ComLab Improvements to NASTRAN-95

Comparison to MSC.Nastran

Comlab started life as NASTRAN-95 using a copy of the code provided by Stuart Pendelton, who was in charge ot technology transfer at NASA,s Langley Research Center , in 2000. The goal of The MacNeal Group was to develop a version that would be plug compatible with MSC.Nastran. Whether this was a wise business decision I leave to others. The fact is that the SEC opened an antitrust investigation that required MSC to divest a copy of their version of NASTRAN to a viable competitor and that TMG lost out to Siemens and led to the dissolution of TMG in the 2007-8 time frame. At that time ComLab was Bulk-Data compatible with MSC.

There were differences in the user interface for the EXEC Control Section and related mostly to assigning permanent files; ComLab would generally process a PATRAN deck.

There were and are differences under-the-hood as described in following section

Element Library

Dr . Richard H. Macneal, one of the founders of TMG, formulated the design of the solid elements to aid the transition from fine to course meshes. The resulting elements, the CHEXA, CPENTA and TETRA, connect all vertex nodes and a variable number of nodes on the line segment connecting the vertices. The resulting element perform and is as good as or better than a higher order Lagrange elements. The CHEXA connecting only vertex nodes has the same accuracy as a 27 node Lagrange element.

The shell elements include an enhanced 4 node. The element library dose not include higher order shell elements.

Line elements include a CBEAM CBAR, CBUSH, CROD, CTUBE, and CGAP.

Linear Algebra

Two sparse solves are supported: One for sparse symmetric called BCS; and the other for sparse unsymmetrical matrices called UMFPACK. The DMAP Scripts use the BCS solver that is best for models having > 1 million DOF.

Eigensolvers are replaced by Lanczos methods for symmetric and unsymmetrical matrices.

Auto SPC and MPC

Methods are included that automatically determine unconnected DOF which can then be removed from the solution set called AUTOSPC. AUTOMPC automatically determines the set of dependent DOF and uses the sparse unsymmetric solver to determane the transformation matrix that reduces the disparagement set to a set of independent DOF.

Automated Multi-Level Substructures (AMSS)

AMSS was included in the NASTRAN-95 release. Unfortunately, the part-oriented approach to

synthesizing large structures exceeded the capability of the NASTRAN-user community. ComLab includes enhancement to AMSS and the use of a persistence database. MSC uses a technique called Super Elements that divides the solution structure into smaller pieces.

Dynamics

Upgraded all rigid formats to use modern linear algebra utilities and allow static load bulk date to replace DAREA Bulk Data.

Nastran Operating System

1. Implemented a scratch manager
2. Reorganized the nastran file systrem
3. Use dynamic memory allocation

DMAP

1. Replace MPL with XML file
2. Replace /revise main event loop with fortran case statements
3. Added GATEWAY Nastran Module that allow user to implement code in either fortan or c/c++ DLL