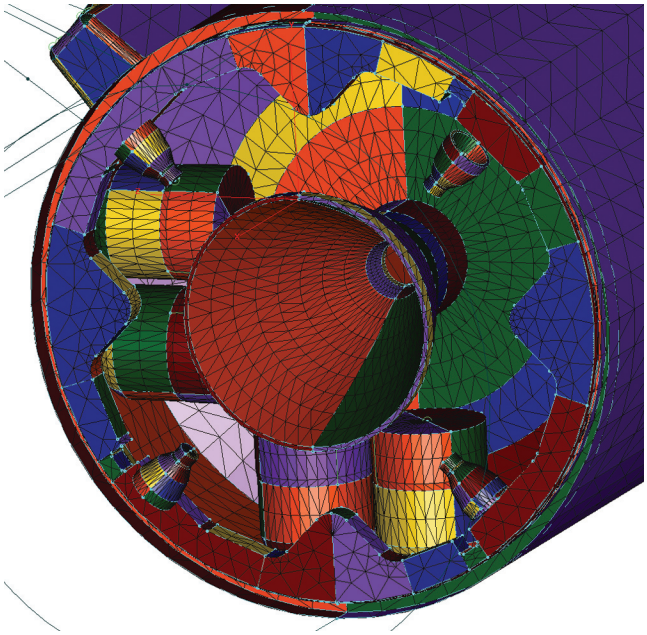
GridgenApp

A Unique Gridgen® Application

Grid Generation Using Gridgen for Radar Cross Section (RCS) Predictions



RCS surface grid of the SM3 third stage aft end.

The John Hopkins University Applied Physics Laboratory (JHU/APL) has been working with the U.S. Navy, U. S. Air Force, and Missile Defense Agency (MDA) in the development, testing, and evaluation of the Ballistic Missile Defense System (BMDS).

JHU/APL has been using a Computational Electromagnetic (CEM) code, named Xpatch, for the past eight to ten years. Xpatch is a high frequency radar signature code based on the Shooting and Bouncing Ray (SBR) technique. Computations with Xpatch require only a surface geometry definition in the form of triangular facets or triangular grid cells, i.e. an unstructured grid. Xpatch computations do not need a volume grid. The surface grid generation is where Gridgen has become an integral and useful instrument in the RCS computational process.

There are numerous application areas where Gridgen has enhanced efforts in the surface grid generation for RCS computations. Gridgen provides the necessary tools for unstructured surface grid generation of the various missile configurations. Computer Aided Design (CAD) tools are used to construct and define the surface geometry. Typically, transferring geometry to Gridgen is through the Native CAD Readers or Initial Graphics Exchange Specifications (IGES) files. The underlying geometry database is cleaned up and modified using Gridgen database commands. Flexibility during creation of connectors provides the necessary options to develop the surface grid. At this point, consideration based on wavelength requirements is given to how much geometric detail needs to be included or not. Gridgen easily allows one to ignore or grid over geometric details that are deemed unnecessary without having to remove them from the database. Then at a later point in time, if the wavelength requirements change and require more detail, the additional detail can be added easily and quickly.

Prior to implementing Gridgen in our RCS computations process, the grid generation tools used did not provide the necessary control over the maximum and minimum facet size. In many cases we needed to better control the facet size. Often details are defined using a structured grid and then simply converting to unstructured grid through the best fit option. Older versions of Gridgen provided an output format that was nearly compatible with the requirements the Xpatch code. Only minimal changes were required to ensure complete compatibility. As our use of Gridgen increased, Pointwise accommodated our request to provide a version with an output option completely compatible with Xpatch input requirements.

Over the past several years, JHU/APL has successfully used Gridgen to construct Xpatch surface grids for many missile configurations. The employment of Gridgen in the RCS computational process helped to greatly increase the fidelity of the predicted results, reduce the amount of time needed to define the surface grid, and to provide much more timely computational predictions to our customers. The increased productivity developed in the RCS computational process, which Gridgen has been a major factor in, has lead to additional work from our current customers, and is providing a steppingstone in the development of new customers as well.

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