

NX Mechanism Design

Integrated mechanical system motion simulation

fact sheet

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► Summary

NX™ Mechanism Design software is an add-on module within the NX digital product design suite that offers basic capabilities for simulating articulated mechanisms. Using assemblies created in NX Master Assembly, Mechanism Design allows you to create joint constraints, contact locations and connectivity information in order to apply motion inputs. Mechanism Design helps you understand, from the earliest stages of conceptual design, the dynamics of a mechanism, enabling you to explore more “what if” alternatives. The result is a better, more refined product design.

Benefits

Perform motion simulation of articulated mechanisms quickly and easily

Analyze the motions, velocities and accelerations of a mechanism to achieve a better product design

Evaluate the integrity of the design via automatic degrees-of-freedom calculation, interference checking and clearance checking

Import and export simulation results using standard ADAMS formats

Features

Analyze both open and closed loop mechanisms

Define models directly from Master Assembly data including reuse of assembly design constraints

Sketch or define complex motions using standard ADAMS functions

Use a wide range of automatic or interactive tools to create and manipulate joints, loads and boundary conditions

Modify and manipulate quickly both input and result functions

Display the mechanism in a variety of ways, including animated, to refine the model or observe simulation results

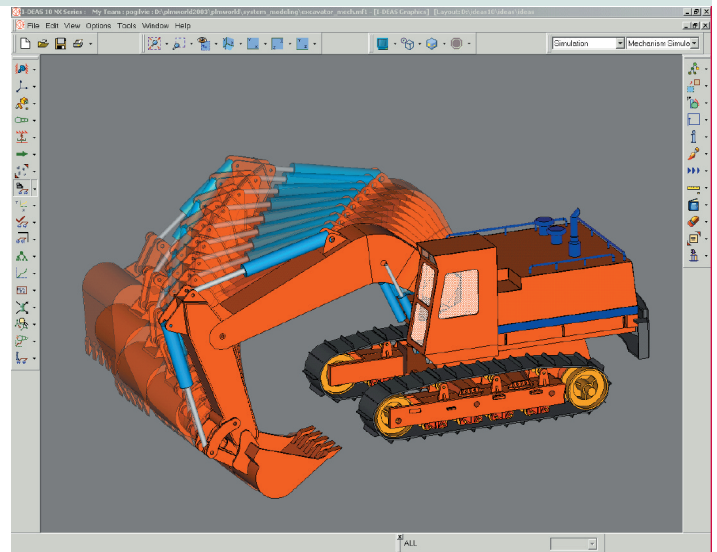
A wide range of tools for mechanical design simulation

Mechanism Design provides an integrated capability for simulating the complex motion of articulated mechanisms. Using assemblies created in Master Assembly, joint constraints, contact locations and connectivity information are created, and motion inputs are applied. The embedded ADAMS dynamic solver helps you understand, from the earliest stages of conceptual design, the motions, velocities and accelerations of a mechanism. Mechanism Design enables you to study more design alternatives, and the overall result is a better, more refined product design.

Mechanism modeling

Model definition. You can analyze both open and closed loop mechanisms. Models are defined directly by information from Master Assembly, including solid geometry and inertia properties. Rigid bodies are automatically created as joints are created, and constraints are defined simply by selecting appropriate topology on assembly or subassembly instances. Complex motions are easily sketched or defined as functions using a forms-based user interface.

Joints. Joints can be created automatically from constraints defined in Master Assembly, and they are easily modified directly on the geometry. Primitive joints can be used together with standard joints. Also, motions and functions can be applied within the joint user interface.



Solids-based kinematics and dynamic analysis simulate complex motions of mechanisms.

System requirements

Mechanism Design shares the I-deas® NX Series software system requirements.

Recommended system configuration

For information on particular operating systems or graphics cards, please visit <http://support.ugs.com/>

Joint definitions include revolute, translations, cylindrical, universal, spherical, planar, fixed, rack and pinion, screw and constant velocity. Multi-joint capabilities enable the modeling of gears. Couplers help pre-define the relative motion between two translational, rotational, or cylindrical joints, or any combination of two of these joint types. Joint validity checking assures proper joint definition for purposes of the solution.

Loads and boundary conditions. Mechanism Design enables you to apply both gravity and contact loads. Using higher order pairs, you can model contact constraints such as cam to cam and cam to follower. Contact options include sphere to plane, sphere to sphere and curve to curve. Reference point series are usable as contact curves. You have the option of using both the impact and the coefficient-of-restitution approach during the solve. Spring dampers facilitate ease-of-friction modeling. And Mechanism Design automatically performs a kinematic or dynamic solve, depending on the remaining degrees of freedom.

Display capabilities. Mechanism Design can display functional results of motion, velocities, accelerations, etc., and can display up to ten functions simultaneously. This enables you to perform comparative analysis between different functions.

The motion envelope of the assembly can be animated, and point trace uses a series of points to track a location on the assembly. Notes, tagging data points and the versatility to modify plot axes and plot headers enable results data to be viewed on screen and sent to a printer for use in reports.

Results and extended analysis. Results of a motion simulation include displacements, velocities, accelerations and a sequence of configurations. Within Mechanism Design, mathematical function manipulations – including add, subtract, multiply, divide, scaling, integration, differentiation and interpolation – enable you to quickly modify and manipulate both input and result functions.

Automatic degrees-of-freedom calculation helps you evaluate the integrity of your design. Automatic solids-based interference and clearance checking, either on a specific step of the solution or over the entire sequence of steps, facilitates evaluation of the design integrity as the assembly articulates. Functions can be easily listed, plotted and modified to facilitate iterative analyses.

Relative motion analysis. Results analysis provides post-solution methods for calculating relative position, velocity and acceleration between any two arbitrary rigid bodies based on results of your solution.

Mechanism studies. Mechanism Design includes an embedded ADAMS solver. Once joints, constraints and functions have been defined, the mechanism can be solved automatically using this internal solver, which handles both kinematic and dynamic solves.

Advanced mechanism simulation. Using the standard ADAMS data model format, Mechanism Design provides an automatic interface to external solvers. You can define the mechanism within I-deas, export the data for a more complex motion simulation study using ADAMS, and then read those results back into Mechanism Design for post-processing or iterations on the design. For more advanced analyses, Mechanism Simulation within the I-deas digital simulation suite can be used.

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