

Knowledge-based Hex-mesh Generation

Status Report (12/14/00)

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Project Management

According to the plan, a Post-Doc research associate will be hired to work part-time on this project. Search began in September 2000 and a candidate (Dr. Yan Luo, currently in P. R. China) was identified in early November. The University of Toledo has approved the position this Tuesday and we are preparing paper works so that Dr. Luo can get his Visa to the U.S. We anticipate Dr. Luo to report to work in late January.

Project Resource

We have obtained a copy of GridPro from Program Development Corporation and the license from the Ohio Super Computing Center. Mr. Sumit Maloo has learned how to create TIL codes for different geometries and is currently working on mesh generation and optimization.

Research Progress

We have investigated the use of the method described as follows for hex-mesh generation:

1. A family of simple geometries with corresponding rules for mesh generation is maintained in a database
2. Decompose complex part geometry to a number of simpler geometries.
3. Match these geometries with those in the database, retrieve the rules and generate corresponding meshes.
4. Synthesis these meshes into a final mesh.

Using the rules previously provided by Erlendur, we have constructed block topologies for the some simple geometries (see the file named TILcodes.doc). We would like to know whether the topologies are OK.

An important research issue is how to recognize geometry. It is extremely difficult to recognize geometry automatically. Neural networks require a fixed unit coding for the input, therefore, we need to develop a uniform representation for different types of geometry. We propose to use polar coordinate transform to represent different geometry as a function defined in $0^\circ \sim 360^\circ$ (A graphical representation can be found in the file named geo.doc). As a result, similar geometry will have similar curves and thus can be recognized. However, more research needs to be carried out.