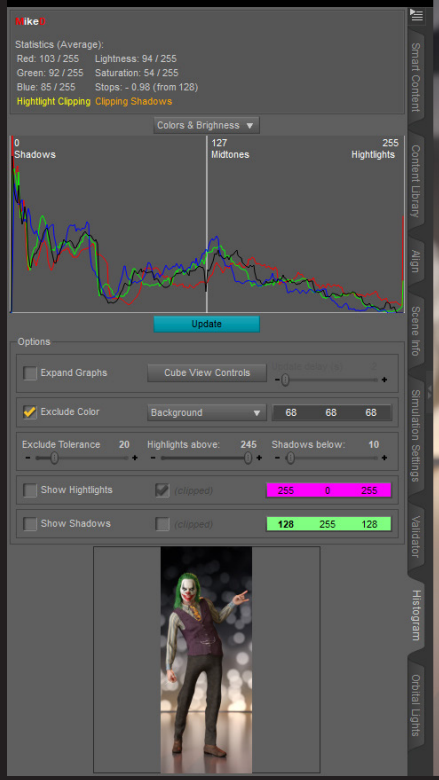
Histogram plug-in

for DAZ Studio

by MIKED



The histogram plug-in will add a new pane in DAZ Studio that will allow you to see the histogram of the scene preview in Iray or Filament mode, without the need to render the image and pass it to an external photo application. The plug-in will show you not only the histogram of the Iray or Filament preview, but it will also calculate useful statistic information like the average Brightness, the average Color's value etc. The 256 px thumbnail screenshot at the bottom of the pane will show you the current captured image, and it will also project the (clipped) highlights, or/and the (clipped) shadows if you wish. You don't want information about the full image but just for a part of it? No problem! You can click and drag a rectangular on the thumbnail with your mouse and the histogram will automatically updated the information only for the area you want. A special 'expand graph' check box will normalize the peeks of the graphs and an 'Exclude Color' option will ignore a specific color from the image, like the viewport background color, the backdrop color, or even a custom one. With the histogram plug-in you can adjust the lighting of your render and make a fine tuning before rendering!

In the following text you will find some 'Advanced shot' areas, which explain more mathematically some terms. You may skip them if you don't really care too much about math and algorithms.

The 'Photographic tip' areas is a more simple explanation of some terms and how to use the histogram for your renders. These areas worth to be read.

I must also clarify that the terms 'Brightness' and 'Lightness' are expressing something different mathematically in photography, but in this manual, I use them as the same thing for simplicity.

The histogram is available if you are in Iray or Filament draw style in main viewport, and the histogram is not in the 'Off' mode.

Information area

At the top of the pane is based the information area. This area shows the statistics of the captured image or of the selected part of it.

At the first column you can see the average color values, comparing to the 255 value (255 is the max value that a pixel can have).

The second column starts with the average lightness, followed by the saturation. These are the average value and average saturation of the pixels in the HSV mode of the image.

The next value is very interesting. It shows the average stops (fStops in photography) difference from the middle gray (middle gray value of 128).

Advance shot

The Stops are calculated using the average lightness (value of the pixels) with the algorithm:

$$Stops = gamma * \log_2 \frac{Value\ 1}{Value\ 2}$$

which came from the type that calculates the Stops between two pixels' value:

$$\text{Stops}=2.2^{*}\log_2 \frac{\text{Lightness}}{128},$$

Photographic tip

You **don't** have to adjust the lightings of your scene in order to achieve the middle gray of 128 (0 Stops). Having an image with a lightness of 128 is not a necessity. Many images or part of the image must be underexposed (values below middle grey of 128). As an example, we have the low-key images. They must be dark. Also, the shadows of an image must be some stops below the middle value of 128. In the contrary high-key images or the highlights of an image must be overexposed. So, don't chase the 128 value (or 0 stops) for your renders. See the histogram like a guide to the current state of the image, comparing to the result you want to achieve that will help you get what you imagine.

Histogram area

Advance shot

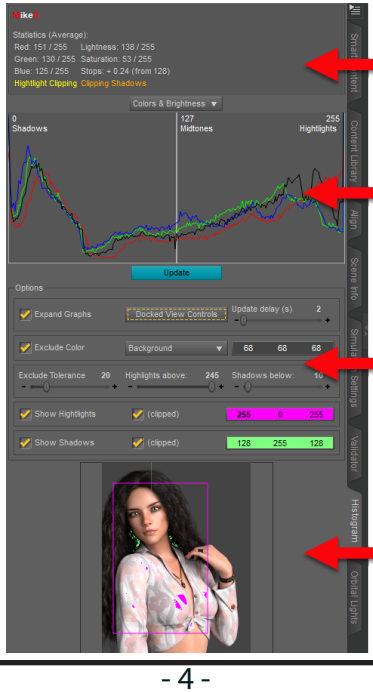
A **histogram** is an approximate representation of the distribution of numerical data.

(https://en.wikipedia.org/wiki/Histogram)

Although the histogram is a statistical tool, we use it in the photography (and of course in a 3D rendered image) in order to have a better (and numeric) perception of some image's data.

Photographic tip

The histogram is nothing more than a graph. If it is shifted to the left, the image, or the selected image area, is relatively dark. If the main graph's body is at the horizontal middle of the histogram, the image is considered to be balanced. If the graph is shifted to the right the image or the selected part of it, is overexposed.



The histogram area has a mode button at the top of it. The possible modes are:

Off: This mode sets the Histogram off. The histogram updates every time the main viewport is changing into the Iray or into the Filament mode. This is not always desirable. With this mode you can set the histogram off.

Colors: This mode shows you three graphs, one for each color (Red, Green and Blue). The values are taken by the pixels' Red, Green and Blue properties.

Colors & Brightness: The same as the 'Colors' mode with the addition of the Brightness (the value of the pixels in HVS).

Red: The histogram is showing the distribution only for the red color of the pixels.

Green: The histogram is showing the distribution only for the green color of the pixels.

Blue: The histogram is showing the distribution only for the blue color of the pixels.

RGB: A lightness graph of the weighted combination of the red, the green and the blue values of the pixels, to better match to the human eye.

Brightness: The value distribution of the pixels in HSV mode.

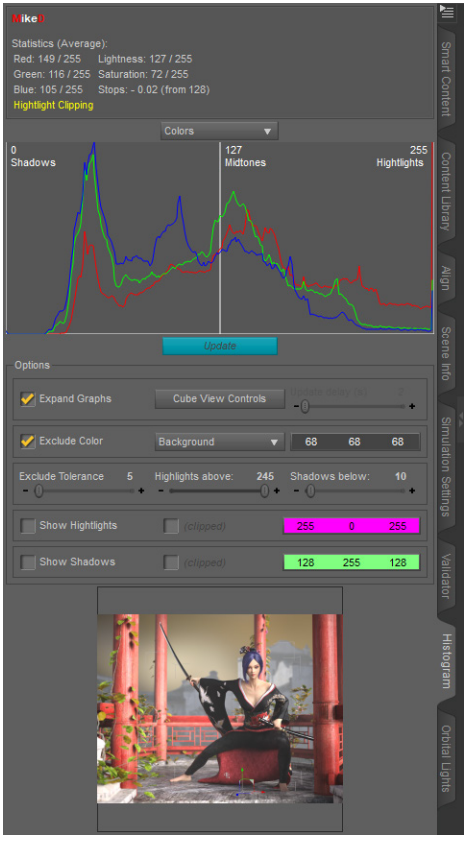
Saturation: The saturation distribution of the pixels in HSV mode. Of course, the saturation distribution does not follow the rule 'more underexposed to the left' or 'more overexposed to the right'. This graph is following the rule 'more under-saturated to the left' of 'more oversaturated to the right'. Be aware that the saturation has different normal values than the brightness.

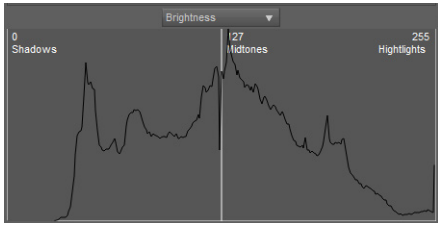
Advance shot

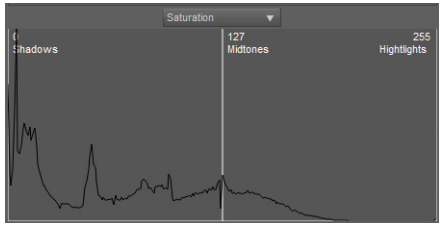
The weighted RGB formula that is used for the RGB mode is:

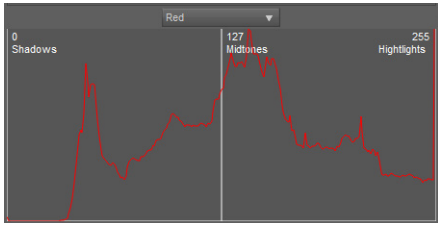
$$Value_{RGB} = 0.3 * Red + 0.59 * Green + 0.11 * Blue$$

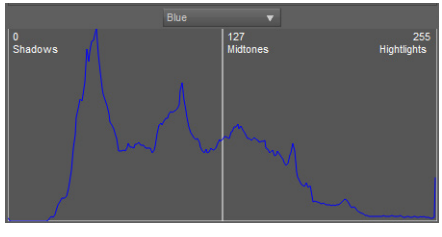
The **update** button is under the histogram area. Use it if you want to update your data. Each time you select the "Iray" or the 'Filament' draw style in the main viewport, the histogram is auto updated. There will be many times that you need to update manually the data. Use this button. The button is enabled if the "Iray" or the 'Filament' draw style is active, and the mode is not set to 'Off'.

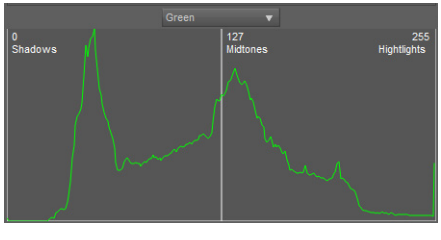

MikeD
Statistics (Average):
Red: 149 / 255 Lightness: 127 / 255
Green: 116 / 255 Saturation: 72 / 255
Blue: 105 / 255 Stops: - 0.02 (from 128)
Hightlight Clipping
Colors
0
Shadows
127
Midtones
255
Hightlights
Update
Options
Expand Graphs
Cube View Controls
Exclude Color
Background
68 68 68
Exclude Tolerance 5
Highlights above: 245
Shadows below: 10
Show Hightlights
(clipped)
255 0 255
Show Shadows
(clipped)
128 255 128
Smart Content
Content Library
Align
Scene Info
Simulation Settings
Validator
Histogram
Orbital Lights

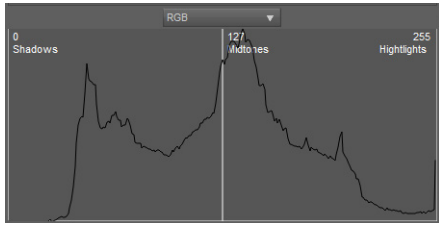

Brightness
0
Shadows
127
Midtones
255
Hightlights


Saturation
127
Midtones
255
Hightlights


Red
0
Shadows
127
Midtones
255
Hightlights

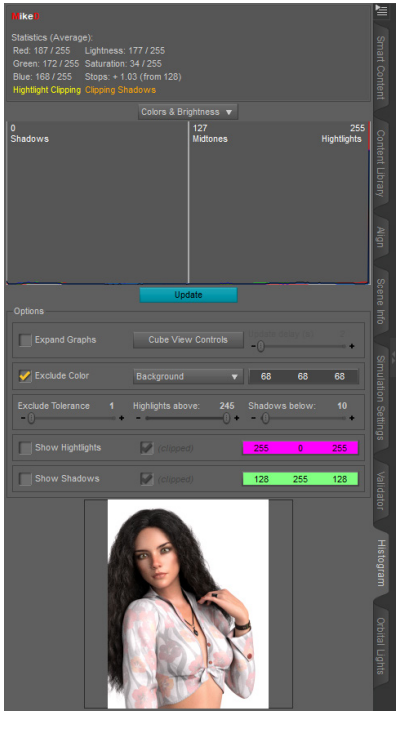

Blue
0
Shadows
127
Midtones
255
Hightlights


Green
0
Shadows
127
Midtones
255
Hightlights


RGB
0
Shadows
255
Hightlights

Options

Expand Graphs: With this checkbox you can expand the vertical distribution of the graphs in some situations that a value is too high in comparison with other values. For example, in the next high-key render, graphs are compressed near the 0 value (with the 'Expand Graphs' deselected) due to the great number of pixels with 255 value (all peaks are to 255).

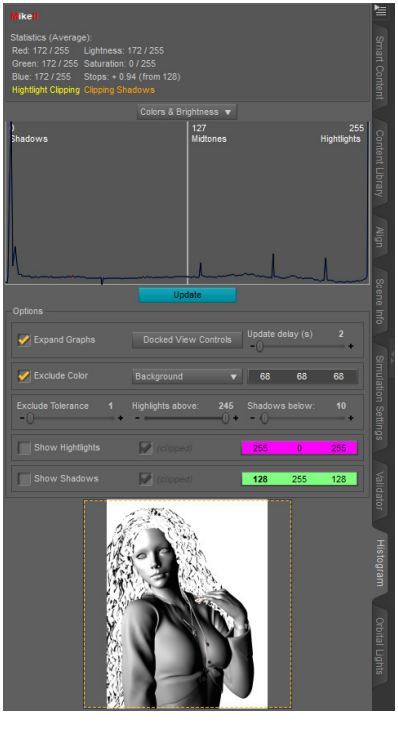


The "Expand Graphs" is enabled for the next histogram of the same render. As you can see now the graphs are more 'readable'. It is recommended to leave this option always on.

Advance shot

The 'Expand Graphs' feature checks the maximum value of the graph, recalculates and redistributes all values, until the next value is at least the half of the maximum, so the graph is readable.

"**Cube View Controls**" or "**Docked View Controls**": This button will allow you to change the view controls mode from "Cube" to "Docked" and vice versa (a shortcut for the menu options). The Histogram will change the viewport into 'Docked View Controls' if you press 'Update' (if the 'Docked View Controls' mode is not already active). This is happened to avoid capturing the cube and its buttons in the screenshot. The switch from "Cube" into "Docked" mode will make the viewport to update the render in Iray mode and it will cause a delay. The screenshot will be taken into that delay period and the image will not be the actual Iray preview (see the next image).

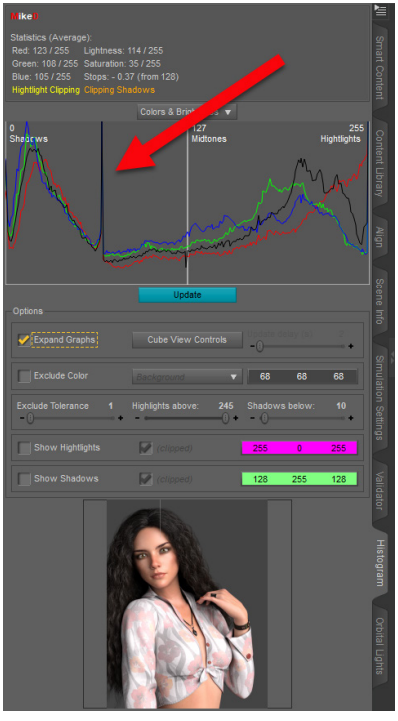


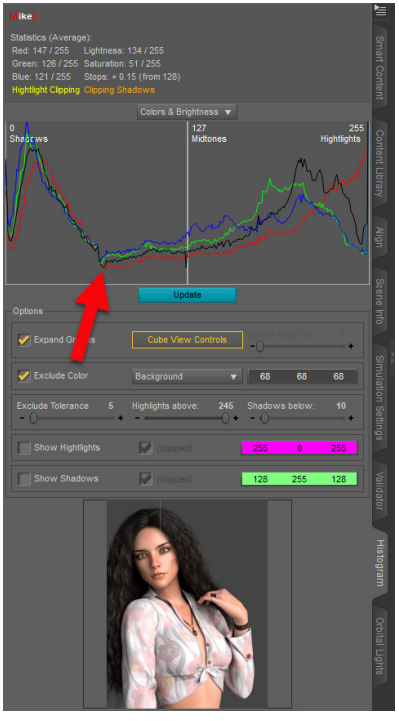
Change the mode into "Dock View Controls" before the "Update" procedure in order to avoid this mode auto switching. This way you can also capture the viewport after the Iray iterations you think that are acceptable for the specific image, as now in this mode the Iray will not be refreshed again pressing the 'Update' button.

Update delay (s): This button is enabled if you have "Cube View Controls" mode in the viewport. Set with this slider the delay you want before the screen capturing in order to avoid the phenomenon that is described into the previous paragraph. If you are switching from any other style into Iray preview, the scene will need some time to load the items into the PC (or GPU) memory, so set a relatively high value (according to the system configuration). Of course, you can let the scene prepared for the Iray and use the 'Update' button later. In this case you need relatively small delay times.

Exclude Color Row: This option will exclude a specific color from the histogram calculations. You can select to exclude viewport's 'Background' color, 'Backdrop's' color or a custom one. Choosing the 'Background' color or the 'Backdrop' color, the color widget will auto update with the correct value. You can choose the color you want only in the custom mode.

The exclude tolerance slider will let you set the tolerance for the exclude color feature.



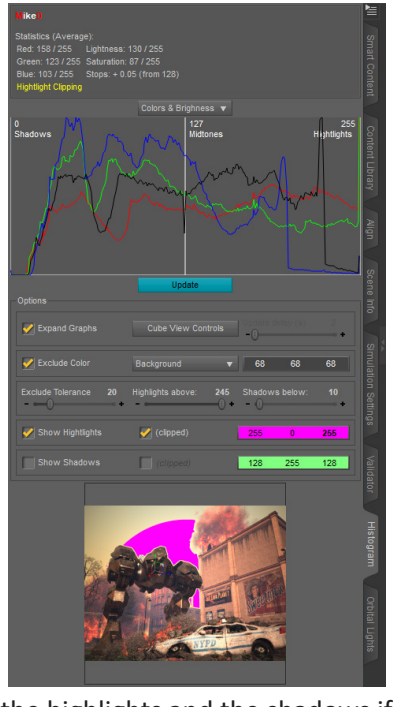


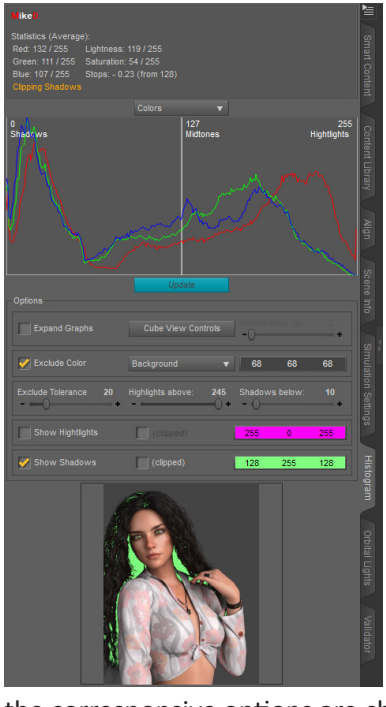
Advance shot

The tolerance is measured by the distance that a pixel's color has from the selected 'excluded color'. If the distance is lower than the tolerance, the pixel will be excluded from the calculations. The distance is given by the Pythagorean theorem (3D) for the Red, Green and Blue values of the pixels (R: red value, G: green value, B: blue value, R_0, G_0 and B_0 is the excluded color Red, Green and Blue values):

$$Distance = \sqrt{(R_{pixel} - R_0)^2 + (G_{pixel} - G_0)^2 + (B_{pixel} - B_0)^2}$$

Highlights – Shadows: By checking any of these check boxes the thumbnail shows the Highlights or the Shadow pixels with the corresponding selected color. In Highlights belong the pixels with a value greater than the value of the slider "Highlights above" and the shadows includes the pixels with a value lower than the value of the slider "Shadows below". You can set the values of these sliders, with any value from 170 to 250 for the highlights (default 145) and from 5 to 85 for the shadows. You can also set the presenting color for the highlights and the color for the shadows. The clipped checkboxes will be available if you have checked the highlights or the shadows options first. The clipped boxes are responsible to show you the highlight or the shadow pixels with no information.





Advance shot

For this plug in, a pixel is considered to have no information if all the pixels around it, in a square area of 3x3 has a difference in value less than 3, compared with this pixel's colors value (all next equations need to be true):

Abs(Pixel.Red.value – NeighborPixel.Red.Value) < 3

Abs(Pixel.Green.value – NeighborPixel.Green.Value) < 3

Abs(Pixel.Blue.value – NeighborPixel.Blue.Value) < 3

Thumbnail

The thumbnail area shows a scaled preview (256 x 256) of the captured image. You can drag a rectangular with your mouse left button on the thumbnail to narrow the information of the histogram only for this cropped area. The rectangular will be shown on the thumbnail with a pink border. On the same rectangular appeared the highlights and the shadows if the corresponsive options are checked. Left click once anywhere on the thumbnail to cancel the cropping.

DzMDSceneHistogramPane Scripting Documentation

The histogram plug-in pane can be used in your scripts. Take the Histogram object from the Pane Manager:

```
//get the pane manager
var oPaneMgr = MainWindow.getPaneMgr();


// Find the content library pane
var oPane = oPaneMgr.findPane( “DzMDSceneHistogramPane” );


// If the pane is found
if (oPane){
        …Do somthing
}
```

The ‘DzMDSceneHistogramPane’ inherits from **DzPane** Object Class

Public Functions:

QRect **getThumbRect()**: Returns the thumbnail crop rectangular. The value is initiated as (0, 0, 0, 0).

Void **setThumbRect (QRect rect)**: Set the thumbnail crop rectangular rect as a QRect object. The rect object will be adjusted to the current thumbnail pixmap in order to be within the right dimensions. The rect should be < 256 in width and < 256 in height.

Void **refresh()**: refreshes the pane and check if the conditions are met to capture another screenshot and update the results.

Void **sleep(Number miliseconds)**: sleep for the given milliseconds while the application process the events. Use with caution, better with a progress event.

Number **getUpdateDelay()**: Returns the value in SECONDS of the 'Delay Update' slider.

Void **setUpdateDelay(int delay)**: Set the value of the 'Delay Update' slider in delay SECONDS (integer).

Void **takeImageInfos()**: The pane process the image (if any image captured).

Bool **isHistogramOn()**: Returns false if the histogram mode is not set to "Off", and true in any other mode.

Void **setHistogramOnOff(bool onOff)**: Set the histogram off (false) or on (true) in the color mode.

Dz3DViewport **get3DViewport()**: Returns the main active 3D viewport of DAZ Studio.

Number **getLightness()**: Returns the average lightness of the image or the average lightness of the cropped area of the image, or -1 if the lightness is not set (the cropped area has less than 1 pixel, by excluding a color or by selection).

Number **getSaturation ()**: Returns the average saturation of the image or the average saturation of the cropped area of the image, or -1 if the saturation is not set (the cropped area has less than 1 pixel, by excluding a color or by selection).

Number **getRed ()**: Returns the average red of the image or the average red of the cropped area of the image, or -1 if the red is not set (the cropped area has less than 1 pixel, by excluding a color or by selection).

Number **getGreen ()**: Returns the average green of the image or the average green of the cropped area of the image, or -1 if the green is not set (the cropped area has less than 1 pixel, by excluding a color or by selection).

Number **getBlue ()**: Returns the average blue of the image or the average blue of the cropped area of the image, or -1 if the blue is not set (the cropped area has less than 1 pixel, by excluding a color or by selection).

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2021