1 Welcome!

This sub-module will enable you to create 3d-models you can use in any available 3d-package to create real 3d-images with refraction-effects, shadows and whatever you want. You could even create solid objects to put onto your (real! :-)) desk using a 3d-printing-service! But, beware, this can be like "living on a edge". It can happen that you put much effort into a particular scene, and finally you will end with nothing. On the other side you could achieve outstanding results, which you could not get with any other technology.

2 How does it work?

The basic idea is the one of a CT scan. You scan an object slice by slice to obtain a model of the whole. The make it work, the object (i. e. the fractal) must to be a (pseudo-)3d-fractal. A "slice" is just a 2D-render of this object at a certain "scan-position" (z-coordinate). So, there are five steps involved:
Design the fractal
Render the slices ("perform the CT scan")
Create a model from those slices
clean-up, smooth, refine, ... the model
render the model in any 3d-software

3 What do we need?

You will need a lot of passion, some decent computer hardware and a few software packages for various tasks. But you do not need any expensive commercial software, anything can be done using fine free software. All of this will be explained in the following sections in detail.

3.1 "Solid" flame fractals

What helps the most is the ability to create "solid" (i. e. not too noisy) flame-fractals, in 3d. But there are many tutorials around which help you. Good candidates to start are the so-called "3D Bubbles", "3D Julian Bubbles" or "Xenophilia".

3.2 The JWildfire volumetric renderer

There is at least one (very misleading) tutorial who describes a technique to create a 3d-mesh by stacking the same (flat) object at differing sizes. This finally also produces a 3d-object and you can use any flame-fractal-renderer to create the "slices". But, the technique described here is about volumetric rendering, and a standard-renderer is of no use.

3.3 The free Fiji-software

The free Fiji-software is used to create the 3d-model (also refered as "mesh") from the slices. You can download it from http://fiji.sc/Fiji
3.4 The free MeshLab-software

3,4 The free MeshLab-software is used to clean-up, smooth, reduce, ... your model. You can download it from http://meshlab.sourceforge.net/

3.5 Any 3D-package

Use any 3D-Renderer you want, to finally render the model created in *.obj-format. If you have no idea, where to start: both Blender (http://www.blender.org/) and Bryce (http://www.daz3d.com/software/bryce) are excellent choices, the latter is not really free, but the 20$ are it really worth, if you can get used to the interface ;-).

4 Let's create the first model!

4.1 Inside JWildfire

Load a previously designed "solid" flame-fractal, if you have no idea were to start, just try the example from the Appendix of this document (you may freely use and alter this for aynthing you want)
Select the right "top-view"-position using the "CentreX", "CentreY" and "Zoom"-sliders. This the size of each "scan"
Select slicing area (range of the "scan") using the "Position 1" and "Position 2" sliders. To help you with this those positions are visualized inside the fractal-preview
Select the volumetric-resolution, quality and memory-consumption
"Render width" and "Render height" specifies the resolutiuon of each slice
"Total number of slices" specifies the number of slices and together with the slicing range ("Position 1" and "Postion 2") the cutting range
"Slices per pass" is a major speed-up option. It allows to generate any number of slices in parallel, at nearly no CPU-cost, but, ... each slice must fit into memory. So, the higher this value, the faster the render, but the more memory is needed.
"Render quality" is the quality for generating slices. If you have a noisy fractal, you may need higher values. As a general rule of thumb use a quality level in the range equal or down to the half of the slice size.

4.2 Inside Fiji

start the Fiji software
for example "ImageJ-win64.exe" in the installation drawer "Fiji.app" on Windows
import the image-stack
choose the menu item "File"->"Import"->"Image Sequence"
in the next dialog choose the first of your image-stack
in the next dialog, check the "Use virtual stack" box and leave all others options unchanged
generate the raw mesh
choose the menu item "File"->"Save as"->"Wavefront .OBJ"
in the next dialog enter a "Threshold" of 0 and uncheck the "green" and "blue" checkboxes (because the image stack is in grayscale)
enter a file name in the next dialog
now comes the tricky part:
ignore the progress-bar of Fiji and open the task manager
on Windows locate the Fiji-process (e. g. "ImageJ-win64.exe") and the process-tab
wait until this process is not busy anymore for at least a couple of seconds (i. e. having a "CPU" value of zero)
assume Fiji is done and quit the program

4.3 Inside MeshLab

start the MeshLab-software
for example "meshlab.exe" in the installation drawer "MeshLab" on Windows
open the generated mesh
choose the menu item "File"->"Import Mesh"
turn the orientation of faces into the right direction
choose the menu item "Filters"->"Normals, Curvature and Orientation"->"Invert Faces Orientation"
in the next window click "Apply" and the "Close"
eventually smooth the mesh
for example "Filters"->"Smoothing, Fairing and Deformation"->"Taubin Smooth"
eventually recreate the mesh with lower polygon count
for example "Filters->"Remeshing, Simplification and Reconstruction"->"Quadric Edge Collapse

Decimation" (enter any desired "Target number of faces" value)
there are endless options to play around :-)
finally, save the altered mesh "File"->"Export Mesh As…"

4.4 Have fun to use the model in your 3d-package

Appendix: A simple example flame to start

Just select the following text (starting with "<flame ", ending with "</flame>") with your mouse and press <Ctrl+C> to copy it into the clipboard, then press the "From-clipboard"-button inside JWildfire to load this flame.

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