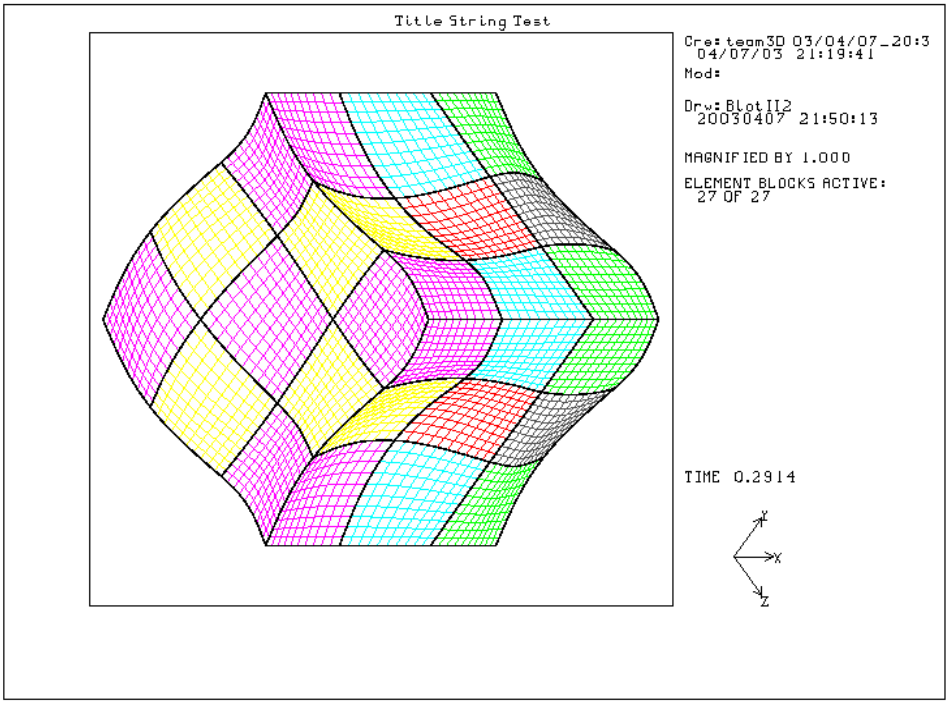
Large-Scale Inline Meshing

The multi-block structured mesh type within ALEGRA provides a low memory footprint and fast execution speed alternative to ALEGRA's unstructured mesh type. Multi-block structured mesh supports solid dynamics and hydrodynamics physics. These problems may be run in a lagrangian , eulerian, or ALE context. The improved performance comes at the cost of the requirement that each block of mesh have a structured topology. There are no restrictions on the geometry of the structured blocks, and the blocks can connect to each other in arbitrary ways.

The ongoing work in this area focuses on calculation efficiency and parallel performance.

The same physics are used in evolving solutions on structured and unstructured meshes within ALEGRA. The difference is in the data storage, traversal, and access strategies of the two mesh types. As an example the structured mesh type has no 'node' objects. All nodal data is stored in arrays and its association to elements is implicit in the topology of the structured block and the conventions of the structured mesh.

The image below is an example of a domain discretization using curvilinear multi-block mesh. Each block has a consistent topology, but the individual blocks may share nodes and elements along portions of their faces.



The image below shows the result of a lagrangian calculation performed on a domain discretized with a multi-block structured mesh. This mesh has a regular block to block topology which is identical to the topology required within the structured blocks.