurement data and identified dynamic stiffness and phase angle. The tool can also be used to fit user-customized isolator models. Furthermore, broad user control of the optimization program parameters is provided.



PAC2002 Tire Data and Fitting Tool

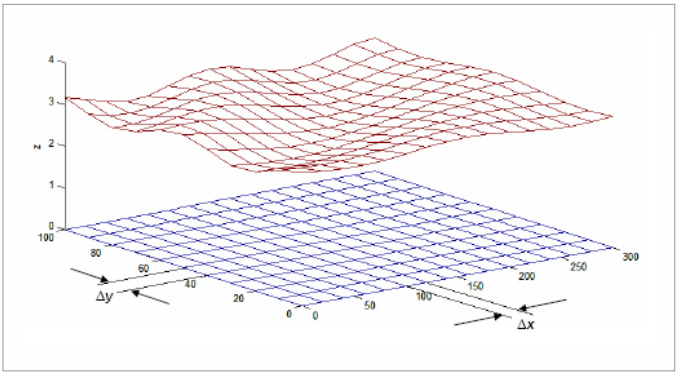
Similar to the isolator parameter identification tool, this new MD Adams/Car release will include a parameter identification tool for the PAC2002 tire model. It enables quicker and easier identification of tire parameter values from tire data that was measured either physically or virtually (for example, from FEA). Also this, in effect, allows you to switch tire models if you choose to create your PAC2002 tire property file based on virtual data from another tire model using the MD Adams/Tire Testrig.





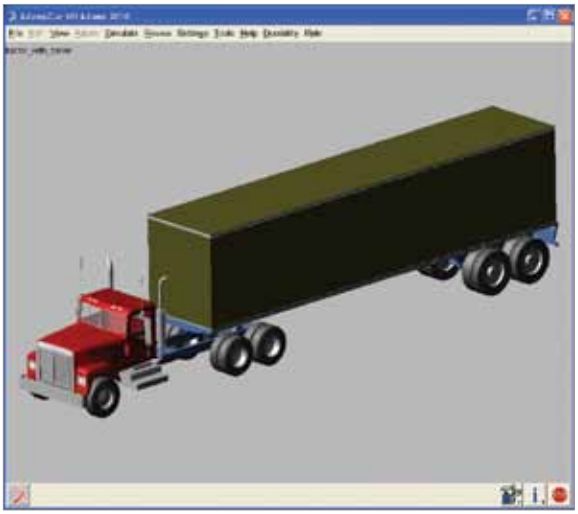
Curved Regular Grid (CRG) Road

This functionality, released as an experimental feature, provides an efficient means to work with high-resolution 3D road surface data. The CRG road provides a description of the three-dimensional surface in terms of z-values over a discrete rectangular grid equidistantly spaced in both x and y direction. Compared to roads based on triangulations, CRG provides reductions in file size, memory demand, file loading time and CPU time for evaluation. In bringing this format to MD Adams, MSC leveraged the OpenCRG® project. See www.opencrg.org for more details.



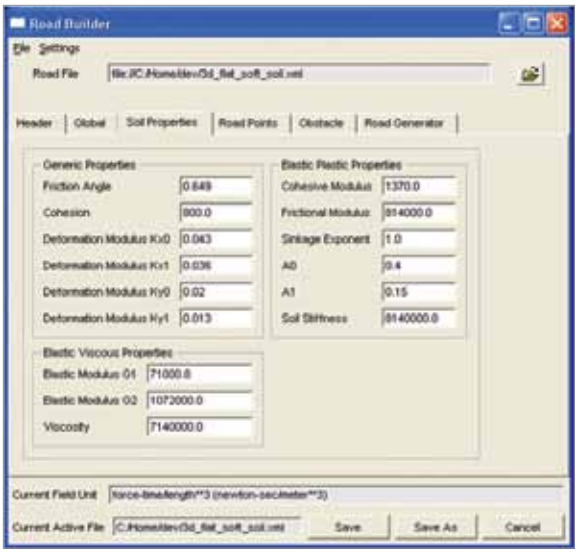
Truck Plugin and Database

A Truck plugin and database will now be available through MD Adams/Car. This includes formal support and official release for the truck database containing example heavy vehicle templates, subsystems and assemblies for things like dual wheels, leaf springs, a tractor, trailer, bus, etc. And, it also includes sample parameter files for heavy vehicles for things like airbags, cab bushings, truck tires, etc. Furthermore, the MD Adams/Car SmartDriver control system, used in full-vehicle events, has been enhanced to be better tuned for heavy vehicles.



Deformable Road for Soft Soil Tire

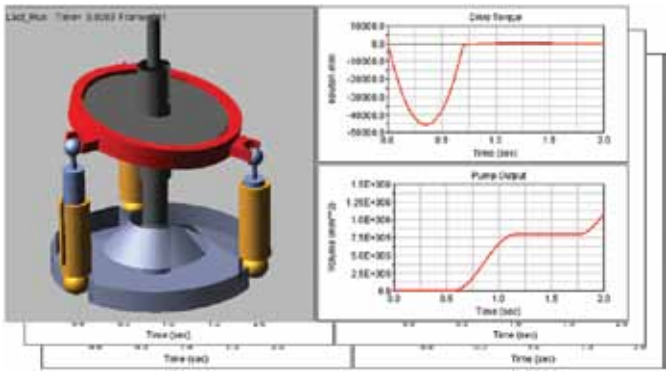
This functionality, released as an experimental feature, provides a direct means for modeling tire-soil interaction forces for any tire on elastic/plastic grounds, such as sand, clay, loam and snow. Two tire-road contact models are available. There is an elastic-plastic model where tire deformation and the plastic deformation history of the road are taken into account. And, there is a visco-elastic contact model where tire deformation is not accounted for, but the viscous deformation history of the road is. Example applications include off-road vehicles in the military, construction and agriculture industries.



Usability and Productivity

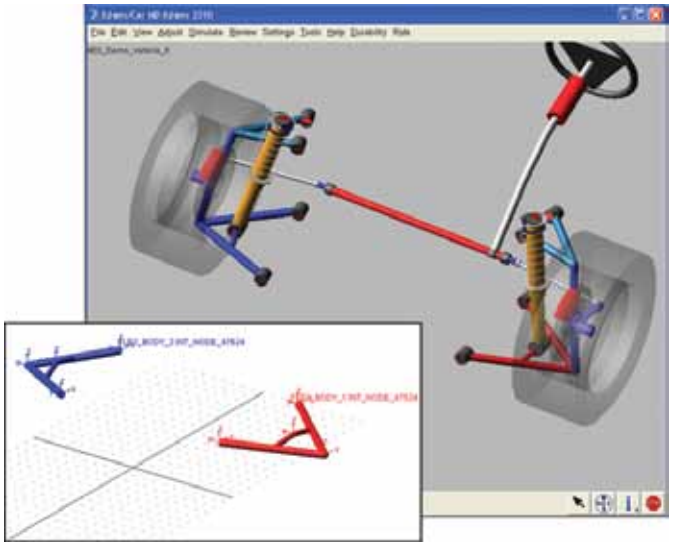
Plotting Plugin for MD Adams/View

Post-processing automation comes to MD Adams/View! The Plotting Plugin for MD Adams/View and MD Adams/PostProcessor is a significant ease of use enhancement that allows you to save and restore multiple post-processing pages all at once for association with new analyses. This allows users, who may have previously been resorting to command file scripts or manual operations, to quickly recreate a series of custom formatted, often used plots saving time and effort. This functionality was previously only available in MD Adams/Car but is now available to all MD Adams users.



Flexible Body (MNF) Mirroring UI

In this release MD Adams/Flex provides a quicker means to copy and paste flexible bodies within a model including the ability to automatically "mirror" flexible bodies about line of symmetry. Nodes are automatically renumbered within Adams and there is no need to run a second finite element analysis to generate the modal neutral file. This is particularly useful for automotive suspension components or anything with a line of symmetry. But, because this allows for general copy and paste, it benefits anyone using multiple copies of the same flexible body such as modelers of spinning flexible bodies like the blades on wind turbines or helicopters.

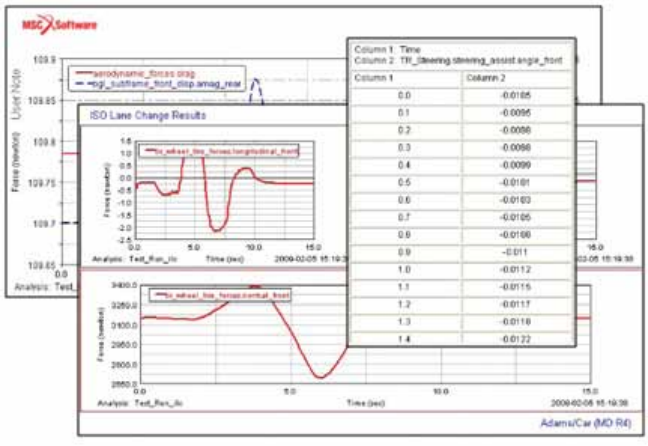


Flexible Body Dynamic Limit

Those working with flexible bodies in Adams know the importance of managing the modal content when tuning models for reduced calculation time. The new flexible dynamic limit input helps eliminate guesswork and iteration when controlling modal content. It provides an easy means to specify a threshold frequency above which only static modes for a given flex body will be used essentially damping out noise from higher frequencies. This is a significant improvement over the various trial-and-error methods with CRATIO and damping expressions and subroutines.

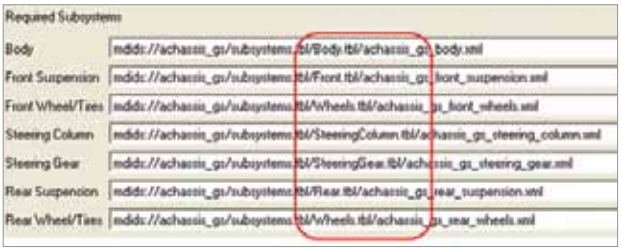
Adams/Car Post-Processing Improvements

Plotting automation for the MD Adams/Car package products is now more powerful. The plot configuration file (.plt) now supports the most important interactive plotting capabilities such as tables, mathematical curve expressions, multiple axes and much more. So, the time saving benefits of automated post-processing can be realized by those performing much more sophisticated post-processing activity. And, these enhancements are also found within the newly-available plotting plugin for MD Adams/View.



MD Adams/Chassis VDB Reorganization of Subsystems

Navigation to MD Adams/Chassis subsystems is made easier with this release as it organizes subsystem into sub-folders by type as opposed to a single folder. Existing subsystem folder structures will automatically updated transparent to the user without manual conversion effort.



XSL Stylesheet Examples for MD Adams/Car

In this release MD Adams/Car includes example xsl stylesheets for a more user-friendly experience when viewing xml-based MD Adams/Car property files from a web browser.

Environment Announcement

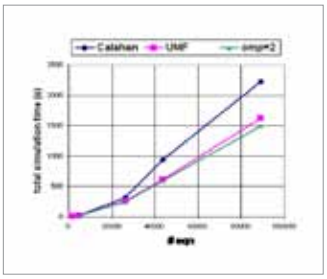
The message file output from MD Adams/Solver (C++) now reports the values of all operating system environment variables applied to the simulation. This provides useful audit trail information for model and result tracking and comparison purposes.

Performance

Default Solver is MD Adams/Solver (C++)

The C++ solver is now the default solver for the base products of MD Adams/Solver and View as well as their plugins Controls, Durability, Mechatronics and Vibration. Since so many of the recent Solver advances have been made within the C++ solver; it is now the default. MSC is investing in C++ Solver technology because it has, and continues, to allow us to more quickly deliver powerful new features and capability to MD Adams/Solver. As this is just the default, naturally, there is still the ability for the user to select either the FORTRAN or C++ solver.

UMF Linear Solver



The UMF Linear System Solver is a new matrix solver method that will provide faster calculation times for very large models compared to the existing Harwell or Calahan solver. It is an Unsymmetrical Multi-Frontal (UMF) direct sparse solver. It was selected for inclusion in Adams due to its known ability to solve non-linear finite element (NLFE) models effectively in MD Nastran.
In MD Adams, the default mode of linear solver selection is "Auto" and will select the most appropriate type based on the model. But, naturally, users themselves still have the ability to specify the linear solver type directly.

New Static Equilibrium Methods

This functionality, released as an experimental feature, should show improved performance and require less manual solver setting adjustments by users when solving for static equilibrium - especially in difficult scenarios like nonlinear systems that are ill-conditioned, singular and with an initial estimate far away from the solution. Several types of alternative static solvers are being introduced which are designed to work in conjunction with the existing statics solver, taking the results of the last unsuccessful static iteration as a starting point for subsequent iterations with the new methods.

SmartDriver and SDI Enhancements

All user adjustable longitudinal and lateral PID (Proportional, Integral, Derivative) Controller parameters are now exposed to the Event Builder and .xml event file to improve Machine Control tracking performance. This includes controller settings for: following a longitudinal velocity or acceleration profile, steering when following a path, or following a lateral acceleration profile. It also includes controller settings for steering output if the steering actuator type is set to Force or Torque.

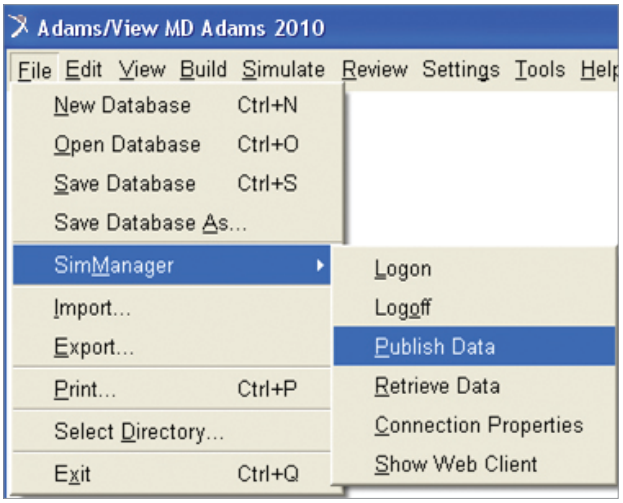
Multidiscipline Solution Integration

Adams2Nastran Support

This previously introduced feature allows for an easy way to write out Nastran equivalent models from MD Adams so as to connect linearized subsystem models to structural models for more accurate vibration analysis. In this new release, several Adams-to-Nastran enhancements have been made. Major developments include the ability to export MD Adams models from dynamic operating points, the ability to export equivalent CBUSH representation of MD Adams force elements in the Nastran model, the export of MD Adams friction forces and the addition of several new directives in the export configuration file.

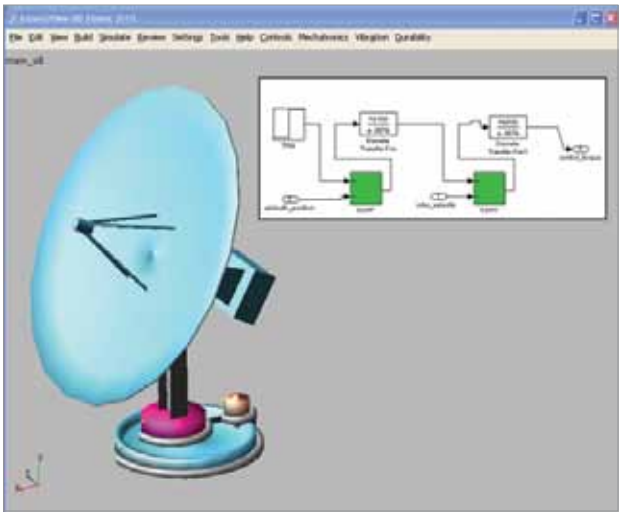
SimManager Support

SimManager interaction from both MD Adams/View and MD Adams/Car has been updated to support more platforms – all Linux and Windows platforms – and will be compatible with SimManager 2010 after its release. Specifically, this functionality allows for publishing and retrieval of MD Adams models and results to and from a SimManager database.



MATLAB/Simulink® S-Function Support

Through MD Adams/Controls this release allows for embedding MATLAB/Simulink® S-Function models directly within MD Adams as external system libraries. This is of particular interest for MD Adams users who rely on others to supply such controls models but do not, themselves, run MATLAB® and also for those who do not wish to expose the source code of such models when sharing them with other MD Adams users as in some supplier-OEM relationships.



MD Adams – Your Future Assured

With your continued support, MSC.Software remains committed to the persistent enhancement of our core multibody dynamics solution, MD Adams. The content of this release demonstrates that commitment on multiple levels.

Customer Driven Features

We take requests. MSC commits itself to meeting customer needs and requirements. Many of the new capabilities and enhancements in this release are a direct result of customer feedback. This includes the new Adams-to-Nastran output styles, MD Adams/Car SmartDriver enhancements, the post-processing automation capabilities and the new MD Adams/Car Truck Plugin and Database.

Leading Edge Innovation

We push the envelope. MSC continues to bring exciting new capability to multibody dynamics simulation. Evidence in this release of Adams includes the new parameter identification tools, experimental new features like the deformable road, and the extensions to our industry-leading contact modeling methods.

Speed of Use

We help you go faster. MSC is focused on helping you get the job of CAE analysis done more efficiently. For many of our customers it is no longer enough to simply use simulation to accelerate product development. The process of simulation, itself, must now be accelerated. The numerous ease-of-use enhancements in the interface and performance improvements in the solvers and methods featured in this release of MD Adams are there for this reason.

Thank You

MSC.Software appreciates the confidence and trust that you, our customers, have placed in our products all these years. This is also demonstrated by the customizations of the product and level of integration of our products into your CAE processes. You will continue to see more advances going into the product and we, as always, are pleased to have you as a customer and partner.

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