TET_MESH_DISPLAY
Interactive Program for
Tet Mesh Wireframe Plots

TET_MESH_DISPLAY is a MATLAB program which reads data defining a tet mesh and displays a wireframe plot of the nodes and edges, and a solid plot of selected tetrahedrons.

The tet mesh is defined by a *node file* containing the coordinates of nodes, and an *element file* containing lists of node indices that make up each tetrahedron.

The tet mesh may be either linear (defined by 4 nodes) or quadratic (defined by 10 nodes).

Note that, for the 10 node case, we assume that the element file lists the node indices in the following order:

P1 P2 P3 P4 P12 P13 P14 P23 P24 P34

Here "P14" is meant to indicate the midside node between nodes 1 and 4. There are many possible conventions for ordering the nodes, and if this particular convention is not followed, the display of 10 node tetrahedrons will be garbled.

The nodes and edges of all tetrahedrons will be displayed automatically.

The input argument SOLID can be used to specify the indices of tetrahedrons that are to be displayed as solids. Specifying a single nonzero index will highlight the corresponding element. If SOLID is not supplied as an argument, it will be prompted for, and can be given as a MATLAB expression, such as '[]', '1', '1:2:9', or '[3,7,8]'.

Usage:

tet_mesh_display ('*prefix*', *solid*)

where

- '*prefix*' is the common prefix of the node and element files:
  - '*prefix*'**_nodes.txt** lists the coordinates of nodes.
  - '*prefix*'**_elements.txt** lists sets of 4 or 10 nodes that form each tetrahedron.
- *solid* is an empty list, a single integer, or a vector of indices of tetrahedrons to be displayed as solids.

Licensing:

Languages:

TET_MESH_DISPLAY is available in a MATLAB version.

Related Programs:

BALL_AND_STICK_DISPLAY, a MATLAB program which demonstrates the creation of a 3D "ball and stick" image;

BEZIER_SURFACE_DISPLAY, a MATLAB program which reads two files defining a Bezier surface and displays it within MATLAB.

CVT_TET_MESH, a FORTRAN90 program which uses CVT methods to compute a tet mesh in a 3D region.

FEM_BASIS_T6_DISPLAY, a MATLAB program which reads a quadratic triangle mesh and displays any associated basis function.

MESH_DISPLAY, a MATLAB program which reads data defining a polygonal mesh and displays it, with optional numbering.

MPAS_GRID_DISPLAY, a directory of MATLAB programs which can read an MPAS NETCDF grid file and display the primary polygonal mesh or the dual triangular mesh.

OBJ_DISPLAY, a MATLAB program which reads an OBJ file defining a 3D object and displays it within MATLAB.

POLYGONAL_SURFACE_DISPLAY,, a MATLAB program which reads two files defining a polygonal surface and displays it within MATLAB.

QUAD_SURFACE_DISPLAY, a MATLAB program which reads files defining a 3D quadrilateral mesh surface and displays it within MATLAB.

STLA_DISPLAY, a MATLAB program which reads an ASCII STL file defining a 3D object and displays it within MATLAB.

TEST_TET_MESH, a FORTRAN90 library which defines a few test regions for the generation of a tet mesh.

TET_MESH, a MATLAB library which carries out computations with a tet mesh.

TET_MESH_DISPLAY_OPENGL, a C++ program which reads a tet mesh and displays the nodes and edges using OpenGL.

TET_MESH_ORDER4, a data directory which contains a description and examples of a tet mesh using order 4 elements.

TET_MESH_ORDER10, a data directory which contains a description and examples of a tet mesh using order 10 elements.

TETRAHEDRON_SLICE_DISPLAY, a MATLAB program which determines the intersection between a tetrahedron and a plane and displays the result.

TRI_SURFACE_DISPLAY, a MATLAB program which reads data defining a triangular mesh of a 3D surface and displays it.

TRIANGULATION_ORDER1_DISPLAY, a MATLAB program which reads files defining a piecewise constant triangulation of data, and displays a corresponding 3D surface.

Reference:

1. Herbert Edelsbrunner,
   Geometry and Topology for Mesh Generation,
   Cambridge, 2001,
   ISBN: 0-521-79309-2,
   LC: QA377.E36.
2. David Field,
   Qualitative Measures for Initial Meshes,
   International Journal of Numerical Methods in Engineering,

Volume 47, 2000, pages 887-906.
3. Barry Joe,
GEOMPACK - a software package for the generation of meshes using geometric algorithms,
Advances in Engineering Software,
Volume 13, Number 5, 1991, pages 325-331.
4. Per-Olof Persson, Gilbert Strang,
A Simple Mesh Generator in MATLAB,
SIAM Review,
Volume 46, Number 2, June 2004, pages 329-345.

Source code

- tet_mesh_display.m the source code.

Tests and Examples

CUBE_ORDER4 is an order 4 tet mesh of a cube, using 8 nodes and 6 tetrahedrons.

- cube_order4_nodes.txt, the node file.
- cube_order4_elements.txt, the tetrahedron file.
- cube_order4_output.txt, the printed output from the program.
- cube_order4.png, a PNG image of the mesh, with element 5 displayed as a solid.

CUBE_ORDER10 is an order 10 tet mesh of a cube, using 27 nodes and 6 tetrahedrons.

- cube_order10_nodes.txt, the node file.
- cube_order10_elements.txt, the tetrahedron file.
- cube_order10_output.txt, the printed output from the program.
- cube_order10.png, a PNG image of the mesh, with element 5 displayed as a solid.

ONEONEEIGHT_ORDER10 is an order 10 tet mesh using 118 nodes and 70 tetrahedrons.

- tetra_rhombic_order10_nodes.txt, the node file.
- tetra_rhombic_order10_elements.txt, the tetrahedron file.
- tetra_rhombic_order10_output.txt, the printed output from the program.
- tetra_rhombic_order10.png, a PNG image of the mesh, with element 1 displayed as a solid.

P01_00063 is an order 4 tet mesh using 63 nodes and 144 tetrahedrons to mesh the 3x1x1 channel.

- p01_00063_nodes.txt, the node file.
- p01_00063_elements.txt, the tetrahedron file.
- p01_00063_output.txt, the printed output from the program.
- p01_00063.png, a PNG image of the mesh, with element 5 displayed as a solid.

PRISM is an order 4 tet mesh of a triangular prism, using 5 nodes and 3 tetrahedrons.

- prism_nodes.txt, the node file.
- prism_elements.txt, the tetrahedron file.
- prism_output.txt, the printed output from the program.
- prism.png, a PNG image of the mesh, displaying elements 1 and 3 as solids.

TETRA_RHOMBIC_ORDER10 is an order 10 tet mesh of a rhombic tetrahedron using 10 nodes and 1 tetrahdron.

- tetra_rhombic_order10_nodes.txt, the node file.
- tetra_rhombic_order10_elements.txt, the tetrahedron file.
- tetra_rhombic_order10_output.txt, the printed output from the program.

- tetra_rhombic_order10.png, a PNG image of the mesh.

You can go up one level to the MATLAB source codes.

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