User Manual of MendIT

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*Part of this work has been finished in Tsinghua University, Beijing.

1 Introduction

MendIT is a software designed for topology repair and editing of mesh models. The algorithm of this software is based on the paper:

Editing The Topology of 3D Models by Sketching[1]
Tao Ju, Qian-Yi Zhou and Shi-Min Hu, SIGGRAPH 2007.

Briefly speaking, the software contains two major functions: a sketching system and a back-end algorithm.

The software first read a mesh file (in OBJ or in PLY format), shows it on the screen, and lets the user draw a skeleton by simply clicking and dragging some strokes on 2D screen.

****Important: It would be better to run MendIT on a NVDIA graphics card!****

After that, the user click the ´GO!´ button on the control panel and the software reads a SOG file which represented a valid volume of the model[2], automatically turn the model into the desired topology. During this process, only necessary geometry changes are introduced, so that most geometry are preserved while the topology has been changed. The output of the back-end algorithm is also a mesh file, which can be loaded and smoothed easily in the interface.

2 User guide: an example of ´Knot´ model

A step-by-step guide is shown in this section, using ´Knot´ model as an example.

2.1 Input data

First, two files should be prepared:

- **Mesh file**: the original model file, should be of OBJ or PLY format.
- **SOG file**: the volume representation of the former mesh file, can be generated from PolyMender software: *http://www.cs.wustl.edu/~taoju/code/polymender.htm.*

Run the software, a input dialog will turn up as Fig.1. Fill in the first two edit controls with full path of mesh file and SOG file, fill in the third edit control with full path of output mesh file. Use ´Browse´ button to help selecting files.

[1] A copy of this paper is available at the following website:
http://graphics.usc.edu/~qianyizh/research.html

[2] A SOG file can be generated from the mesh file using PolyMender software:
http://www.cs.wustl.edu/~taoju/code/polymender.htm

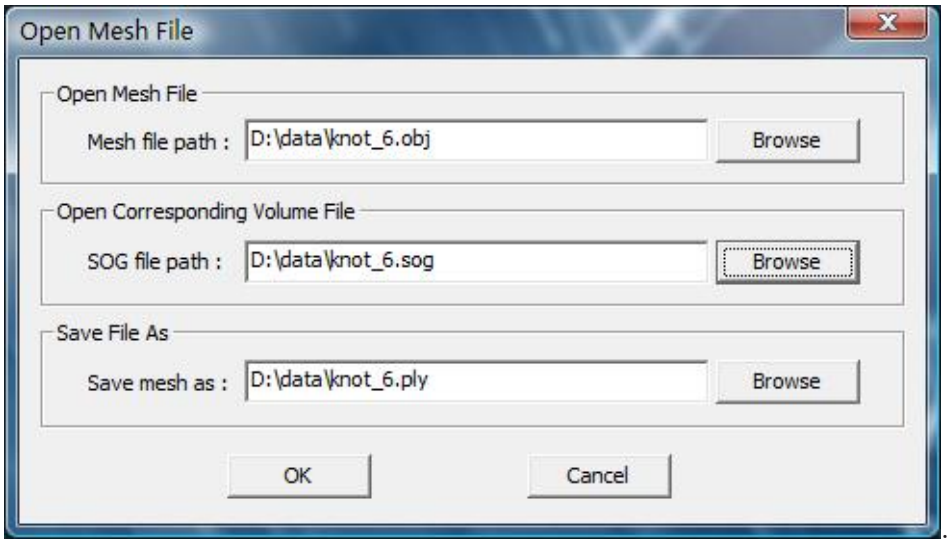

Figure 1: Input Dialog

2.2 Draw skeleton

Now we come up to the main user interface, as Fig.2. The user can hold the right mouse button down and drag cursor on the right view to change the viewpoint.

- With **Shift** key down : Zoom in and out;
- With **Alt** key down : Translation;
- With **Ctrl** key down : Rotation.

Stop at an appropriate viewpoint, press the ´**Space**´ key or click the ´Draw Skeleton´ button on the left panel, the model is now rendered semi-transparently to ease viewing, shown in Fig.3.

There are several features of this sketching interface:

- **Layer selection**: when move the mouse over the screen, the layers of solid materials projected to the mouse location are displayed in realtime (besides the cursor). By scrolling the mouse wheel, a desired layer can be selected easily without interrupting sketching;
- **Depth determination**: sometimes, layer is not enough, we need to determine the depth in certain layer. Combined with ´**Shift**´ key, we can adjust a depth value withing each layer (indicated by the blue arrow beside the layers);
- **Adding new points**: each click of the left mouse button places a new point at the selected depth in the selected layer of solid and forms a line from the previously placed point;

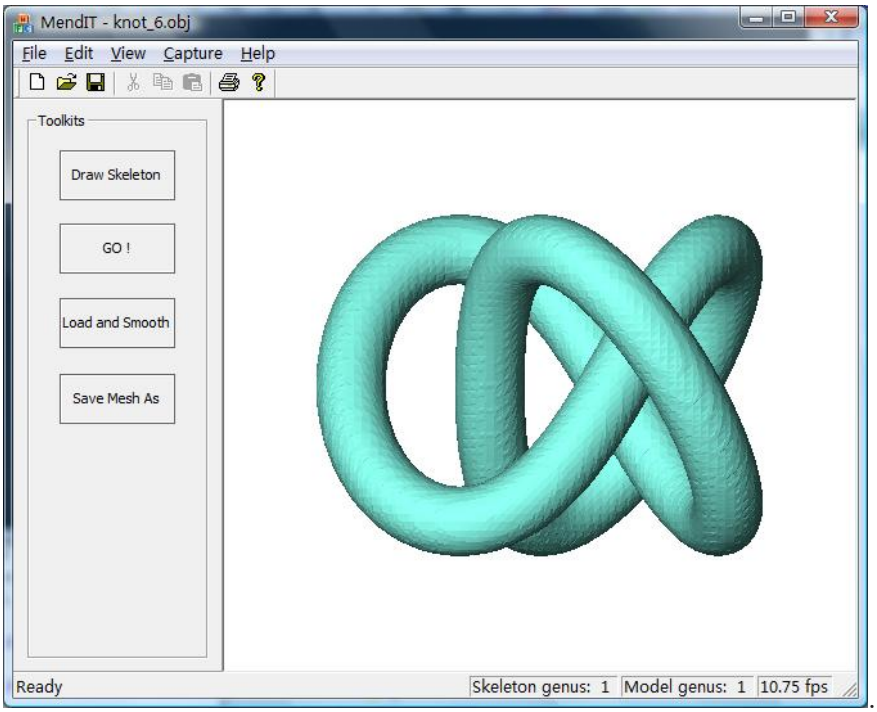

Figure 2: Main user interface

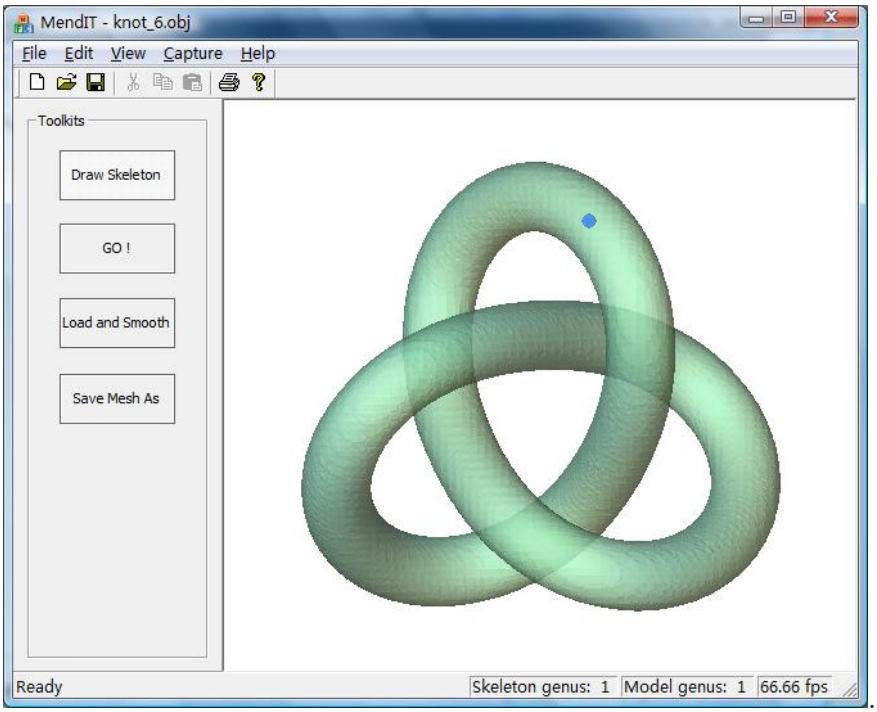

Figure 3: Main user interface

- **Snap and cancel selection**: new points can be snapped onto nearby, existing points and lines, making it easy for creating junctions and closures. Clicking the right mouse button to cancel selection;
- **Add lines outside the model**: in general cases, the skeleton lines are restricted not to lay outside the model. However, by holding ´**Ctrl**´ key, we can force generating such a line.
- **Undo**: we can undo only once by pressing ´**Ctrl + z**´ key;
- **Save and load**: by clicking menu item ´Edit→Load/Save Skeleton´.

Fig.4 shows a whole process of drawing a skeleton.

During sketching, if it is not sufficient to draw skeleton from one viewpoint, we can also change the viewpoint and press ´**Space**´ key again to continue the process.

2.3 Back-end algorithm

When skeleton is finished, simply click the button ´Go!´ on the left control panel (see Fig.5).

Then wait .....

The console window shows the progress of the algorithm.

2.4 Post processing

Although the algorithm automatically write result into mesh files, you will still need to click the ´Load and Smooth´ button on the left panel to load the result into memory and show it on screen. Moreover, the algorithm will ask you for a smooth intensity to smooth the generated cut. After all, you can click ´Save Mesh As´ to save the smoothed result. See Fig.6.

3 Advanced features

I will add this in the next version of user manual..

About how to use ´Config.ini´ and other menu items.

4 Acknowledgement

I would like to thank Prof. Tao Ju[3] in Washington University in St. Louis and Prof. Shi-Min Hu[4] in Tsinghua University in Beijing for their help and valuable discussion.

The models used in the paper (some of them are included in the package) are courtesy of the Stanford 3D Scanning Repository, Aim@Shape Digital ShapeWorkBench, Cyberware and 3DM3.com.

[3] *http://www.cs.wustl.edu/~taoju/*

[4] *http://cg.cs.tsinghua.edu.cn/*

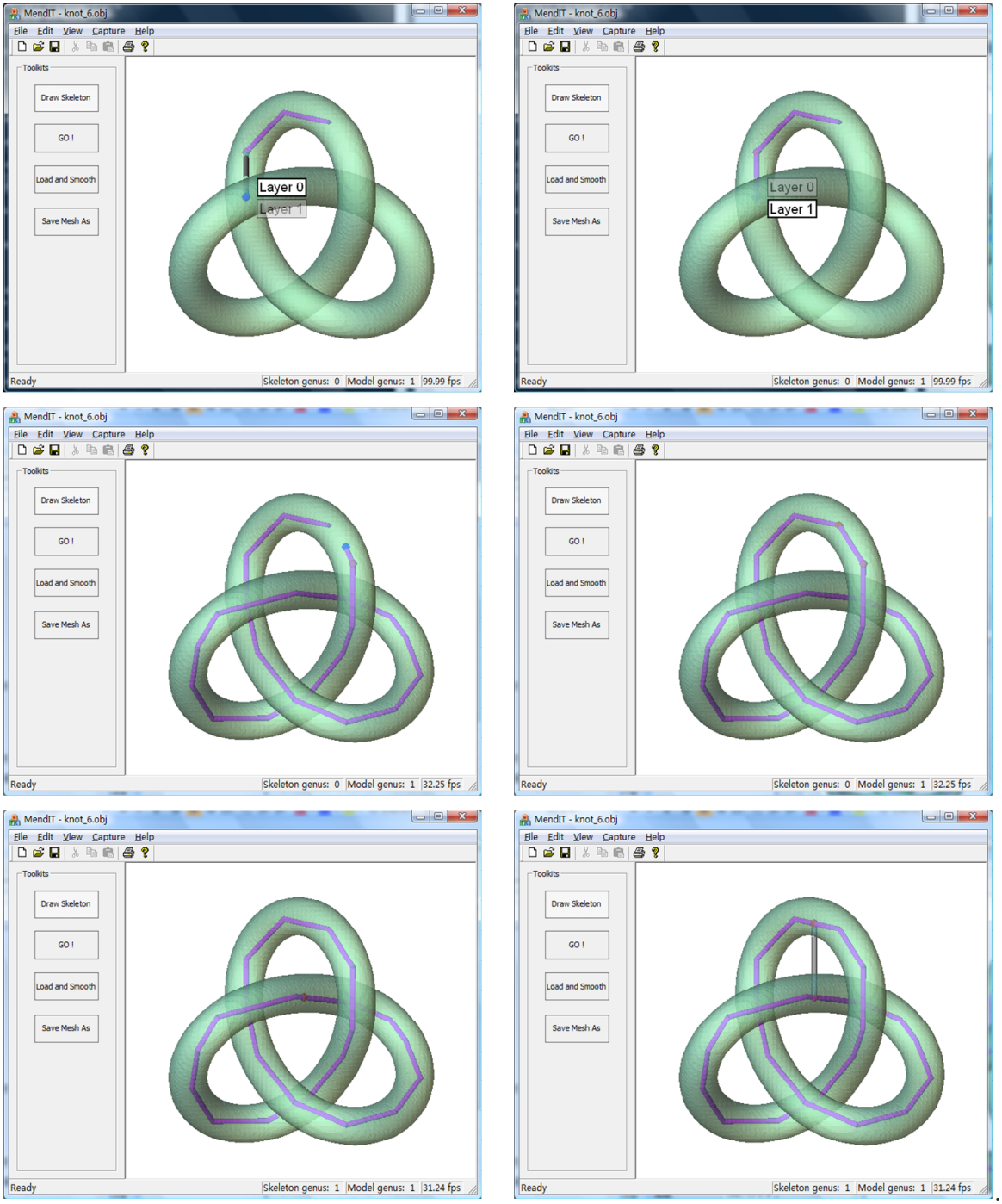

Figure 4: Pipeline of sketching

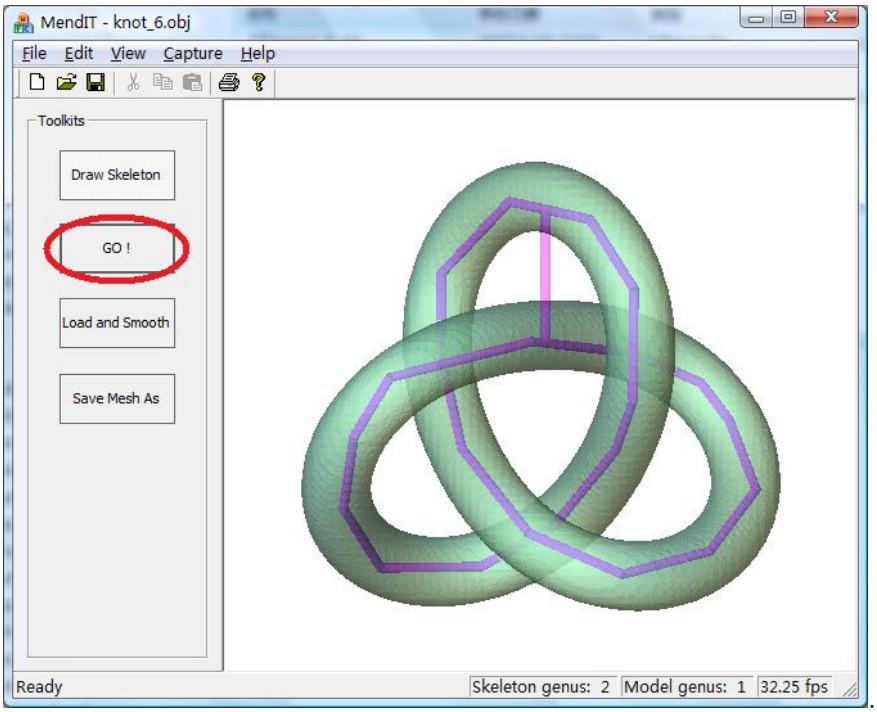

Figure 5: Click ´Go!´ button to start back-end algorithm

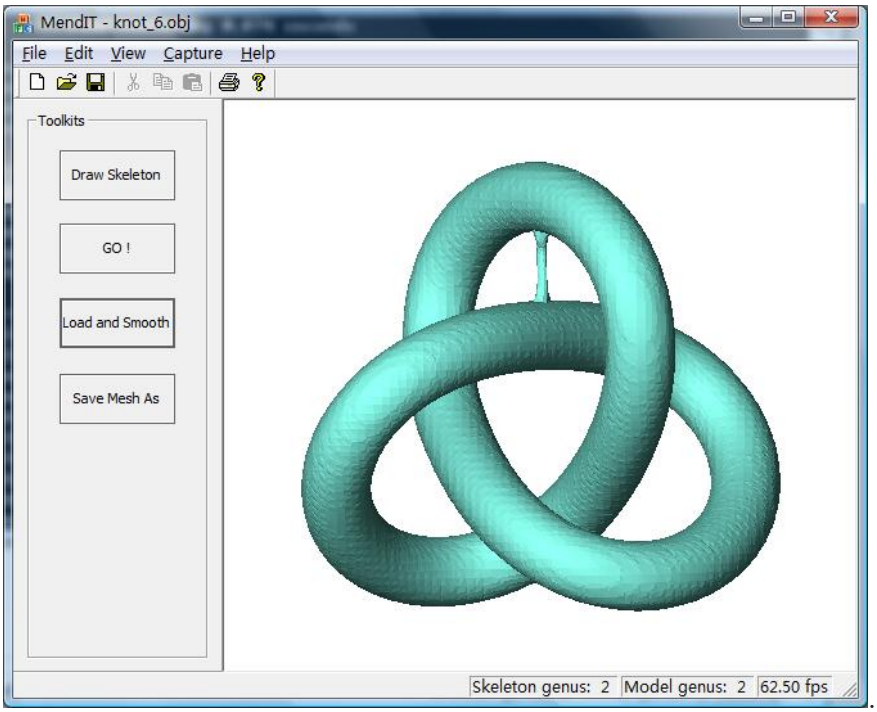

Figure 6: Result after smoothing

5 Update history

- **Version 1.0**: A first version to publish, including an executable package, a user manual and a small data set.