

Blender Roto2D User Guide

Version 0.48 *ALPHA*

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The software described in this document can be found at:

<http://www.aspicio.net/roto2d>

1. Keyboard Shortcuts

Key	Action
'X'	Remove (edit mode) Removes all selected points. A pop-up will appear asking you if you want to remove the entire mask if less than 2 points will remain after the operation. This will also remove the last added point when in mask creation mode. Limit transform (Grab or Scale op.) Limits the Grab or Scale operation to the X-axis.
'Y'	Limit transform (Grab or Scale op.) Limits the Grab or Scale operation to the Y-axis.
Shift – S	Smooth Smooths out the selected points. All points will be smoothed out if no points are selected.
G	Grab Grab and move the selected points using the mouse. The mask handle will be moved if no points are selected and 'Mask handle' is enabled on the panel.
S	Scale Scale the selected points using the mouse. The entire mask will be scaled if no points are selected. In this case, the center used for the operation will be the mask handle if 'Mask handle' is enabled on the panel.
R	Rotate Rotate the selected points using the mouse. The entire mask will be rotated if no points are selected. In this case, the center used for the operation will be the mask handle if 'Mask handle' is enabled on the panel.
A	Select All Selects all points in the selected mask. If all points are already selected then all points will be de-selected.
Esc	Cancel Cancels the creation of a new mask or a grab, scale or rotate operation.

2. Introduction

When combining live-action footage with CG elements it is often necessary to mask out parts of the image to be able to realistically place the elements within the footage. Blender's compositing system has several keyers for this purpose. The problem is that a keyer cannot always get the job done since it needs a certain degree of contrast to work. In compositing, what you normally fall back on in this situation is rotoscoping. Up until now, the only way to do this in Blender was through the use of the RotoBezier addon. This enables you to animate curve objects which, when rendered in a separate render layer, can be used for masking. It is a very useful addon, but in my opinion it lacks the speed and accuracy needed to get good results in an acceptable amount of time. This is the reason why I began developing the Roto2D addon. These are the goals I set for this project:

- Integration into the UV/Image Editor
- Ability to create and edit 2D Bézier masks in the UV/Image Editor
- Key frame animation
- Soft edges
- Generated masks available in the Node Editor
- Updated dynamically on a frame change

All of these goals have been met, plus a couple of additional features (variable soft edge, linking, etc.) that were not on this list. The development phase isn't over yet but I feel it is time to share it with the world and see what comes out of it.

3. Rendering Issues

Roto2D uses custom mask objects that are not checked by the render system. This means that the renderer does not wait for the masks to finish updating before moving on to the next frame. This will be resolved in the future by wrapping it all up in a Roto2D compositing node. But, for now it is necessary to have at least one render layer node in the compositing node setup. It can be completely empty and it doesn't even have to be connected to anything. It is only needed to stall the renderer long enough for the masks to be updated. So, if your scene does not contain any 3D stuff, only Roto2D masks, then you can add an empty render layer like so:

1. Go to 'Layers' in the Render-tab
2. Add a new layer or use the default one if you're not using it
3. Set it to a scene and a layer that is completely empty
4. Uncheck every check box in the 'Layers' section
5. Disable anti-aliasing
6. Uncheck everything in 'Shading' except 'Color Management'
7. (optional) go to 'Performance' and set the tiles to 1

Now you can add it to your compositing node setup. Don't connect it to anything, just collapse it and move it out of the way.

4. The Panel

The image on the right shows the Roto2D panel in the UV/Image editor. The panel is divided into 4 sections. These are:

1. activate / de-activate button
2. global settings
3. mask list
4. mask specific settings (Only visible if a mask is selected)

Keep in mind that this is an **alpha version**. This means that some features described here are subject to change in the near future.

1. activate / de-activate button

The reason I mention this button separately is because it is likely to be removed in some future version. At the moment, however, it is needed to properly start and stop the event handler and without the event handler the addon does not work. This is why the panel is grayed out until this button is pressed.

2. global settings

This section contains toggles that affect the rendering or editing of all masks. The following features are currently available:

Outlines

This toggles the visibility of the outlines and handles for all masks. It does not affect the rendering of the masks.

Mask handle

Toggles the usage of the mask handle. This handle allows you to move / animate a mask as a whole. All points are relative to this handle. This means that changing the animation for the mask handle does not affect the animations of the individual points. For this reason it is recommended that you use the mask handle to animate the position of the mask and the individual points to animate the shape of the mask.

3. mask list

This list shows all the existing masks. The names displayed here can be changed in the 'mask specific settings' (*next page*). Masks can be added and removed using the 'Blender standard' + & - buttons on the right. See chapter 3: *Creating and Removing Masks*; for more information.

4. mask specific settings

This section contains the available settings for the currently selected mask as well as a number of operators that only operate on the selected mask. Some settings may not be available for certain masks depending on the position in the list or the activation of certain features.



Example active Roto2D panel with a mask selected.

Top row

Internal name

'*Bezier2*' in the example panel on the previous page. This is the name used by Roto2D for the node and the image connected to this mask. This name cannot be changed.

UI name

'*Mask 2*' in the example panel. This name can be changed and is used for the mask list and node label. *Note: node labels are updated only when the node is accessed for an image update.*

Color

The red bit connected to the UI name. This shows the current color of the mask in the interface. Clicking on it will bring up the standard color chooser where you can change the color and the transparency. *Note: this color is only used for the interface and does not affect the generated image.*

Second row

Invert

When this is active the masked area will be made transparent and the surrounding area opaque. However, if the current mask is linked, the masked area will be cut out of the mask it is linked to. See chapter 7: *Linking masks*; for more information.

Link

Activating this will link the mask to the first non-linked mask above it in the mask list. This means that any number of masks can be linked together (adding / subtracting) to create more complex forms. This setting is not available for the first mask on the list. See chapter 7: *Linking masks*; for more information.

Resolution

This setting allows you to change the number of steps used to interpolate the Bèzier curves. The default setting is 30. The range is [10,80]. You can adjust this setting to improve render times (decrease) or to get smoother curves and feathering (increase).

Third row

Feather

Feathering allows you to add a soft edge to the mask. Enabling this will add a white, dotted line to the mask in the interface, indicating the boundary of the soft edge. This panel setting controls the feather distance for the entire mask. Each individual point can, however, have an offset; allowing non-uniform feathering. See chapter 5: *Feathering*; for more information.

Bottom row

Smooth

Smooths out the selected points. All points will be smoothed out if no points are selected. The same as pressing Shift-S.

Remove

Removes the selected points. A pop-up will appear asking you if you want to remove the entire mask if less than 2 points will remain after the operation. The same as pressing 'X' or 'Del'.

Reset feather

Resets the feather offset for the selected points. All points will be reset if no points are selected. This button is available only if feathering has been enabled.

5. Creating and Removing Masks

Creating a new mask

1. Make sure the addon is active. If the button at the top of the panel reads 'Activate': press it.
2. Press the + button next to the mask list on the panel. The panel will be grayed out. This means that you are now in mask creation mode.
3. Click on the image to add a point or drag to add a point with handles. Pressing 'X' or 'Del' will remove the last added point.
4. Close the mask by clicking on the first point. Drag to reset the first point's handles. Open masks are not supported at this moment so all masks have to be closed this way.

Pressing Esc or right-clicking anywhere on the image will cancel the process.

Removing a mask

1. Make sure the mask you want to remove is selected. If not: click on the mask's name in the list or right-click on the mask's outline to select it.
2. Click on the – button next to the mask list on the panel. You will be asked for confirmation before the mask is actually removed. Selecting all points (by pressing 'A' or through a rectangle selection) and pressing 'X' or 'Del' will have the same effect.

6. Mask Editing

Selecting a mask

There are two ways through which you can select a mask:

1. Click on an entry in the mask list.
2. Right-click on the outline of a mask.

Right-click anywhere else to deselect a mask.

Moving a mask

When enabled on the panel the mask handle will show up somewhere near the center of the mask. This initial position is calculated once right after creating the mask. All point locations are relative to this point even if it is disabled. This means that moving this point will move the entire mask without affecting the animations of the individual points. This property is automatically key-framed when any change is made.

Selecting points

There are three ways through which you can select points:

1. Click on a point.
2. Drag (away from any point). This will bring up the rectangle selection. All points within the dotted rectangle will be selected.
3. Pressing 'A'. This will select all points or, if all points are already selected, deselect all points.

Holding down 'Shift' allows multiple points to be selected in the first two cases.

Adding / removing points

A point can be added to an existing mask by double-clicking on the outline. Because all point locations are relative to mask handle, the new point will follow an existing mask handle

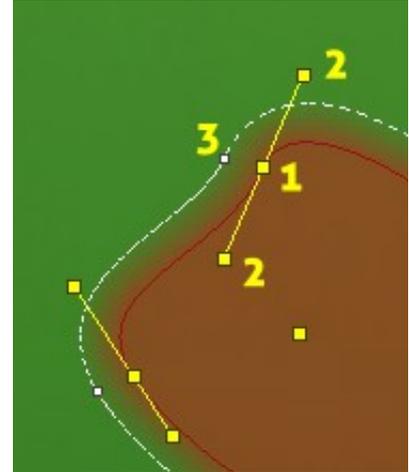
animation. It is not however, automatically animated in relation to the adjacent points. This is another reason why I recommended using the mask handle for all major mask movements. Removing one or more points is as simple as selecting the point(s) and pressing 'X' or 'Del'. The 'Remove' button on the panel will have the same effect.

Editing points

There are three basic properties that can be edited on a per point basis. These are: location, handles & feather distance offset. These are also the three properties that are automatically key-framed for every point on any change. The first two will be fully covered here; the third is covered in more detail in chapter 6: *Feathering*.

1. Location

The location of a point can be changed by either dragging the point or pressing 'G'. Both methods allow all selected points to be moved together. However, if no points are selected and 'Mask handle' is enabled on the panel pressing 'G' will allow you to move the entire mask by moving the mask handle. Scaling or rotating multiple points by pressing 'S' or 'R' will affect the location and the handles of the selected points but will not change the feather distance offset.



The 3 editable point properties: 1:location, 2:handles & 3:feather distance offset

2. Handles

Handles control the curve between two points. A point can have none, one or two handles. You can add a handle to a point with none or one handle by dragging the point while holding down 'Ctrl'. If the point has no handles the drag direction will be considered in relation to the adjacent points to determine which handle to add. You can also remove an existing handle by dragging the handle while holding down 'Ctrl' and moving the handle over the point.

For a point with two handles, the default handle dragging behavior is to change only the length of the handle being dragged and maintaining the angle between the handles. This default behavior can be altered in the following ways:

1. Holding down 'Shift' during dragging will equalize the lengths of both handles while maintaining the angle.
2. Holding down 'Ctrl' allows a handle to be changed completely independent (both length and angle) from the other.
3. Holding down both 'Shift' and 'Ctrl' will keep the lengths equal but will not maintain the angle between the handles.

3. Feather distance offset

A white, dotted line will appear around the mask after enabling feathering through the panel. This line shows the boundary of the soft edge. Small white squares accompany every point of the mask. These points control the feather distance offset for each point. Hold down 'Shift' and drag these points to adjust the offset. See chapter 5: *Feathering*; for more information.

7. Feathering

Note: this feature is a work in progress. Be aware that there are some issues that remain to be resolved.

Introduction

A new mask will have, by default, aliased edges. But, the image element you want to mask will probably have some degree of softness to it. The feathering option allows you to add a variable soft edge to the mask to match this softness. To enable it: check the box next to the 'Feather' slider on the panel. The slider value is relative to the mask image size. So, if the mask image is 100x100px and the feather distance is 0.1, the actual distance will be 10px. After enabling feathering, you will notice a white, dotted line around the mask. This line shows the feather boundary. Right now, the interpolation between the two lines is always linear. In future versions an additional setting may be added to change this to quadratic or perhaps a slider to vary between the two.

This feature is really meant to be used for relatively small soft edges. Using larger distances will rapidly increase render times, boundary issues (see below), etc.. If a larger soft edge is needed then I suggest using it in combination with a blur node in the compositing nodes.

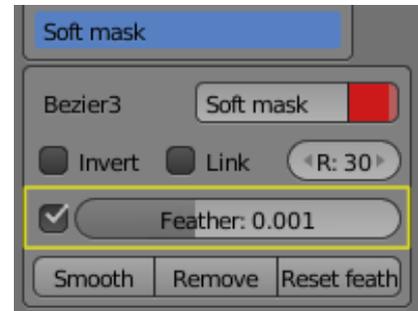
Varying the feather distance per point

The panel slider controls the overall distance. Every point, however, can have an offset to this distance. This means that the feathering can be varied from point to point. To add an offset to a point: hold down 'Shift' and drag the small white handle accompanying the point on the dotted line. The feather boundary between offset points has a sigmoid shaped progression. This is to ensure the boundary is parallel to the mask at the points. This works well for minor offsets, but not that well for larger differences between adjacent points. This will probably be improved in the future but, for now, it is best to keep the offsets relatively small.

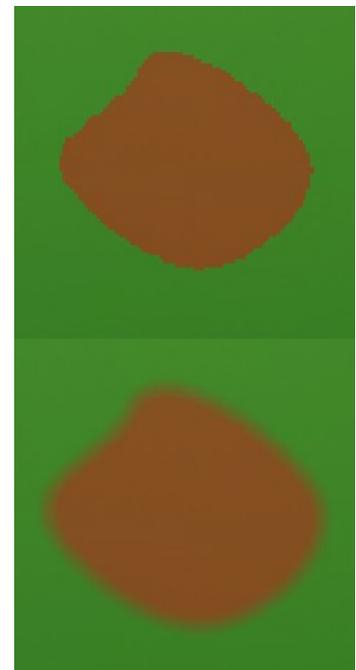
Self-intersecting boundary issues

The current version does not automatically fix the feather boundary when it intersects itself. This problem primarily occurs when the angle between the handles of a point is too sharp in relation to the feather distance. There isn't a simple solution to this problem at this point, but there are a number of things you can try:

- Decrease the mask's Bèzier resolution through the panel as much as is acceptable
- Decrease the feather distance and use a blur node connected to the mask's image node to compensate



Feather setting on the panel.



The same mask without feathering (top) and with feathering enabled (bottom).

8. Animation

In general

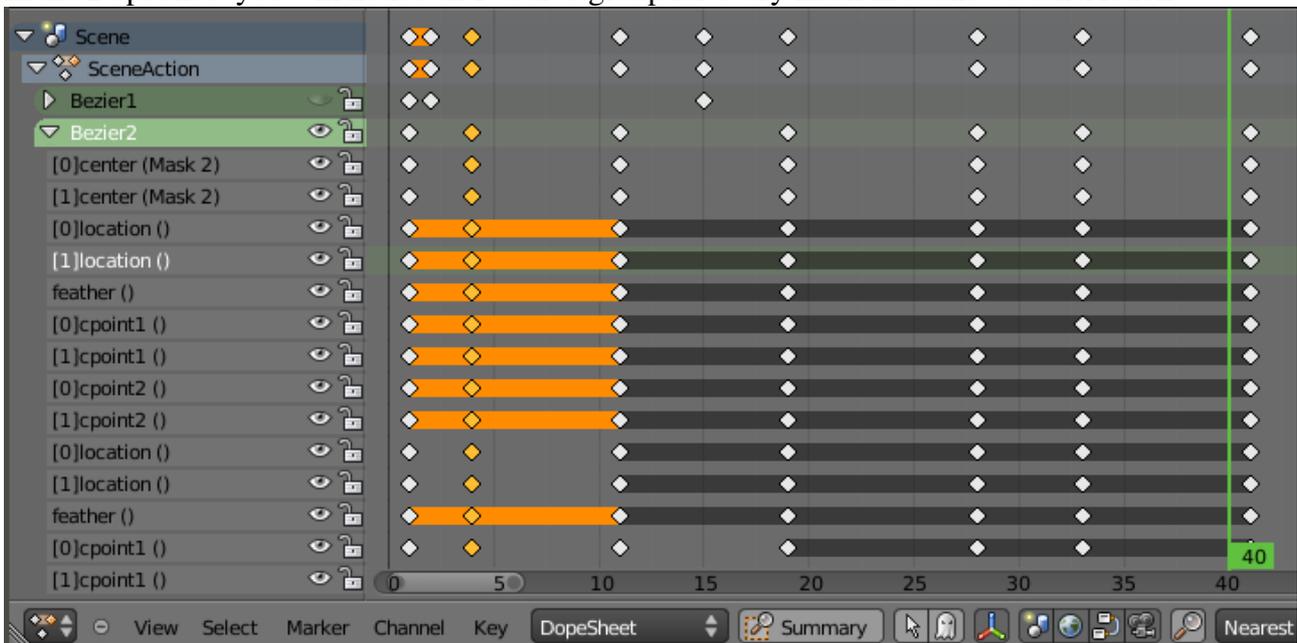
Animating a mask is as simple as moving to a different frame and changing the mask's position or shape (see chapter 4: *Mask Editing*; for more information). Changing the feather distance offset for a point will also cause a key-frame to be created (see chapter 5: *Feathering*; for more information).

Playback

Roto2D animations can be played back in the same way as any other animation in Blender. Either click on the play button on the Timeline or press 'Alt-A'. When Roto2D is activated it will automatically enable playback for Image Editor views. During playback the nodes are not forced to update for performance reasons. This means that you will not see any changes in the mask nodes even if playback for Node Editor views is enabled.

Editing key-frames

The easiest way to edit key-frames is through the use of the DopeSheet. It allows you to move, remove and duplicate key-frames for an entire mask or specific animation curves within the mask. In the DopeSheet you will notice an F-Curve group for every mask in Scene->SceneAction.



Every mask's group has the following structure:

- [0]center – X-coordinate for the mask handle
- [1]center – Y-coordinate for the mask handle
- [0]location – X-coordinate for the first point
- [1]location – Y-coordinate for the first point
- feather – feather distance offset for the first point
- [0]cpoint1 – angle of handle 1 for the first point
- [1]cpoint1 – distance of handle 1 for the first point
- [0]cpoint2 – angle of handle 2 for the first point
- [1]cpoint2 – distance of handle 2 for the first point
-

All this this may look a bit intimidating. However, in most cases you will want to edit key-frames for an entire mask, so it will usually suffice to keep the groups collapsed. All this is just to let you know what the structure is in case you want to get really creative.

The most commonly used operations are:

Moving a key-frame

1. Select one or more key-frames
2. Press 'G'
3. Move it to the desired frame and click

Removing a key-frame

1. Select one or more key-frames
2. Press 'X' or 'Del'
3. Select 'Delete Keyframes' in the pop-up or press enter

Duplicating a key-frame

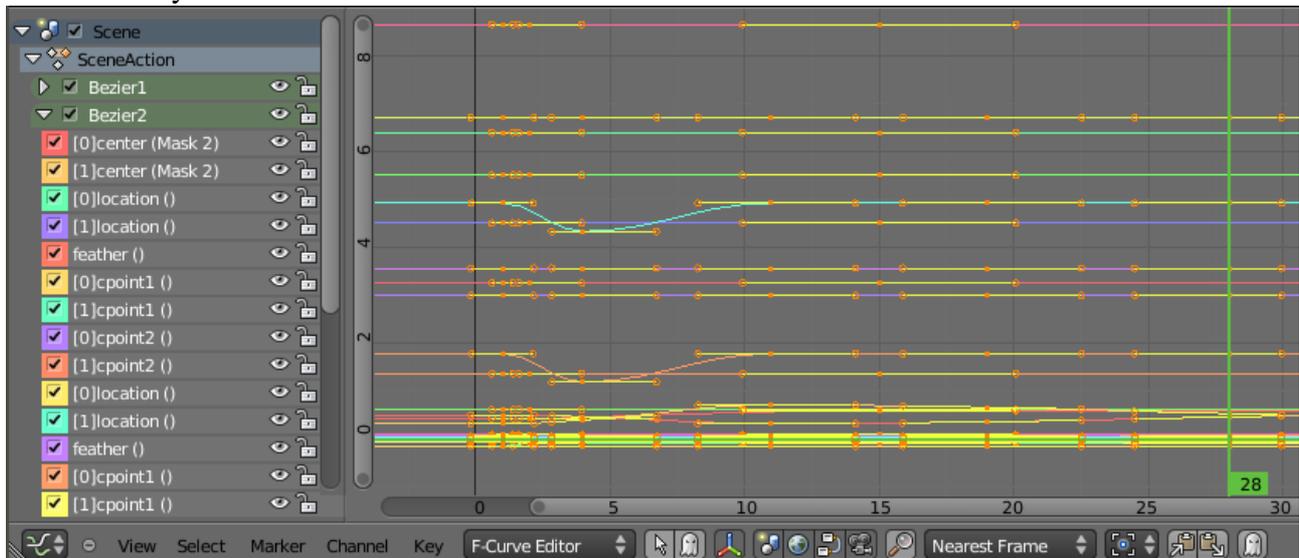
1. Select a key-frame
2. Press 'Shift-D'
3. Move it to the desired frame and click

Copying a key-frame

1. Select a key-frame
2. Press 'Ctrl-C'
3. Move it to the desired frame and press 'Ctrl-V'

The Graph Editor

To get an even better idea of what goes on in the background you can have a look at the Graph Editor. Here you can view and edit the actual F-curves that drive the animations.



For most masks it won't be necessary to manually edit the F-curves. But, in some cases it can be useful to change the interpolation mode from Bèzier to linear for specific curves. To do this, select the F-curves you want to change from the list; select the key-frame points you want to effect and press 'Shift-T'. Then, in the pop-up, select Linear. The same thing can be done in the DopeSheet, however, the Graph Editor will provide direct visual feedback, which may be useful at times.

Animating the feather distance

A mask's feather distance does not get automatically key-framed.

To animate it anyway:

1. Right-click on the 'Feather' slider on the panel
2. Select 'Insert Keyframe'
3. Move to a different frame
4. Change the feather distance
5. Insert another key-frame

See chapter 5: *Feathering*; for more information.



9. Linking masks

When masking a image element that has a complex shape it is often easier to use a combination of several simple masks instead of a single complex one. Roto2D has the option to link masks to facilitate this work flow. This allows multiple masks to be combined into a single image for compositing.

How it works

To link two masks:

1. Ensure the masks are directly above one another on the list
2. Select the second (in the list order) mask of the two
3. Enable 'Link' on the panel

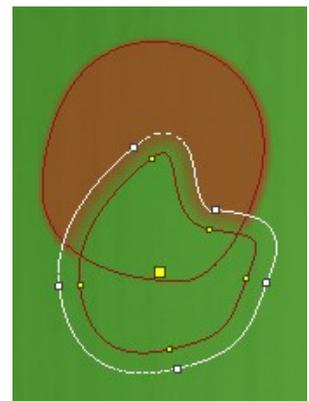
This will make the selected mask draw into the image of the mask directly above it on the list. If this mask happens to be linked as well, both masks will be linked to the mask above this one, etc.. Editing and animation is unaffected by this and the link can be removed at any time.



Link toggle on the panel.

Cut out masks

You can also use a linked mask to cut out a section of the 'linked-to' mask. All it takes to accomplish this is to enable 'Invert' on the panel. Be aware that the mask list determines the order in which the masks are combined. This means that a cut out mask will not affect a mask below it on the list. In other words, a normal linked mask below the cut out mask will fill any parts overlapping the cut out mask.



An example cut out mask.