NX Nastran – Superelements

Perform complex system level analysis with very large FE models in the most efficient way using the Nastran sparse matrix algorithms

fact sheet

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▶ Despite the ever-increasing power of computers, finite element models are continuing to get larger, which means that finite element analysis (FEA) solutions can require hours of compute time. NX® Nastran software solves large systems of equations efficiently using sparse matrix algorithms; however, NX Nastran – Superelements offers still greater efficiency. Superelements, an add-on to NX Nastran – Basic, plays a key role when solving very large and complex finite element models by decomposing larger structures into equivalent sets of smaller substructures called superelements. NX Nastran – Superelements can be used with all NX Nastran analysis capabilities; is particularly efficient in large, full-system analysis such as an entire aircraft, vehicle or ship; and performs incremental and partial assembly solutions.

Benefits

Accelerate innovation through enhanced solution efficiency

Reduce product design risk through the ability to perform more iterations

Enable enterprise-wide collaboration by combining models from different sources (internal and external) and masking proprietary data

Maximize output of precious computing resources; reduce the amount of memory and disk space required

Features

Powerful solution capabilities to analyze models comprised of upstream superelements

Superelements provide solution efficiency

Advantages of incremental processing

Instead of solving an entire finite element model each time, NX Nastran – Superelements offers the advantage of incremental processing only one superelement at a time. And, if you make changes to your design in one place, only that superelement requires re-analysis. Automatic restarting is also available so only the operations necessary to incorporate changes are performed.

Superelements can also be used in collaborative design, as components of the model can be transferred (in superelement matrix form) from one company to another while enabling design details to remain hidden (only the stiffness terms are represented).

Major capabilities

Powerful solution capabilities:
- Ability to use with all NX Nastran analysis capabilities
- Ability to combine models from different sources (internal and external)
- Single and multiple levels
- Global-local analyses
- Input and output partitioned by superelement
- Incremental solutions and partial assembly solutions

Superelements provide solution efficiency:
- Localized re-design requires only partial re-analysis
- Less computer time required per run, since only one superelement at a time need be processed
- Easier trouble shooting since each superelement is processed individually
- Faster non-linear analysis runs because upstream superelements are linear
- Faster parametric ("what if…") studies
- Ability to subdivide models that are too large to be analyzed all at once and analyze them in pieces instead
- Automatic restart – only the operations necessary to incorporate changes are performed
- Less risk per run – if an error occurs, only the affected part needs to be re-run
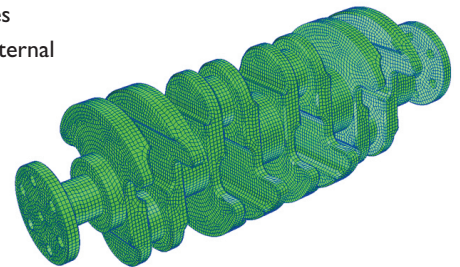
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