Overview

This is a documentation for executable file Segmentation.exe, which has the following function:

- Using Centroidal Voronoi Tessellation (CVT) to segment the input surface into patches based on the surface normal information.

The user needs to align the boundary edges if the segmentation doesn't follow the boundary edge.

I/O

Input: manifold triangle mesh in the **raw format.**

- No restriction

Output:

- The triangle mesh after segmentation in .k format:
  - "XXX_initial_write.k": the output mesh after segmentation

All .k file can be visualized using LS-Prepost.

Manual modification if needed in LS-Prepost: modify special elements appearing zigzag caused from CVT and output a new .k file.

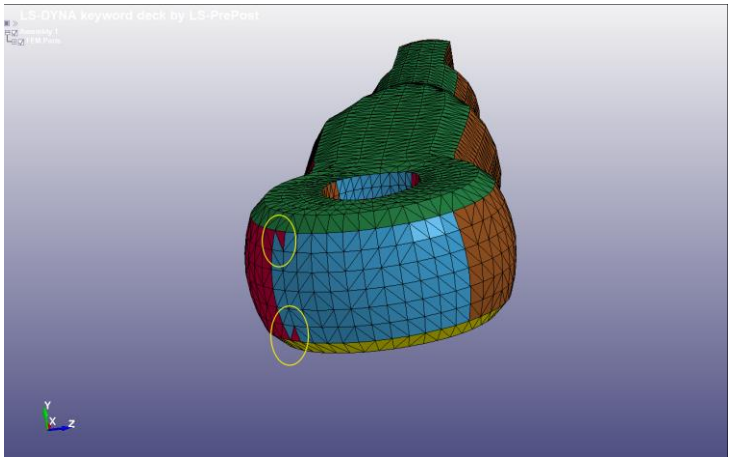
No matter whether manual modification is needed, you must use LS-Prepost to open and save the file to the "XXX_initial_read.k", which will be used as input of other program.

Usage of LS-Prepost to modify special elements appearing zigzag caused from CVT:

User may modify special elements appearing zigzag caused from the program.

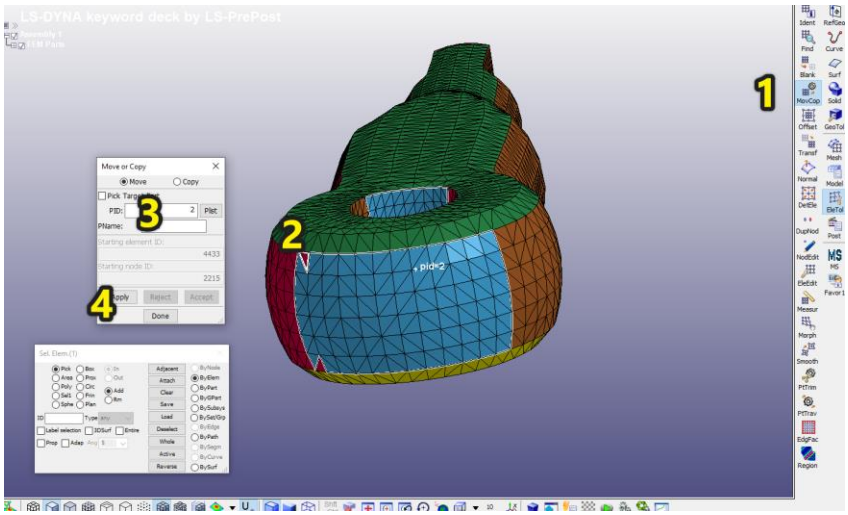
Here, we will use the rod model to explain the usage of the free program (https://ftp.lstc.com/anonymous/outgoing/lsprepost/4.6/win64/LS-PrePost-4.6.18-x64-20Sep2019_setup.exe):

The initial visualization of the segmentation mesh is shown below:

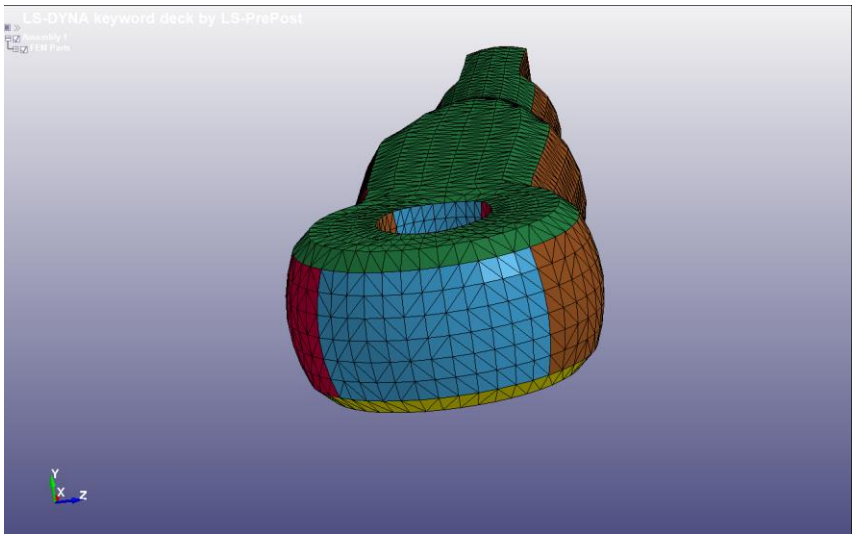


Some elements appear zigzag. The following four steps will solve the problem:

1. Click move/copy tab
2. Click the elements appear zigzag
3. Enter the target patch ID. The blue color is 2
4. Click Apply button.



The result shows as follow



Usage of executable file:

User can run the executable file “Segmentation.exe” through command line.

Each file that ends with “.bat” contains a series of line commands for the specific model. User can run the file to get the ideal results for each model. User can also open the file with text editor to check the detailed commands.

Here, we will use the following file structure to explain the usage of the program:

Generator for Volumetric Mesh/

Segmentation.exe

example/

cube_with_hole/

helicopter/

rod_demo/

The segmentation is explained using the model in rod folder (“rod_tri.raw” as input file) .

The options to run the code are explained as follow:

Help Interface (“-h” or “--help”)

User can use this option to check the help information

Example: Segmentation.exe -h

```
Exeecutable_file ./Segmentation.exe -h
CMU Create Segmentation
Usage:
  G:\My Drive\ShareWithYuxuan\GEM\Software Package\Demo\PolycubeHexMeshing\1\Exeecutable_file\Segmentation.exe [OPTION...]

 General options:
  -h, --help        Print help
  -i, --input arg   File name without type of mesh and extention
  -o, --output arg  The output file

Exeecutable_file
```

Input mesh setting ("-I" or "--input")

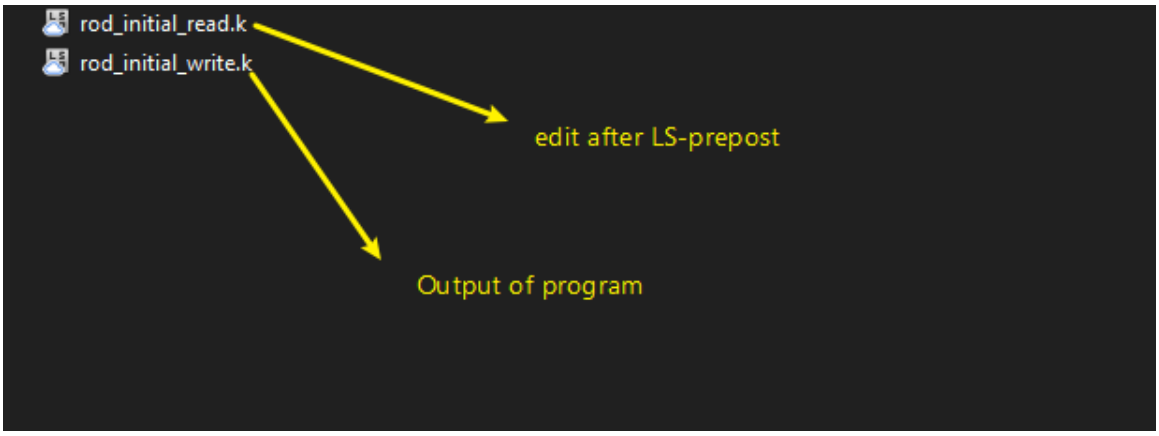
User need to set the input mesh file using this option. The example is shown in the following options.

Example: Segmentation.exe -i rod/rod -o rod_output/rod_initial_write

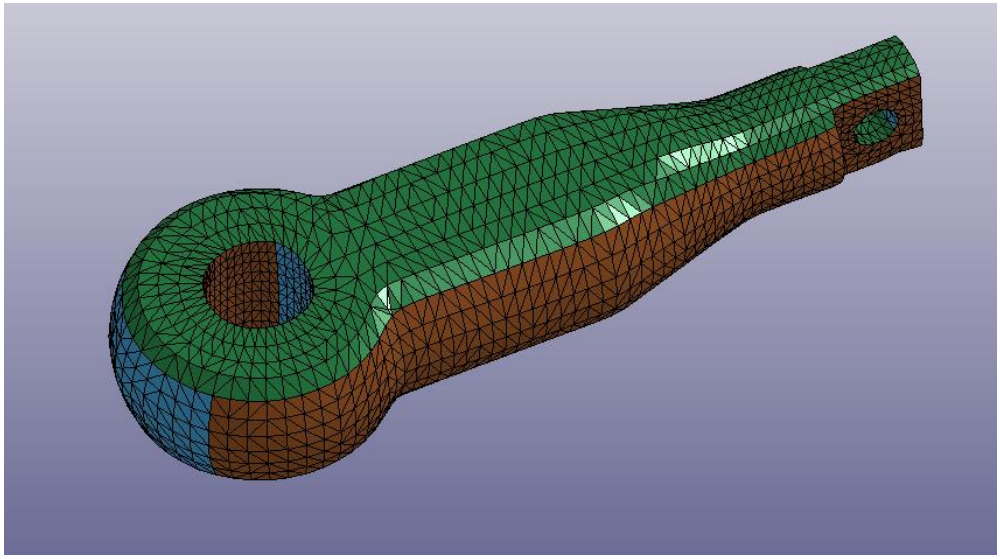
```
G:\My Drive\ShareWithYuxuan\GEM\Software Package\Demo\PolycubeHexMeshing\1\Exeecutable_file>ECHO ON

G:\My Drive\ShareWithYuxuan\GEM\Software Package\Demo\PolycubeHexMeshing\1\Exeecutable_file>Segmentation.exe -i rod/rod
-o rod/rod_initial_write
[==================================>                                ] 50 %
[==================================================================] 100 %
```

the segmentation mesh is output as below:



The visualization of the output segmentation mesh is shown below:



References

[1] K. Hu, Y. J. Zhang, T. Liao. **Surface Segmentation for Polycube Construction Based on Generalized Centroidal Voronoi Tessellation**. *Computer Methods in Applied Mechanics and Engineering Special Issue on Isogeometric Analysis*, 316:280-296, 2017.

[2] K. Hu, Y. Zhang. **Centroidal Voronoi Tessellation Based Polycube Construction for Adaptive All-Hexahedral Mesh Generation**. *Computer Methods in Applied Mechanics and Engineering*, 305:405-421, 2016.