

# NEi Motion

## NEi Motion (Simulation Analysis)

### Overview

NEi Motion (FEDEM) by Fedem Technology AS, is a comprehensive modern CAE tool for virtual testing and verification of mechanical systems. The integrated dynamics and structural solving in NEi Motion is the most efficient way to evaluate your mechanism's function, strength and life. The software is founded on the integration of finite element technology and nonlinear dynamics, utilizing super-element methods. NEi Motion can simulate overconstrained systems, can determine the loads in your mechanism and work with a large set of long time-varying events. The software uses a modeling and post-processing environment from which the specific solvers are launched and controlled.

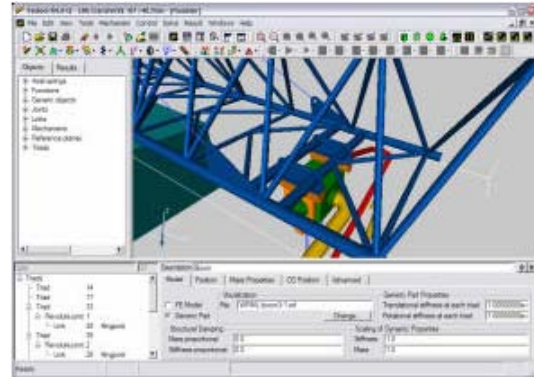
### Solvers

#### FE Reducer:

- Reduces automatically the DOF's of the finite element models to only include DOF's required
- The combined static and dynamic reduction ensures a physically correct behavior of the reduced models
- Out-of-core reducer breaks the 2GB limit on 32-Bit systems
- Component modes of FE-parts and eigenmodes of the reduced FE-models are visualized for better control and understanding

#### Dynamic Solver:

- Performs nonlinear dynamics for the time interval and time step size required by the user
- When using add-on modules, the solver runs in conjunction with the external solver
- Improved output to .res file makes it easier to find and correct model errors
- New pure quasi-static simulation mode
- Advanced spring characteristics enables easy clutch modeling. Simplifies modeling of mechanical failure and yield.



#### Curve Plotter & Analyzer:

- Displays results from the dynamical simulation on-the-fly
- Loads, motions, results can be monitored, manipulated and exported
- Functionality: FFT, scaling, statistics
- The deformational displacements in Triads are now available for plotting
- Automatic creation of curves for all objects in model makes it easy to find peak loads, and get an overview of the total model performance
- New curves automatically get a new color

#### Stress/Strain Recovery:

- Maps nodal displacement from the reduced system back onto the full system, or parts of the full system after the dynamic simulation is performed
- Automatic export of animations and stress recovery results to VTF. For use in GLview Express.
- Residual stresses can be imported to improve accuracy of stress and fatigue results

### Capabilities

#### Nonlinear Structural Dynamics:

- Simultaneously solve structural deformations and 3D motion dynamics in the time domain

- Assembly comprised of parts, each represented by a linear elastic FEM and coupled together with linear or nonlinear joints
- DOF reduction of each part based on dynamic superelement formulation is performed
- The system equations are assembled and solved utilizing proprietary element formulations and solvers

#### **Integrated and Efficient Workflow:**

- Build the mechanical assembly and specify mechanism drive functions
- Define and run the dynamic time domain simulation
- Each FEM is reduced to a superelement prior to running the time domain solver
- Dynamic results are readily available from the time domain solver
- Structural results are obtained by an integrated superelement recovery process

#### **Efficient User Interface:**

- One common 3D graphical environment to create, solve and post-process the model
- Types of models that can be imported into the modeler
  - FEM from Nastran BDF files
  - CAD geometry from VRML
  - CAD geometry defined by coordinates and mass properties only
- Types of elements created in the modeler
  - Joints
  - Springs
  - Dampers
- Cam joints
  - Radial contact enables pipe contact models
  - All 6-DOFs available for full modeling flexibility
  - Slider length and accumulated contact distance as new output
- Functions are created, visualized and described in the modeler
- Event description, loads and displacements are defined in the modeler along with the solver set up
- Dynamic results (curves and animations) are available during and after model solution

#### **Industry Standard Formats:**

- FEM models and pre-reduced models are imported from Nastran bulk data files
- Mechanism drive functions can be linked with external data files in several formats
  - MTS RPC III/Pro
  - nCode DAC
  - ASCII
- Simulation results can be exported in the following formats
  - MTS RPC III/Pro
  - nCode DAC
  - ASCII
- Animations can be exported in different formats
  - MPEG-1
  - MPEG-2
  - AVI
  - JPG
  - PNG
  - BMP
  - RGB/IV(3D only)

#### **Large Models and Long Time Histories:**

- Large finite element meshes are easily handled due to superelement technology (combined static and dynamic reduction)
- High performance 3D graphics ensures efficient modeling and post-processing
- The equations of motion are only solved for the reduced system and the number of equations is independent of the finite element sizes. This enables the simulation of long time histories.

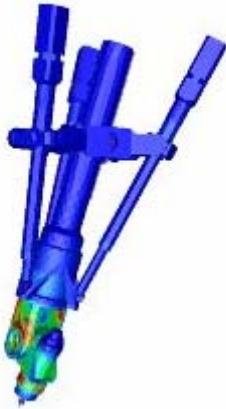
#### **Complete Library of Mechanism Entities:**

- Joint library
  - Nonlinear spring
  - Damper and friction characteristics
  - Discrete springs and dampers
- Functions with references to
  - External data files
  - Forces
  - Control systems

#### **Internal or MATLAB/Simulink Control Systems:**

- The internal control system contains a library of compensators and elementary control blocks which enables modeling of supplementary mechanism units like
  - Hydraulic cylinders
  - Actuators

- Electrical drives
- The FEDEM MATLAB/Simulink interface is used for modeling of more advanced control loops



#### **Multi-Event Duty Cycle Analysis:**

- Combines result sets from different simulations
- Intuitive user interface provides overview on available results sets and duty cycle management

#### **Supported Platforms:**

- Windows NT/2000
- HP-UX
- SGI-IRIX

#### **System Requirements:**

- 2GB RAM recommended for large models for the solvers
- Results file format are cross-platforms compatible

#### **Tire and Road Models:**

- MF-Tyre and SWIFT-Tyre models developed by Delft-Tyre (TNO Automotive) are implemented through the Standard Tire Interface (STI)
- FTIRE developed by COSIN – implementation based on the COSIN Tire Interface (CTI)

#### **Fast Structural Recovery:**

- Complete set of strain and stress components can be recovered for all elements and time increments
- Recovery can also be performed individually on parts or on pre-defined element groups for selected time increments
- Time histories summaries (max/min stress) are also provided

#### **Durability Assessment with nCode:**

- Provided through a seamless interface to FE-Fatigue from nCode International
- Peak-valley extraction is performed for selected elements simultaneously with the stress or strain recovery from the nonlinear structural dynamic solution
- Rainflow matrix is calculated as input to the fatigue solver
- Durability analysis results can be viewed as contour plots on the model in the 3D graphics environment
- Virtual strain gage measurements can be obtained from the model

**NEi Software, Inc.** is aggressively focused on commitment to the customer. Detailed documentation, customized on-site training, and comprehensive technical support ensures that you will see immediate return on your investment.

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**From NEi Software, Inc.**