

# **3D Manual**

Version 3.0  
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# 1. Selecting the 3D Window

At application startup a dialog is presented. Choose 3D to activate Fracton's 3D mode and go to the 3D window. Choosing New 3D... from the File category of the Main Menu bar will also activate 3D mode.

# 2. Main Views

The upper left hand corner of the window has a segmented button with Formula, Settings, Color, Debug, Compose, and Render. Click the segment to change the view.

## Formula View

Formula Text Field - Type an equation here. Equations are used in Formula Simplex and Formula Triplex modes. Mandelbulb, Juliabulb, and Parabolb types do not use formulas. For details on the Simplex and Triplex languages refer to the separate language guide. The formula text field has full copy, paste, search, and replace capability.

## Settings View

Type - The fractal types are Mandelbulb, Juliabulb, Parabolb, Formula Simplex, and Formula Triplex. Mandelbulb, Juliabulb, and Parabolb types do not use formulas. Formula Simplex and Formula Triplex allow the user to type a custom formula into the Formula Text Field in the Formula View.

Max Iterations - This number determines the maximum number of times the formula is iterated. The default value is 6. It is used for all fractal types.

Power - The power is the power of the exponent and is used for Mandelbulb and Juliabulb types only.

Julia Constant - The Julia Constant is used only for the Juliabulb type.

Export Model Files - A popup that allows exported model files to be generated as a single large file or multiple smaller files of about 1 Gb in size. The single file is not recommended as the system in some MacOS versions will try to generate an icon for the file that will fail over and over again.

Export Samples - The sample size for exported model files. If this number is different than the samples on the Compose view, this number will be used. If different, the model will not be redrawn on the Compose view allowing for higher quality models than can be displayed in the Compose view.

Bulbs Popup - Sets the number of bulb parameters. The number ranges from 2 to 6.

Animation Popup - Choose either Start or End. Selects either Start or End for the Bulb Parameters.

Bulb Parameters - Bulb 1 to Bulb 6 has position, rotation, and scale for x,y, and z. The values are returned in the variables p1-p6 in the triplex compiler and p1x,p1y,p1z to p6x,p6y,p6z in the simplex compiler. The parameters are also used in Parabolb type fractals.

Bulb Power - This parameter determines the power of the exponent in Parabolb type fractals only.

Status Message - This area at the bottom displays the number of triangles in a fractal. The value appears after a fractal is drawn in the Compose view.

## Color View

Model Color - The model color sets the body color of the model. Clicking the color well causes the Apple Color picker to appear. Click the desired color or move the sliders. Close the window to use the color. Green is the default Model Color.

Background Color - The background color sets the color of the view where there is no fractal. Black is the default Background Color.

Ambient Color - The ambient color sets the color of the model where there is little or no light. Black is the default Ambient Color.

## Debug View

The debug view evaluates the formula at a user defined point and displays the value of variables. It may be useful for debugging why a formula does not generate the desired result. It is also useful for determining how the various language commands work.

The text fields for X,Y,Z are the values in 3D fractal space where the equation is evaluated. The value of X,Y,Z is delivered to the formula in the variable tp in the triplex compiler and tpx,tpy,tpz in the simplex compiler.

Start Line - The first line of trace output. The default is 1. Set the number higher to skip over the first lines of a trace.

Number Lines - The number of lines in the trace output. The trace stops after the requested number of lines is displayed or the fractal has bailed out.

## Compose View

The compose view adjusts the camera, lighting, and position of the zoom box in the scene in real time. The camera settings and lighting are passed to the render view.

Zoom Box - The zoom box is the white cube in the center of the view. Fracton has no idea where the fractal is located and the zoom box determines where it will look. The fractal equation is evaluated inside the zoom box only and at a resolution determined by the samples field. After drawing the fractal, shrink and move the zoom box to a part of the fractal to concentrate on that area only. Click update to redraw the fractal at the new position and size.

Fractal Model - The fractal model will appear inside the zoom box after the Update button is clicked. The model only needs to be drawn at a high enough resolution to adjust the camera

and lighting for the Render view. The Render view is used to make a high quality image and is not constrained by limits on the number of triangles or the bounds of the zoom box.

Rotate View Button - Sets the mode to rotate view. Clicking and dragging the mouse in the view rotates the view by moving the camera in a circular orbit centered on the zoom box. The camera always points at the center of the zoom box.

Zoom View Button - Sets the mode to zoom view. Clicking and dragging the mouse up and down in the view zooms the view by moving the camera closer or further away from the zoom box.

Move Zoom Box Button - Sets the mode to move zoom box. Clicking and dragging the mouse moves the zoom box left, right, up, and down. After the mouse button is released, the camera will snap to look at the new position of the zoom box.

Zoom the Zoom Box Button - Sets the mode to zoom the zoom box. Clicking and dragging the mouse up or down makes the zoom box bigger or smaller.

Zoom Box Text Fields - The zoom box text fields change the x,y,z position and the size of the zoom box. Clicking on the - buttons makes the numbers smaller. The + makes them bigger.

Box Visible Check Box - The box visible check box hides and shows the zoom box. Even when hidden it still functions as if it were there.

Light Azimuth Circular Button - Clicking and dragging moves the position of the light in a circle around the zoom box. The position of the light can be moved from front, left, back, right or any position in between. The lighting updates in real time.

Light Elevation Slider Button - Clicking and dragging moves the position in an arc around the zoom box. The position of the light can be moved from top to bottom or any position in between.

Samples Text Field - The samples value determines the quality of the model that is made from the fractal. The number of points that are checked to make the model is  $\text{samples}^3$ . For example with 100 samples a million points are checked. Setting this value too high will generate a model that is too complex to fit in the memory of the video card and may cause the video card to crash. Generally, values 500 or below are acceptable on newer computers and 300 or below for older computers. This is only a rule of thumb as the number of triangles in the model depends on the complexity of the fractal.

Update Button - Makes a model using the current settings.

Cancel Button - Only visible when a model is being constructed. Clicking will stop the construction of the model.

## **Render View**

The render view generates a high quality ray traced image of the fractal using the camera settings and lighting specified in the compose view. The Render view is not constrained by limits on the number of triangles or the bounds of the zoom box. Higher quality takes longer but does not use more memory.

Camera Popup - The camera popup determines which camera model is used to ray trace the image. The camera selection draws a view that provides an image similar to that seen in the Compose view. The image goes to the limit of the view and is not constrained by the size of the zoom box in the Compose view. The Zoom Box Front setting draws a non-perspective image from the front of the zoom box to the back of the zoom box and ignores the camera in the Compose view. The VR Over/Under setting draws a true 3D image using Google's VR format for YouTube (COMING SOON).

Far Clip - The far clip field determines how far into the distance the render algorithm searches. A value of 1.0 searches from the camera to the far side of the zoom box in Camera mode. The value is not used in Zoom Box Front mode.

Search Accuracy - The search accuracy determines the resolution of the search in the direction into the view. Finest is the best and also the slowest. Each setting is a factor of 2 different in accuracy and time. Set the accuracy to Coarsest for very quick renders when you are first setting up your scene. Then increase the accuracy to improve the quality.

Animation - The animation field determines how many frames are in an animation. The animation is initiated with the File -> Export -> Export Movie... menu command.

Image Size - The image size fields determine the size of the image. There are presets for common sizes or you can type in the numbers for x and y.

Anti-aliasing - The anti-aliasing popup determines how many samples of each pixel are calculated. More samples give a higher quality image at the expense of a longer render time. For example a 5x5 setting uses 25 samples to make a fairly high quality image but takes 25 times as long to render. The 20x20 setting is very high quality but takes 400 times as long to render.

Render - The render button starts the render using the current settings.

Cancel - The cancel button is only visible when a render is running. Click cancel to stop the render.

## **3. Menu Commands**

### **Fracton Menu**

Preferences - Set the number of cores that Fracton is allowed to use simultaneously.

### **File Menu**

New 2D Fractal - Closes the current window and opens a new 2D window with default settings.

New 3D Fractal - Closes the current window and opens a new 3D window with default settings.

Export Image - Opens a file dialog and saves the current rendered image in a file in TIFF format.

Export Movie - Opens a dialog that lets the user create and select a folder in which to place a sequence of rendered images. The image sequence can be converted to a movie with Quicktime Player, Compressor, Motion, Final Cut, and many other movie editing programs.

## **Help Menu**

Help - Directs the user to the online help at <http://www.fracton.org/help.html>

## **4. Credits**

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