

Generating 3D volume rendering for 3D printing using Dolphin imaging software: a tutorial

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Introduction

Dolphin software is a well know software in the dental field for converting DICOM in a 3D rendering image. This technology allows the operator to measure distances, volumes and also to generated prototypes for a varied of purposes.

In the above-mentioned software imaging, the technique for render airway volume differs accordingly to the type of region you want to render, for example, "air" space or soft tissue or hard tissue.[1] Dolphin software has sensitivity tools that need to be changed depending on the type of density of the region to be depicted. For airway volume rendering, the simple, sensitive tool needs to be adjusted. For soft tissue or hard tissue, an inverted threshold tool needs to be activated. Another interesting feature of the Dolphin® 3D, version 11.95 premium (Dolphin Imaging & Management Solutions, Chatsworth, CA, USA) 11.95 is the practicality of save the file in STL, therefore the operator can send it directly to a 3D printing machine.

During my thesis research project, I couldn't find any material explaining some of the Dolphin's tools I need for my research. Therefore, I spent some time to figure that out by myself. Thinking about that, I decided to develop a simple tutorial to make the life of future researchers in the field a bit easier.

The objective of this tutorial (and the video-tutorial) is to report the step by step to generate 3D Volume rendering- of airway space - in Dolphin software for 3D printing.

Procedure:

Basic knowledge about the software is required since this tutorial starts describing the steps after you have already opened the Dolphin® Imaging main screen, and from there, searched and chose your patient's name, and selected the patient 3D image button.

Step 1

- Click the "sinus/airway" tab to open the window with the airway volume rendering platform

Step 2

- Remove all boundaries, landmarks and seed points that might have been previously saved

Step 3

- Create boundaries for the region you want to render

Step 4

- Click "Add a new seed point" and place the seed into the region you want to render the volume

Step 5

- Click "Adjust the airway sensitivity" tool to fulfill the region of interest

Step 6

- Click layout buttons 2x2, to see (and check) four equal panes containing the slices (axial, sagittal, and coronal) plus the volume rendering

Step 7

- Click "Slice buttons" to check airway volume rendering in axial, coronal, and sagittal slice

Step 8

- Click "Update airway" to calculate the airway volume

Step 9

- On the volume rendering options, click dialog box and uncheck "soft tissue. The, only volume surface will be shown

Step 10

- Save generated surface to workup (patient database). Save as "airway surface database."

Step 11

- Close the 3D airway window to save the volume into the format required for 3D printing (STL.), then Click Photos/surface.

Step 12

- A box with the saved surface appears; click on the export the surface button

Step 13

- Choose recommended .STL (binary)

Step 14

- Finally, choose where you want to save the STL. format

Important observations:

- As observed in the previous paper [1, 2], the adjustment of the sensitivity tool (threshold) is the summa importance on the process to generate volume surface. See in the tutorial video the impact of an excessive or insufficient threshold.

Tips:

- You can set more zoom or less accordingly to your preference and your region of interest.
- Reduce the "zoom" on the result view, so you can check all slice views of the volume surface if needed.

Conclusion

Dolphin software has friendly user tools to render volume and saving it in .STL file faster the process.

References:

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