

bLUe User Manual

Perceptual LUT Editor	1
Presentation.....	1
LUT Edition	2
Basic editing	2
Grouping	3
Grid warping	3
Grid smoothing	4
Selecting nodes from image.....	5
Image analysis.....	5
Mask.....	6
Advanced editing	7

Perceptual LUT Editor

With **bLUe** perceptual LUT editor you can interactively edit a 3D LUT while viewing the effect of the LUT applied to your image.

Presentation

A 3D LUT can be represented as a cubic 3D grid. Grid vertices hold colors to be edited. To get a 2D representation of the LUT, vertices with equal brightness are grouped into a unique node and shown onto a usual (Hue, Saturation) color wheel. The center C of the wheel corresponds to saturation = 0 and saturations are increasing towards the edges. Hue corresponds to the rotation angle around the center C. Hue is 0 on the radius from C to the top right corner and it is increasing **by turning counterclockwise**. Colors displayed on the grid have constant brightness, controlled by the triangular slider located under the color wheel.

Nodes are arranged at the tops of a 2D grid and shown as small circles (Fig. 1). Each node is bound to a set of vertices in the 3D LUT. Grid size can be chosen from the *Grid Size* bottom left combo box

A small square (Fig. 1) indicates the central node corresponding to saturation = 0.

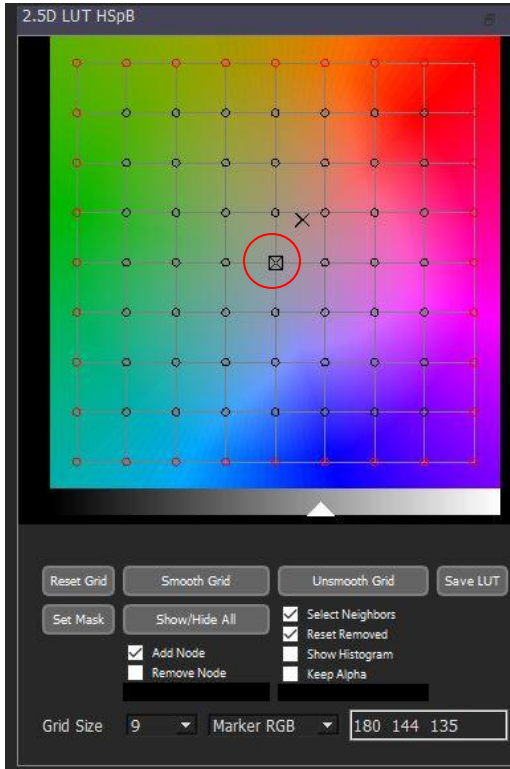


Figure 1

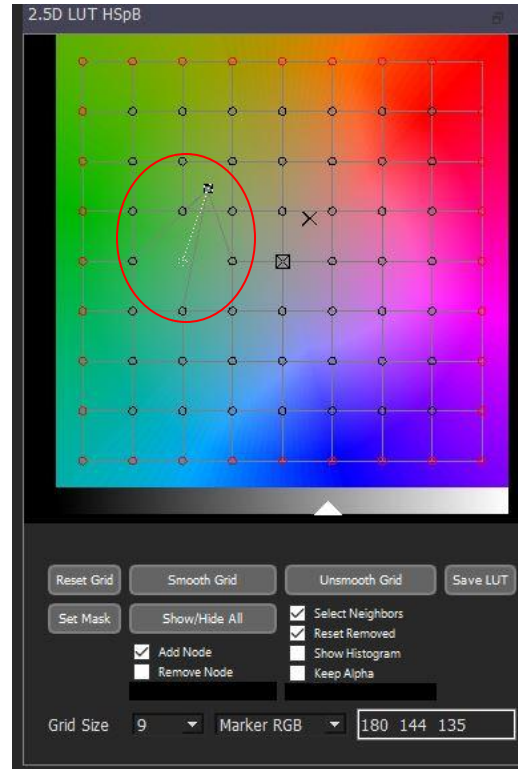


Figure 2

Note 1. If the nodes are not displayed, press the *Show/Hide All* button to show them all.

Note 2. The editor window can be zoomed in and out with the mouse wheel.

LUT Edition

Basic editing

Each node in the editor grid commands a set of vertices of the 3D LUT. Changes in LUT colors are performed by moving nodes over the grid: initial and current positions of a node correspond to LUT input and output values respectively. Displacements are visualized by white dotted lines. When a node is moved over the grid, the color of each LUT vertex bound to it is updated with the new values of hue and saturation, while keeping its brightness.

To move a node, drag it on the color wheel with the mouse while holding the Ctrl key down. A white dotted line connects the initial and final positions of the node; black lines show its neighbors (Fig. 2)

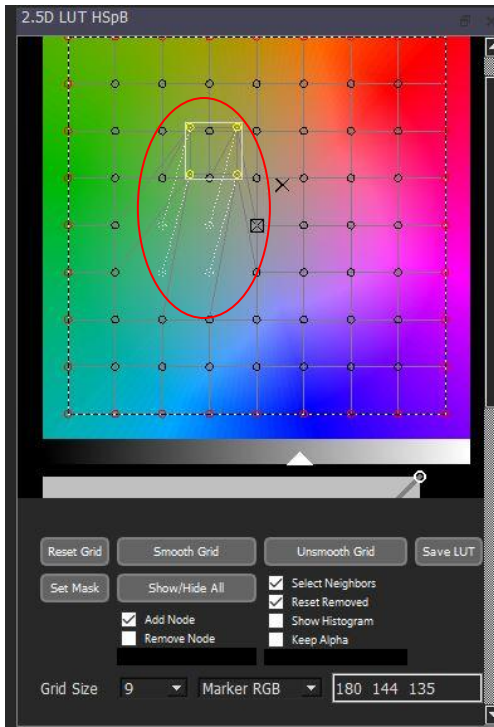


Figure 3



Figure 4

Grouping

Several nodes can be moved together by grouping them. To group several nodes do the following:

- 1) Select the nodes with successive mouse clicks, while pressing the Ctrl key or, alternatively, drag a rubber band around the nodes to select.
- 2) Right click any of the selected nodes and choose *Group* from the context menu which pops up. Nodes will be grouped and a white rectangular frame will surround the group (Fig 3).

Grid warping

All nodes can be moved together by warping the grid.

Grid warping results in a transformation of all colors in an image, for example to achieve a particular look (moonlight, ...)

To warp the grid drag one or several of the four corner nodes while holding both Ctrl and Alt keys down (Fig. 4)

Grid smoothing

To calculate its response to an input color, a 3D LUT interpolates the constraints expressed by colors of the 3D grid vertices, thereby preventing color “jumps”. Moreover, image luminosity (i.e. the black and white image) is not modified, preventing unwanted “luminosity distortions”. However, visual artifacts can still occur, especially when neighbor nodes are moved away from each other. The editor provides a gradual smoothing algorithm to even the changes in color, at the cost of less precise changes.

To gradually smooth the grid, press the *Smooth Grid* button one or more times (*Fig. 5*) (pressing the *Unsmooth Grid* button undoes all smoothing operations).

Control nodes (displayed as red circles) are not affected by the smoothing algorithm. Grid border nodes are always control nodes. For other nodes, the control flag can be toggled on and off by using the context menu of the node.

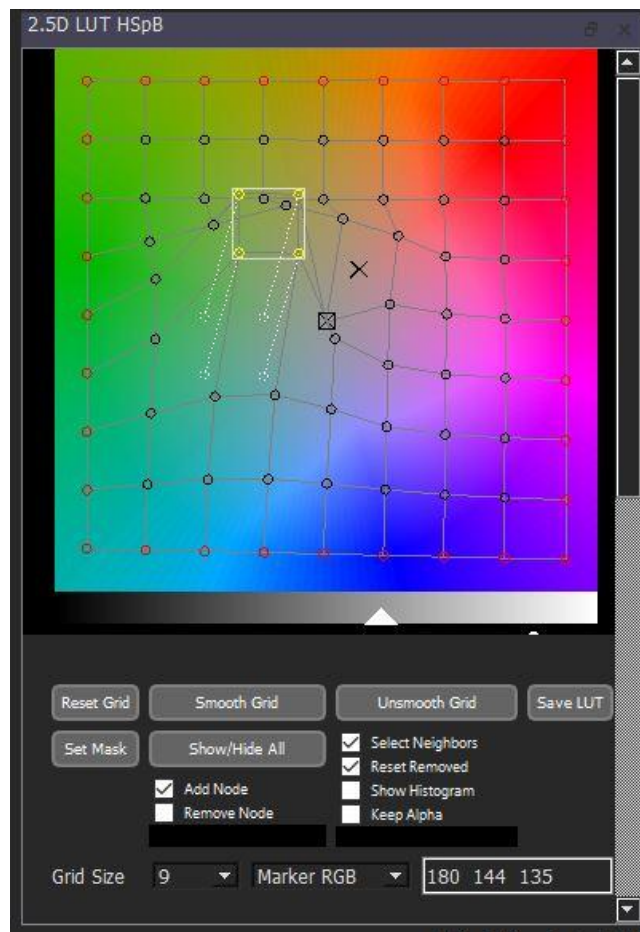


Figure 5

Selecting nodes from image

For best photo realistic results, all nodes corresponding to the same range of colors in an image (sky, trees, faces, hairs, ...) should be moved together. The editor provides a tool for incremental selection, which only requires a few mouse clicks.

To edit a region of an image, do the following:

- 1) Choose the *Pointer Tool* in **bLUe** left pane
- 2) Make sure the option *Add Node* is checked.
- 3) Select nodes by one or several mouse clicks on the chosen region of the image. Selected nodes are displayed as white circles on the editor grid.
If the option *Select Neighbors* is checked, a single mouse click in the image selects a node and all its neighbors.
- 4) Group the nodes (cf. Grouping above).
- 5) Drag the group over the color wheel with the mouse. (the LUT and the image are updated when the mouse is released).
- 6) Changes can be limited to a rectangular area of the image. To define an area, choose *the Marquee Tool* in **bLUe** left pane and, with the mouse, draw a rectangle surrounding the area.
- 7) To remove nodes from the selection do one of the following :
 - Make sure the option *Remove Node* is checked and click in the region of the image whose colors you wish remove from the selection
 - Or alternatively, right click a node and choose reset from the context menu.

Note : Selecting/unselecting nodes with mouse clicks in the image is enabled only when the Color Chooser is closed.

Image analysis

2D histogram is a convenient tool to analyze the colors of an image. It shows the hue and saturation values of image pixels.

To display the 2D histogram, check the option *Show Histogram*. The brighter a region in the histogram is, the higher the number of pixels sharing the corresponding hue and saturation (Fig. 6).

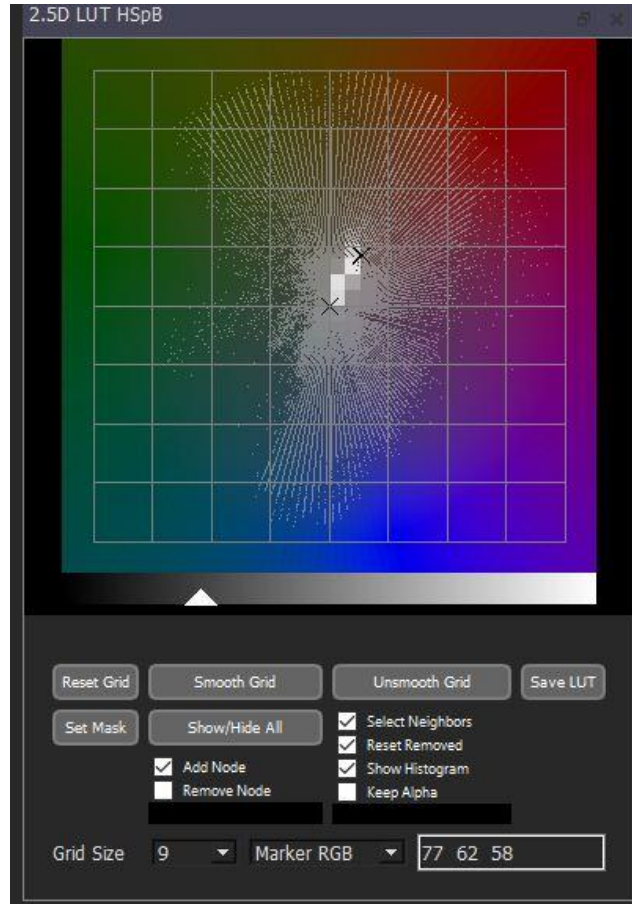


Figure 6

Mask

Editing of a 3D LUT selects a set of colors : modified (edited) vertices are selected and unmodified vertices are not. A mask can easily be constructed, based on this set of colors.

To init or update the image mask corresponding to the current state of the LUT, press the button *Set Mask*. The mask can be used as opacity mask or color mask in any layer of **bLUe**.

Note that the mask is NOT updated automatically when the LUT is modified.

Advanced editing

A group of nodes gives full control over brightness of the corresponding colors.

Each time a group of nodes is created or selected, a brightness curve and a range slider are displayed below the grid in the editor. (scrolling down may be needed to show these new items). (Fig. 7)

The curve defines the correspondence between input and output brightness of colors in the selected group of nodes.

Initially, the brightness curve shows three control points. Drag control points with the mouse to edit the curve.

Control points may be added or removed with the mouse.

- To add a control point, click the curve at the position at which you want to add a point.
- To remove a control point, click it.

The range slider defines two thresholds $thr1$ and $thr2$ ($thr1 \leq thr2$) It limits the action of the LUT to a brightness interval: colors are kept unchanged if their brightness is outside the interval $[thr1, thr2]$.

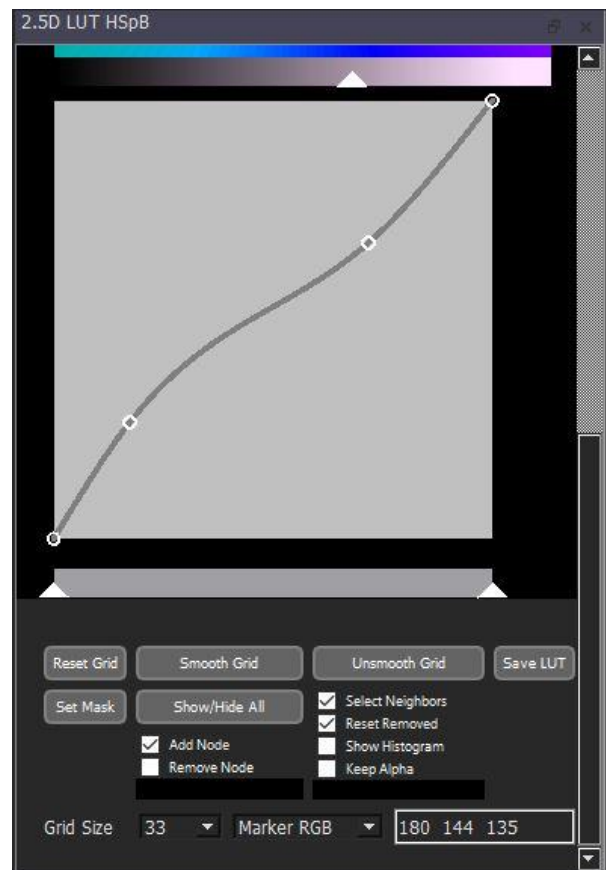


Figure 7