1. About program

  ArtMesh is the mesh generation software. It creates quad-dominant surface meshes. Initial data for meshing is triangular surface mesh. ArtMesh is used for the purposes of animation and visualization. Another software version that is meant for simulation and technical applications is ArtMesh Tech. It generates volume meshes.

  Most of cells in quad-dominant mesh are quads and in addition some triangular cells usually exist in mesh.

   Main software component artmesh.dll is built as dynamic link library (DLL). There are Win32 и Win64 versions of artmesh.dll. Information about version type (32 or 64 bit) is placed in artmesh.dll file properties (Properties>>Details>>"File description").

   Console program artmesh_cmd.exe is used to launch artmesh.dll. Artmesh_cmd.exe uses text file (cmd.txt on default) with commands that determine program operations. Input/output of mesh data is performed via files. ArtMesh supports the OBJ (Wavefront) format of input/output files.

   ArtMesh determines feature edges of initial surface and saves them in final mesh. In OBJ files feature edge has different node normals defined from adjacent to edge cells. Edges between cells of different groups or with different textures are feature edges too.

   Data exchange between calling program and artmesh.dll can be carried out using RAM. In this case a set of external functions of artmesh.dll is used. This possibility is not described in this manual but can be implemented on demand.

2. How to start the program

Files artmesh_cmd.exe and artmesh.dll must be placed in one folder. When artmesh_cmd.exe starts it tries to load artmesh.dll. The message with the result of DLL loading appears in console window.

The work of the program is controlled by commands written in script language.

There are three scenarios of program launch:

1. Place artmesh_cmd.exe and file cmd.txt in one folder. Text file cmd.txt must contain commands on script language. Start artmesh_cmd.exe. It will take commands from cmd.txt and begin their execution.
2. Start artmesh_cmd.exe with parameter that is file name. Commands from this file will be executed. For example you can type in file manager "artmesh_cmd.exe cmd_file.txt". Commands from cmd_file.txt will be executed.
3. Start artmesh_cmd.exe without command file. In this case commands may be typed in console window.

Command "exit" (or "quit" or "q") is used to exit the program artmesh_cmd.exe. Command can be typed in console window or placed in the end of command file or used as the last parameter of program call. For example "artmesh_cmd.exe cmd.txt exit".

4. Commands

meshing_file method=quad in=*input_file* **out=***output_file* **h=***lsize* **[options]**
Command performs mesh generation.

Required parameters	Description
in	File with input triangular mesh (quad mesh may be used too).
out	Output file with generated mesh.
h	Define linear size of mesh cells (lsize).

Additional parameters	Description
use_subdivide	If use_subdivide is equal to 1 a subdividing of quad-dominant mesh is performed as the second stage of meshing. Triangles are subdivided in 3 quads, quads are subdivided in 4 quads. Almost all triangles are eliminated when subdivide=1. Default value of use_subdivide is 0.

Examples:

meshing_file method=quad in="cube 1.vtk" out="cube 1.tri.vtk" h=3.5

meshing_file method=quad in=cube.vtk out=cube_quad.vtk h=3.5 subdivide=1

dir *path*

Sets current folder for input/output files.

Example: dir "e:\tests"

exec *filename*

load *filename*

Starts execution commands from file.

Command *load* is executed in artmesh_cmd.exe, command *exec* is executed in artmesh.dll. Command *load* "understand" command *exit*, that ends work of program artmesh_cmd.exe. Command *exec* doesn't "understand" command exit.

4. Configuration parameters

Configuration parameters are global variables of program that can be changed by user. When program starts the default values are set to these parameters. Some parameters have acceptable range of values. New value must correspond to this range. Otherwise the new value will not be assigned to parameter. Syntax of assigning command:

par_name=*par_value*

Example: dump_log=1

Spaces to the left and right of equality sign are not allowed.

If parameter name is typed the without value the current value of parameter will be returned by system.

Command "set *par_name* default" assigns a default value to parameter. Command "set default" assigns the default values to all parameters.

Examples:

dump_log	-	returns current value of dump_log.
set dump_log default	-	assigns default value to parameter.
set default	-	assigns default values to all parameters.

5.1 Parameters that influences the meshing result

ridge_angle

The limit value for angle between normals of adjacent to edge cells. If the angle is larger than this value the edge is "sharp". By default the sharp edges are considered to be feature edges that must be saved in generated mesh.

Angle is set in degrees.

Default value is 181.

chords_per_circle

Define the discrete approximation of curvature. Parameter sets the minimal number of lines (or edges) for full round at cylindrical part of surface (number of chords that describe circumference). The account of curvature is useful for meshing at conic and rounded parts of surfaces. If the initial surface has local singularities (jaggies, etc) the mesher can "think" that this is a region with large curvature and the mesh will be condensed there. And it may be unexpected for user. So it is necessary to use this parameter carefully for low quality initial surfaces. If parameter is set to 0 the curvature is not taken into account.
Default value: 8

aspect_ratio

Parameter sets the limit value for ratio of edge lengths in cell. In some points of surface main curvatures can differs significantly and the linear sizes of mesh for curvature directions will differs significantly too. Parameter aspect_ratio is used to avoid the appearance of too stretched cells. The maximum linear size in point will be reduced so the ratio of maximum and minimum linear sizes will be equal to *aspect_ratio*. Linear sizes ratio is controlled only when aspect_ratio > 0.
Default value is 3

ridge_angle_for_quad

Parameter is used as a condition for joining two triangle cells into one quad cell. *ridge_angle_for_quad* is a maximal value of angle between normals of adjacent to diagonal edge triangles. Both diagonals of future quad are checked. If some angle exceeds *ridge_angle_for_quad* the quad cell formation is not allowed. This restriction is used for formation of quad faces of hexahedrons, prisms and pyramids.
Angle is set in degrees.
Default value is 50.

max_angle_for_quad

Maximal value for angle between adjacent quad edges. Parameter is used as a condition for joining two triangle cells into one quad cell. If some angle exceeds *max_angle_for_quad* the quad cell formation is not allowed.
Angle is set in degrees.
Default value is 172.

angle_min_in_tri_for_point_insertion

Parameter is used only when subdivide > 0 (argument of meshing_file command). If minimal angle in triangular cell exceeds *angle_min_in_tri_for_point_insertion* the new node can be inserted in cell during the process of mesh subdividing. Otherwise node insertion is not allowed. This restriction is used to avoid the appearance of wedge like cells.
Angle is set in degrees.
Default value is 10.

skip_short_concave_ridge_edges_num

Sets the number of consecutive concave sharp edges that will be excluded from the set of feature edges of initial geometry. Parameter takes effect only for isolated chains of sharp edges. This parameter is useful for models with "accidental" sharp edges of poorly refined models.
Default value: 3

5.2 Log file parameters

dump_log

Determine is the writing to log file will be performed. Log file's default placement is artmesh_log\log.txt. This path is relative to the folder in which artmesh.dll is placed. Any command may be executed in silent mode (without writing echo to log file) using prefix '~'. For example ~dump_log=0
Value range: 0, 1
Default value: 1