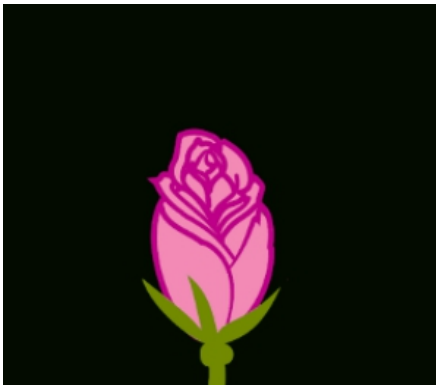


Overview

As you probably know, animation is the rapid display of a sequence of images in order to create an illusion of movement. Traditionally 2D animation is created by drawing each displayed image individually. Those images are called "frames" and thus such method called "frame-by-frame animation". To create good illusion of movement you need to draw many frames, that's why this method requires a lot of time and resources. Synfig Studio is open-source 2D vector animation software. It is designed to produce film-quality animation with fewer people and resources.

Synfig Studio is built to eliminate the need to draw each frame individually. There are two techniques for that: Morphing animation and Cutout animation.

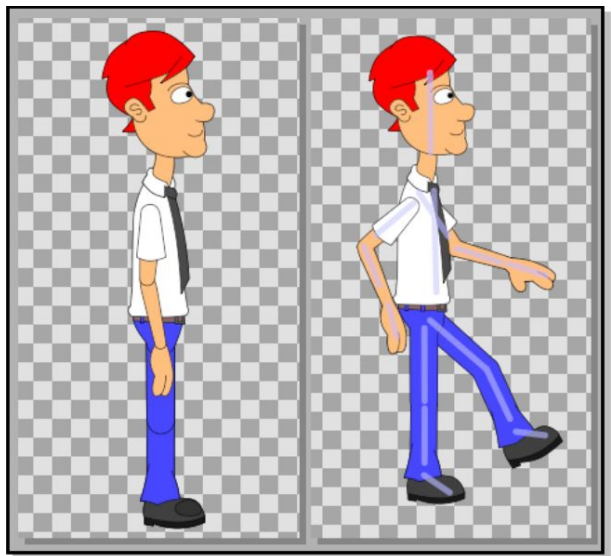
Morphing



Morphing is a technique that takes two images and creates a smooth transition between them. In the process of morphing, one shape is deformed into another and this transformation is usually defined by control points. In Synfig Studio images are constructed from vector shapes and the morphing is done automatically. That allows us to create animation by drawing only key positions at relatively wide time intervals. You need only draw a few frames as needed to create a basic sense of motion for the scene, and Synfig Studio will create the in-between frames.

Cutout animation

Cutout animation is created by splitting objects into parts and applying some simple transformations to them (like translation, rotation or scale) at different moments of time. Synfig Studio uses those values to interpolate the motion for in-between frames. Cutout animation can be produced from bitmap images or vector graphics.



In both cases the role of Synfig Studio is to fill the gaps between the drawn frames (also called "keyframes") and produce smooth and fluid animation. This process is called "tweening".

Although Synfig Studio is not directly intended to draw animation frame-by-frame, it can be used to bring your hand-drawn frame-by-frame animation to the film-quality level by converting bitmap data of each frame into vector format. This process is called "tracing" and usually done by hand by constructing vector shapes on top of bitmap image. In the process of construction you can apply a lot of fascinating effects built into Synfig Studio to achieve a professional look for your animations.

Whether you do frame-by frame animation or not, Synfig Studio gives you flexible control over the repeated data, such as colors, outline characteristics, textures, images and many more - even animation trajectories and their sets (actions). Reusing repeated data is achieved via linking. This is a power of Synfig Studio, which is especially important for big animation projects.

Among the plain linking pieces of artwork data you can also define relations between them using a set of functions. That allows to create automatic animation based on the defined laws and bring whole animation process to the new level.



All those features of Synfig Studio are covered in detail in the chapters of this manual.

Getting Started

User interface

The screenshot below displays Synfig Studio's complete window layout:

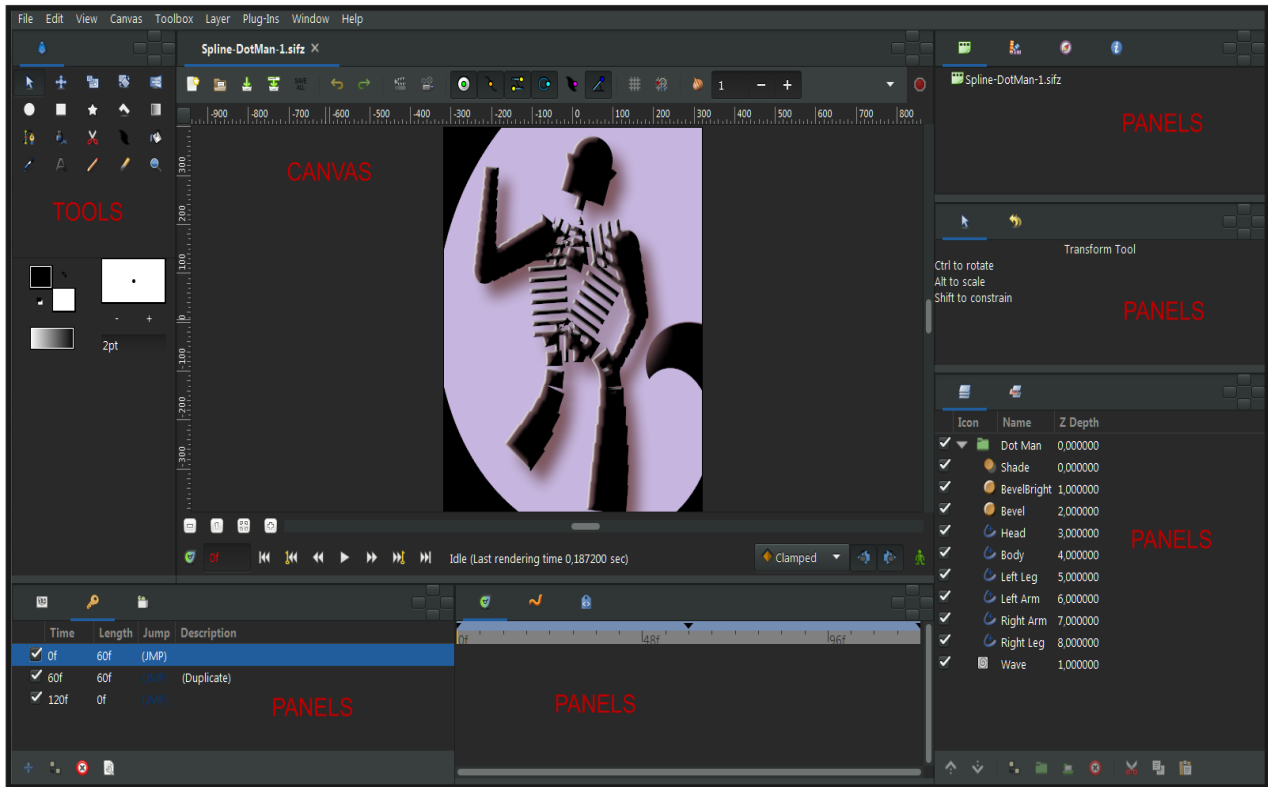


Illustration 1: Standard Synfig Studio's window layout

Synfig Studio main interface components are:

- [Toolbox](#) — is the main Synfig Studio window. It contains system menu and buttons, tools and more to create and edit your artwork. Closing it exits the application.
- [Canvas](#) — displays your artwork and animation.
- [Panels](#) — contain tools and information about certain elements of your project. Some panels will allow you to modify those elements.

Note

To reset Synfig to its default window arrangement. In the "File" menu from the Toolbox select "Panels/Reset Windows to Original Layout"

The center window is the [Canvas Window](#). A new Canvas Window appears each time Synfig Studio starts. The window represents the [Root Canvas](#), not that it means much to you at the moment, but that's OK — we're just trying to show you around. In the upper left corner of the Canvas Window, you'll see a button with a [caret](#). If you click on this caret button, the [canvas window menu](#) will pop up. If you right-click in the canvas area and there is no [Layer](#) under the mouse position, this menu will also appear. So now you know where the most important canvas menu is. Good.

The other two windows (one on the bottom, and one to the right) are customizable [dock dialogs](#). Each dock dialog contains a set of [panels](#), arranged horizontally or vertically. Some panels share the same space inside the dock dialog and you can switch between them by clicking on their [tabs](#). You can rearrange the contents of dock dialogs as you wish by

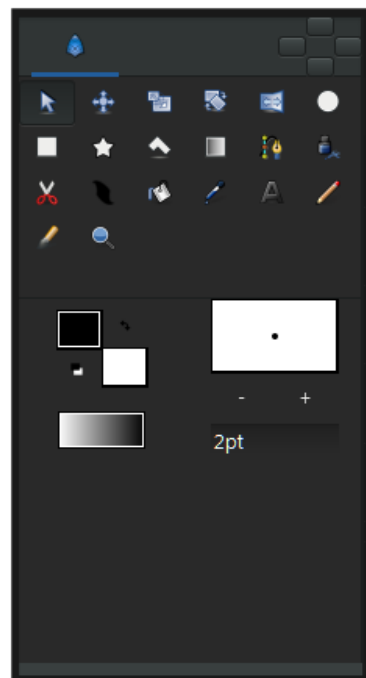
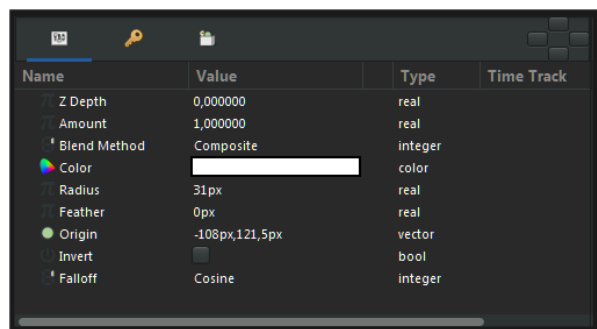
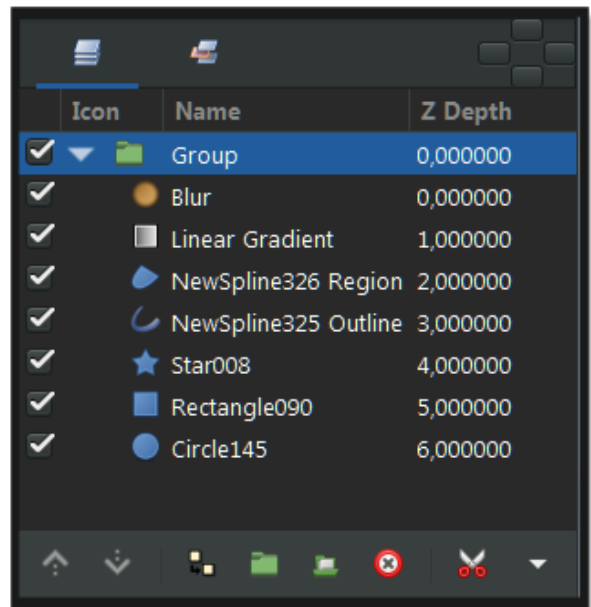
dragging the panel tab to where you want it. You can even create a new dock dialog by dragging a tab out of its dock dialog.

If you accidentally close a [panel](#) (by dragging it out of the dock dialog, and closing the new dock dialog that gets created), no worries. Simply go to the [Toolbox](#), select "File/Panels" in menu right there and then click on the name of the panel you need.

The most important panels are:

- [Layers Panel](#) — shows you the hierarchy of the layer of your working canvas. It also allows you to manipulate these layers.
- [Parameters Panel](#) — shows you the parameters of the layer currently selected. When multiple layers are selected, only the parameters that the selected layers have in common are displayed.
- [Tool Options Panel](#) — shows you any options specific to the currently selected tool.
- [Navigator](#) — shows a thumbnail image of what the currently selected canvas looks like. You can also zoom in and move the focus around with this panel.
- [History Panel](#) — shows you the history stack for the current composition. You can also edit the actions in history.

There are also many other [panels](#) in Synfig Studio. If you have no idea what a panel does, simply hold your mouse over its icon and a tooltip will pop up describing its function.



Under the hood

Synfig Studio, like most every other competent graphics program, breaks down individual elements of a [canvas](#) into [layers](#). However, it differs from other programs in two major ways:

1. An individual layer in Synfig usually represents a single "Primitive". I.e. a single region, an outline of a region, an imported image, etc... This allows you to have a great deal of flexibility and control. It is not uncommon for a composition to have hundreds of layers (organized into a hierarchy for the artist's sanity of course).
2. A layer can not only add information on top of the image below it, it can also distort and/or modify it in some other way. In this sense, Synfig's Layers act much like filters do in Adobe Photoshop or GIMP. For example, we have a [Blur Layer](#), [Radial Blur Layer](#), [Spherize Layer](#), [Color Correct Layer](#), [Bevel Layer](#), etc...

Each layer has a set of parameters which determine how it behaves. When you click on a layer (either in the Canvas Window, or in the illustrated [Layers Panel](#)), you will see its parameters in the [Parameters Panel](#).

First steps

Let's create something to work with.

First, go over to the toolbox and click on the [Circle Tool](#) (if you don't know which one it is, just mouse over them until you find the one with the tooltip that says "Circle Tool").

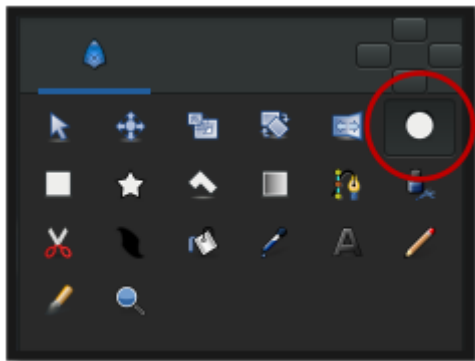


Illustration 2: The circle tool

When you click on the Circle Tool, you should notice that the [Tool Options Panel](#) changed. But we'll get to that later.

With the Circle Tool selected, you can now create circles in the [Canvas Window](#). This works as you might expect — click on the canvas, drag to change length of the radius, and release the mouse button when you are done. Go ahead and create two circles (or more, if you fancy). If you accidentally release the mouse button before dragging, you end up creating a circle with 0 radius and it is effectively invisible! No need to worry, you can easily fix this. In the Parameters Panel, you can change the parameters of the selected object. If you just made a 0 radius circle, it should be the current selected object. You can change its radius to some value other than 0, say 10, and manipulate it to your liking with the handles later.

Note

Some users might experience the following problem: when you click and drag on the canvas using the Circle Tool, either nothing seems to happen or you end up making insanely huge circles. To fix this go to "File/Input Devices" and disable all the devices you can find there.

If you have an extended input device that you want to use, such as a pressure-sensitive pen, then enable it in this screen. After this change Synfig will work as expected.

Now go back to the toolbox and click on the [Transform Tool](#) (the button with the arrow on it). After you do this, click on one of your circles. You will see a "[bounding box](#)" (which is kind of useless at this point in time, but we digress), a green dot at the center, and a cyan dot on the radius. Those dots are called "[handles](#)". If you want to modify the circle, grab a handle and drag it around. Easy!

You can select a [Layer](#) by clicking on it. If you want to select more than one layer, hold down Ctrl key while you are clicking — this works in both the Canvas Window and the [Layers Panel](#). Try it!

You can also select multiple handles. You can do this in several ways. First, you can hold

down **Ctrl** and individually click the handles that you want selected, but this can be tedious.

However, there is a much faster method — just create a selection box by clicking the mouse and dragging it over the handles that you want. Go ahead, select two circles and select all of their handles. With several handles selected, moving one handle will move all of them.

Note

Synfig Studio has an autorecovery feature. If it crashes, even if the current file has not been saved, you will not lose more than 5 minutes of work. At restart it will automatically prompt to recover the unsaved changes. Unfortunately history isn't recovered yet.

The [rotate](#) and [scale](#) tools work much like the Transform Tool, except in the case where you have multiple handles selected. It is much easier just to try, than read about it. Select a few circles, select all of their handles, and try using the rotate and scale tools.

Note that tools manipulating with handles have options associated with them. If a particular tool isn't doing what you want, take a look at the [Tool Options Panel](#) to see available options.

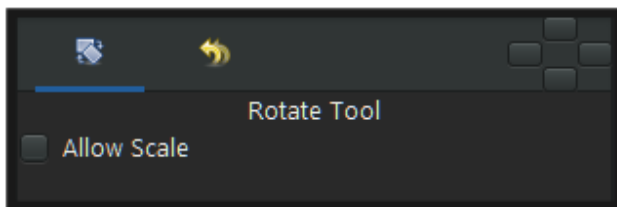


Illustration 3: Rotate Tool Options Panel

Linking

Now let's try [linking](#). Suppose we always want these two circles to be the same size. Select two circles, and then select both of their radius handles (the cyan dots).

To select multiple handles, either drag a rectangle around them, or select the first one, then hold the **Ctrl** key while selecting the rest. Once you have the two radius handles selected, right click on either of them and a menu will pop up. Select **"Link"**. Boom. The parameters are linked together. You can prove it to yourself by selecting

just one of the circles and changing its radius — the other one will change as well. Neat stuff, eh? This is how [outlines](#) are attached to their [regions](#) — but we're getting ahead of to the chapter.

Linking is a fundamental concept in Synfig. You can create links not only for handles, but also between parameters as well by selecting multiple layers, right clicking on the parameter in the Parameters panel, and selecting **"Link"**.

Color selection

Let's say you want one of the circles to be a different color. If you look in the toolbox below the tools, you'll see the outline/fill color selector, the outline width selector, and some other stuff like the default blend method and gradient. The outline/fill color widget works exactly as you might expect — you can click on the fill color, and a modest color chooser will appear. Now you can change the color pretty easily.

But sometimes you just want to click on a color and go. This is where the palette editor tab comes in.

Click on the Palette Editor panel tab and have a look — it's the one with the palette-ish looking icon. Clicking on colors with the left mouse button will immediately change the default outline color and clicking with the middle mouse button will change fill color.

That's all great, but we still haven't changed the color of the circle. There are three ways to do this. The first is to click on the **"Fill Tool"** from the toolbox, and then click on the circle in the Canvas Window. Boom. Circle changes color. This works with more than just circles. Also, you can select the circle layer you want to modify, go to the Parameters panel, right-click on the Color parameter and select **"Apply Fill Color"** or **"Apply Outline Color"** at your preference. Or simply double-click on the **"Color"** parameter - a color selector dialog will show up, and you can just tweak away.

Try playing around with the circles for a bit. Muck around with the parameters, and see what happens. To start, try out to set the [Feather Parameter](#) to 5.

Digging deeper

Of course, so far you just found out how to use the basic features of Synfig Studio but not how you animate a drawing. This is covered in the [next section](#).

Animation Basics

Introduction

Creating an animation in Synfig Studio is really easy. It basically means to change a drawing — you just need to create the first stage and last stage of a change, and Synfig takes care of the steps in between.

Let's look at a simple example. Consider a moving light like the one at the front of the Knight Rider car. Drop the realism, you get a circle moving from left to right and back. In other words, you need to create three 'steps' or 'stages':

1. The circle is on the left.
2. The circle is on the right.
3. The circle is back on the left.

Setting up the workspace

Let's do it. Start Synfig Studio. A new file is created at the start automatically. Click the [caret menu](#) (between the horizontal and vertical rules, in the top left hand corner of the canvas), then select "Canvas/Properties" or select "Canvas/Properties" from the menu. The [Canvas Properties Dialog](#) will appear.

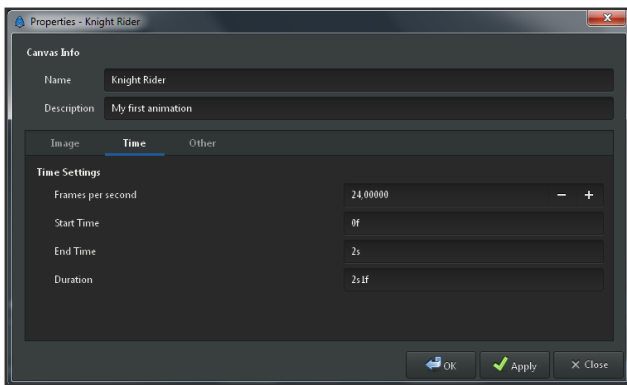


Illustration 4: Canvas Properties Dialog

Give a name and description for your canvas, then click "Apply" (don't click "OK" yet — we're not quite done with the Properties dialog). Go to the "Time" tab and make sure to edit "End Time". Change "5s" to "2s" — that will make our animation 2 seconds long.

Now click "OK", select the [Rectangle Tool](#) and create a simple black rectangle that will serve as our background.

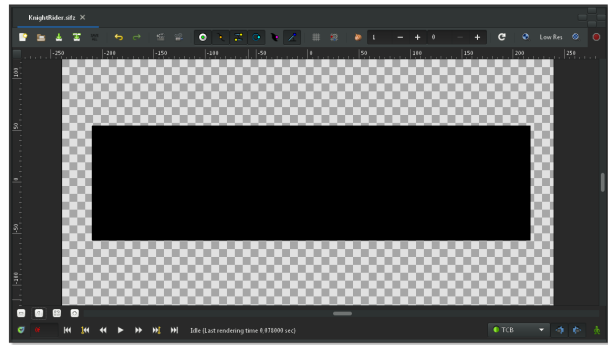


Illustration 5: Square on the canvas

Now we need a circle. Change the fill color to red, select the [Circle Tool](#) and create a circle. It doesn't matter if it's not perfect: You can edit it. Select the [Transform Tool](#) and click the circle. It will go into an editing mode which is easy to detect by the small green dot in the middle and the whitewhite rectangle around it. You can move the circle by grabbing it on its green dot (the *Origin*) in the middle.

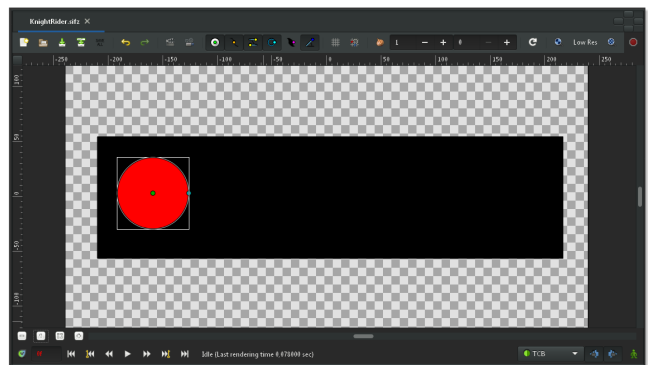


Illustration 6: Circle in editing mode

These are the first steps to draw an object and to move it, but not an animation yet, you may say. Indeed. Let's have a look how this works.

Adding movement

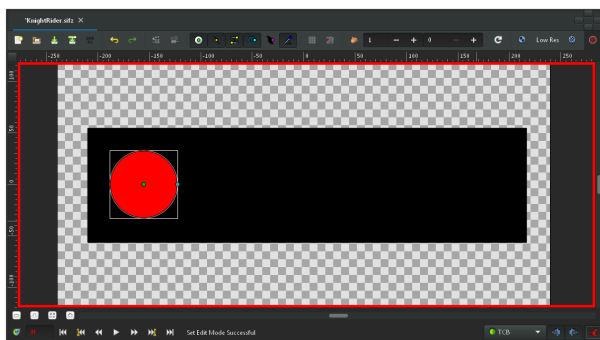
In the beginning, you entered a value of 2 seconds in the Properties dialog. Because the length of your animation is non-zero, your canvas window (the one where you draw) has a grey time slider at the bottom, the [Timebar](#). You can click on it, and a small orange indicator will appear indicating your position in time. Try clicking in several places on the time slider and notice that the entry field on the left of the time slider is changing its values to something like "12f", "1s 15f", etc. You can set your position on the time slider by changing values in that field. For example, if

you enter "1s" and press `↵ Enter`, the orange indicator will move in the middle of the time slider, and entering "2s" will move it to the end of the time slider.

Note

At 2s the orange indicator won't be visible. That's because "2s" is at the far right boundary of the time slider, putting the indicator out of view.

You may notice that nothing changes on the canvas at this point. Return to "0s" and switch to [Animate Editing Mode](#) by clicking the green man button to the right of the gray time slider. The canvas will display a red outline; it reminds you that changes to your objects now affect your animation at the time shown in the time slider.



In animate editing mode, every change to your objects [parameters](#) creates a [waypoint](#) that associates the changes with the current time. As you will see, Synfig can create smooth intermediate changes between waypoints, and you can even choose the way in which the intermediate changes take place. You will probably find it helpful to associate some or all of your waypoints with [keyframes](#).

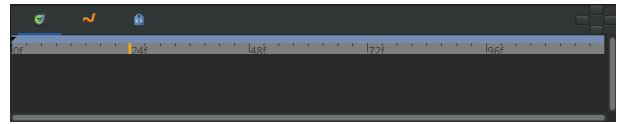
Previously, three "steps" or "stages" were mentioned. These are represented by [keyframes](#). (Just in case you're familiar with video encoding: No, it's not the same!) A keyframe is an image in time where something important happens with your objects.

Default keyframe at 0f

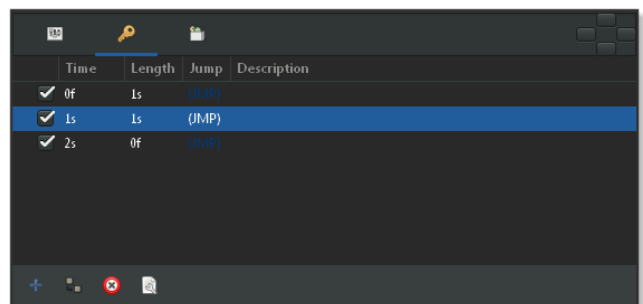
When creating a new project, a default "keyframe" is already set at 0f. If for any reason you do not have this default keyframe, go to the [Keyframes Panel](#) — click on the little tab with the small key icon in the bottom window —

to edit keyframes. Now press the small button with the "plus" sign and you should get a new entry in the list displaying "0f, 0f, (JMP)".

Now, go to the "1s" mark in the time slider. The small orange indicator should move there.



Then add another keyframe by clicking the small plus sign. Repeat the process with the time slider indicator set to "2s" (it's at the end of your animation). You should now have three keyframes in the list.



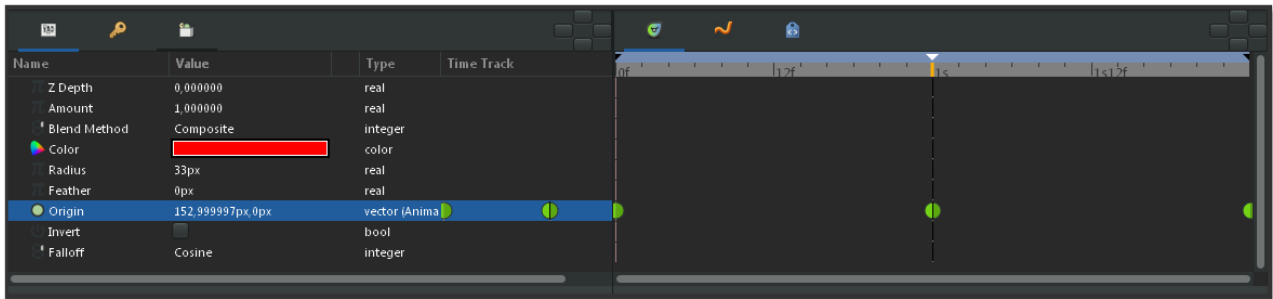
Understanding the Timeline

By now, you may have figured out what those mysterious "1s 10f"-type marks represent. They indicate a specific point on the timeline, expressing a location in terms of seconds (s) and frames (f).

By default each second is divided into 24 frames, much like a meter on a measuring tape is divided into 100 centimeters. The frame markings begin at zero (0) and go up to 24, whereupon a new second is entered and the framecount returns to zero.

For example, when five whole seconds and three frames have passed, using this timeline notation would be "5s 3f".

The Keyframes Panel



The [Keyframes Panel](#) is rather easy to understand. It displays "Time" which is basically the start time, "Length" which is self-explanatory, "Jump" which we'll cover next, and "Description" which is, again, self-explanatory.

You might be wondering about the entries called " (JMP) ". In fact, these are links just like web links: click them, and the indicator in your time slider will jump to the correct time.

You can use this to edit your image for a given moment in time. For instance, you can now jump to the first second, and move the red circle to the right. There! You made your first movement, your first animation with Synfig!

To see your animation click to an arbitrary position on the time slider: You will note that the red circle is in a new position, one that you didn't specify! So what happened? Synfig figured out what you would like to do, namely move the circle, and drew all the images between these states. Each image will later make a frame in your animation and the circle will appear to be moving.

Note that you don't need to go to the last keyframe at "2s" and move your circle back to the left. Keyframes make Synfig remember the image states at particular times. That's why when we modified the circle's position at "1s", it stayed on the left at "2s" (as well as at "0s"). If you switch back to the Parameters Panel, and look at the [Time Track Panel](#) you will see that three orange diamonds (or green dots depending on the default interpolation) appeared on the right of the "Origin" parameter. Those are called [Waypoints](#), and they represent times at which

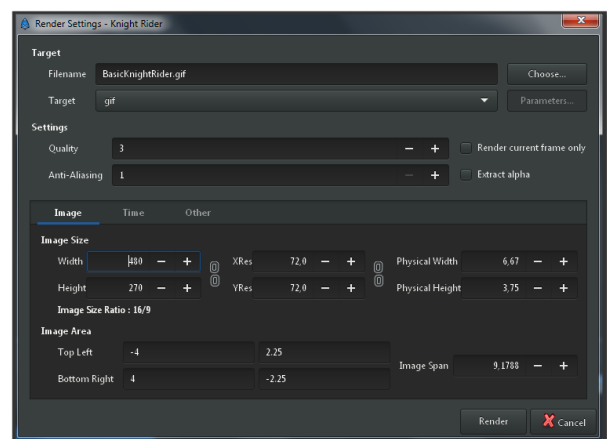
object's parameters, like location or color, are instructed to take on specified new values.



Rendering your animation

Before you can see your animation, you need to render your work. There are two ways to do so: using the Synfig Studio (what you have been using so far) or the command-line program called "synfig".

Let's try the first way. Leave the [Animate Editing Mode](#) by clicking on the red man icon in the timeline editing widget, and save your file; for instance under the name "BasicKnightRider.sifz". Then go to menu in the Canvas Window ([Canvas Menu Caret](#) button in the upper left corner) and select "File/Render" or click on the render icon.



Change the filename to "BasicKnightRider.gif" in the same location where you saved "BasicKnightRider.sifz" and choose "gif" target format instead of "Auto", then click "Render". Depending on your processor

speed it should take a few moments, but finally the image window status bar (located on the bottom of the window) should say "File rendered successfully".

Note

The "magick++" target (if it is available) produces much better gif files than the "gif" target because it can optimize the palette for the image.

Open BasicKnightRider.gif in Firefox or another application that is able to show animated gif's. However, Firefox will replay the GIF all the time which makes your short animation a rather long one. If you're now seeing a red circle moving from the left to the right and back, congratulations! You just made your first animation!

Note

You can also preview your animation. Press the "caret" menu button in the upper left corner of the Canvas Window and choose "File/Preview".

If you would rather use the command line instead of the menu to render your animation, then open a terminal (on Windows, go to "Start/Run", type "cmd" and press ↵ Enter), change to the directory you saved the file in, and type something like this:

```
synfig -t gif BasicKnightRider.sifz
```

A few messages appear that don't matter right now. Depending on your processor speed it should take a few moments, but finally a line like this will appear:

```
BasicKnightRider.sifz ==>  
BasicKnightRider.gif: DONE
```

You can view your animated gif using Firefox or another program as mentioned above.

Conclusion

Of course, the position of an object is not the only thing you can change with Synfig Studio. Other possibilities include its size, its outline, its color, etc. Synfig comes with several example files that should let you dig deeper into the possibilities.

Now, let's continue with the next manual chapter:

[Adding Layers](#)

Adding Layers

Introduction

In the [previous tutorial](#), you made your first simple animation by changing the attributes of [primitive](#) objects, such as: position, color, and size. These simple types, however, are seldom sufficient to create advanced characters and objects. To do so, Synfig uses [layers](#). They are similar to layers used in other drawing applications in that they are used to separate different elements of an image.

However, Synfig's layers have following important specific:

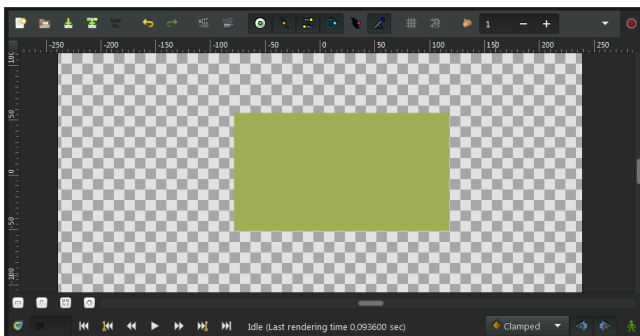
1. Every object or [element](#) gets its own layer.
2. You can organize layers into hierarchical groups.
3. You can use upper layers to change the behavior (or look) of underlying layers. Those are called [filter layers](#) or effect layers.

As you will see, layers are an extremely important aspect of Synfig, much more so than most graphics programs. Understanding the concept of layers is an important part in understanding how Synfig works.

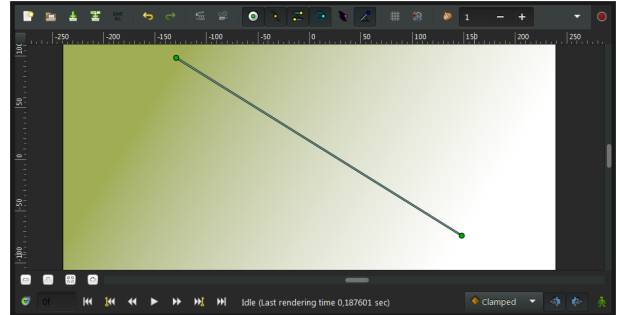
Combining layers

So let's look at a simple example of how we can combine two layers to create a gradient effect on a rectangle.

Create a new file with 0 duration. There's no need to bother with a timeline at this point. Next, create a simple rectangle with the [Rectangle Tool](#).



Pick the [Gradient Tool](#) from the [Toolbox](#), press the left mouse button on the canvas, drag to change the gradient direction and release the button when you are done. You should note that another layer was added in the [Layers Panel](#) called **Gradient**. This is nothing special.

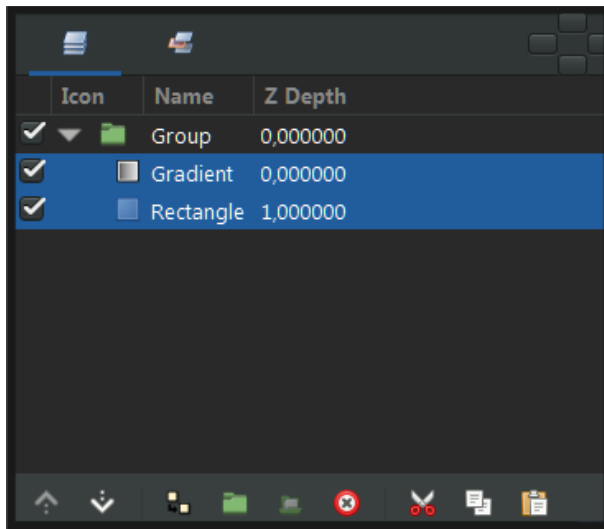


Note

If you see no gradient but just a plain color, that means that you probably just clicked on the canvas without dragging your mouse. To fix that pick the [Transform Tool](#), click into the canvas to activate the gradient's handles. You need to grab the one you see and move it a bit until a gradient appears.

You now have a gradient, but it is not what you wanted: it spreads across the whole canvas. The goal was to have a gradient in the rectangle. So, let's fix this now.

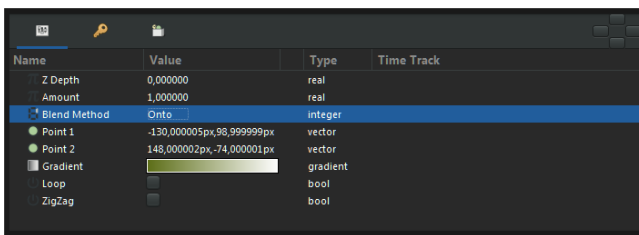
In the [Layers Panel](#), select both the gradient and the rectangle layer. Then, right-click and select "Group Layer" from the menu. The view of your Layers Panel should change now, showing a small box called [Group](#) with a "+" in front. By clicking on the "+" you can expand the group layer to see its contents, your previous two layers: the gradient and the rectangle.



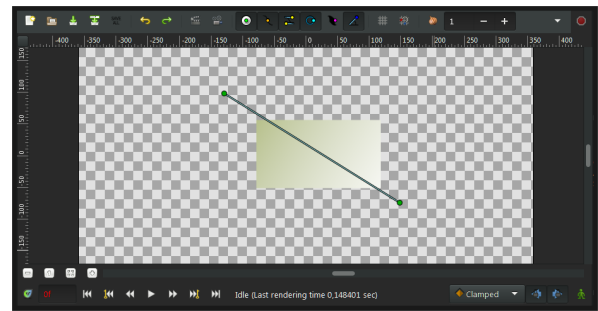
You can treat this layer like any other layer — move it around, duplicate it, copy and paste it. If you want to change the name of it to something more descriptive, just select the layer in the layer tab and click on its label. Then you just edit it in place. You can do this for ANY layer, and are strongly encouraged to do so.

Using locality

However, there is still a problem: the gradient still covers the whole canvas although we wanted it to be restricted on the rectangle. To do so, activate the gradient layer in the Layers Panel. Now go to the [Parameters Panel](#) (by default it resides in the bottom window), and search for the attribute called "Blend Method". Double-click the entry and select "Onto" from the drop-down menu.



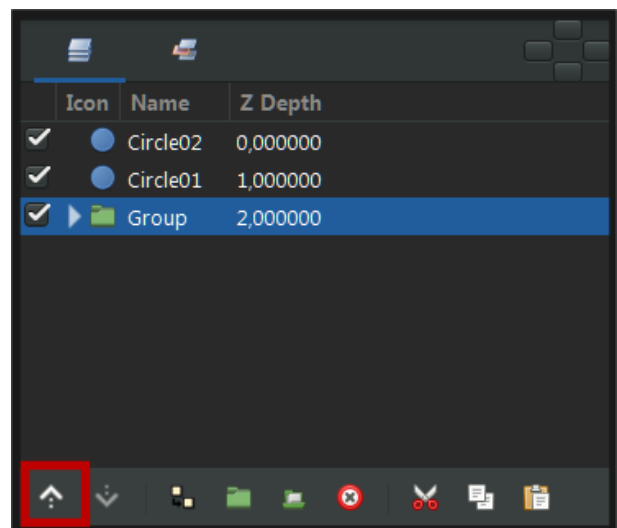
The gradient should now be restricted to the rectangle. Congratulations! You just made your first effect by interacting layers with Synfig.



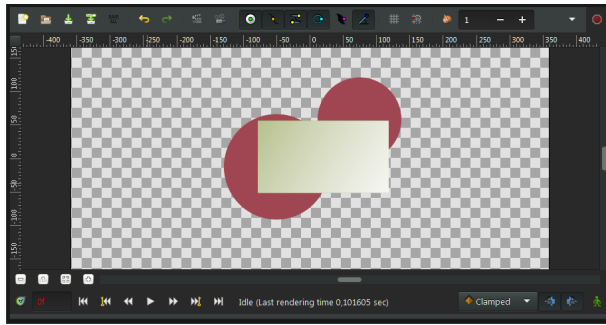
If only for the additional organization, grouping layers dramatically improves the ease of use of Synfig Studio. But lots of programs can do this. The concept of *scope* as just demonstrated sets Synfig apart from other programs with layer hierarchies. The key point is that a layer, inside it's own group, will **only** modify the data contained by all the layers and groups **below** it. In other words, if you were to throw a [Blur Layer](#) on top of the layers inside the [group layer](#) we created, it would just blur them — anything under the group layer would not be blurred! Let's try it.

Modify layers with other layers

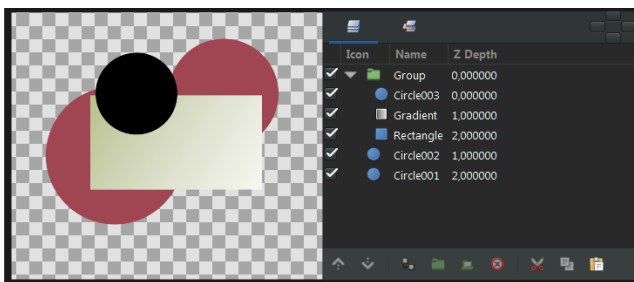
Make sure you have the group layer selected and create two red [circles](#). They will appear on top of the group layer. Select the group layer and use the "Raise Layer" button in the Layers Panel to place it on top of the circles.



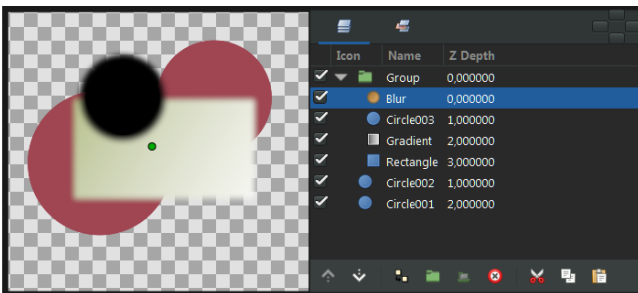
Now our group layer (with rectangle and gradient) is in front of those two circles.



Expand the group layer to show its contents, and select the top layer inside of it (should be the gradient layer). This is where we want to insert the new layer. Create another circle filled with a black color. The black circle layer will be created over the gradient layer inside the group layer.



Now, right click on the black circle layer in the layers panel and a popup menu will appear. The first item in that popup is "New Layer". Inside of the "New Layer" menu, you'll see several categories of layers you could create, but what we want is a blur, so go to the blurs category and select the "Blur" layer (so that would be "New Layer/Blurs/Blur").



The blend method for newly created blur is "Straight" (if the default blend method in the Toolbox is set to "By Layer Default") It blurred all around the outside edge of the contents of the group layer. You can change the [default blend method](#) for new layers from the [New Layer Defaults](#) section of the Toolbox.

Ok, now we have all of the contents of the group layer blurred, but everything under it is sharp! This is because the effect of the Blur Layer over the underlying layers is limited to the scope of the group layer because the blur layer is inside it.

Digging further...

If you care to look into Synfig's main menu under "Layer/New Layer" you will note quite a lot of different possibilities for making layers. Several of them sound rather unusual, like "Transform/Rotate" for example. You can use this to add new attributes to your objects. And just like other, basic attributes in the [previous animation tutorial](#), you can change them to be different on certain [keyframes](#).

Synfig will take care of interpolating the steps in between. For example, you could create a [shape](#) and add a [Rotate Layer](#) over it. Combine this with the lesson learned in the [last tutorial](#) and you will obtain a rotating effect. This technique is used for the creation of [Cut-out Animation](#).

Creating Shapes

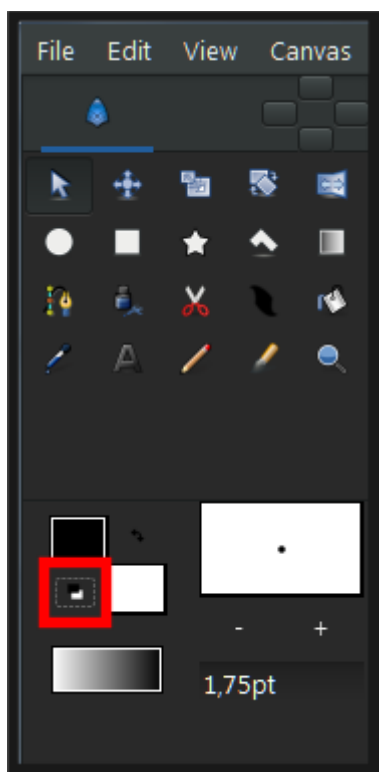
Introduction

Basic primitives such as circles or rectangles, that we have learn to work with [previously](#), are all great but they are pretty much geometrically inflexible. What about creating more complex shapes? To do this, we use the [Spline Tool](#).

Spline Tool

In Synfig, the construct for describing shapes is called a Spline. This is roughly analogous to a "path" in other programs, except that it is strictly a [cubic hermite spline](#).

Reset Colors button in the Toolbox
Before we start with the Spline tutorial, let's look at some additional notes on how Synfig works.



When you click on the [Spline Tool](#), you will see that the handles from your currently selected object (if there was one) will disappear, but the layer(s) will still remain selected in the [Layers Panel](#). This is normal. Anything you create with the Spline Tool will be inserted above the currently selected layer. Keep in mind that if you

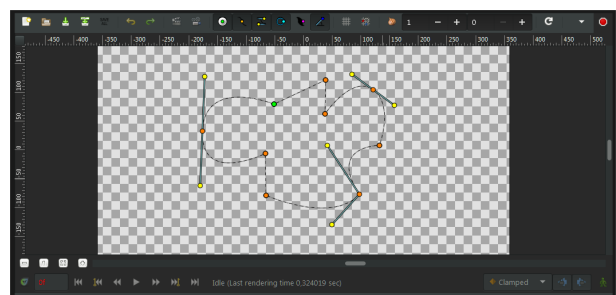
want to insert a shape somewhere, you should select where you want to insert it before you go into the Spline Tool — changing the selection afterward will automatically swap you back to the Transform Tool.

Now, go ahead and click on the "Reset Colors" button in the lower left corner of the FG/BG color widget in the [toolbox](#). This will reset us back to the default black and white. Also, set the [default line width](#) to something nice and thick — 10pt should do the trick.

After you switched to Spline Tool, take a look at the [Tool Options Panel](#). Make sure that only "Create Region", "Create Outline" and "Link Origins" are checked.

Clicking with your mouse in the canvas will place vertices. While you are placing a vertex, you can drag out its tangent by dragging the mouse. Do this over and over, and you construct a Spline.

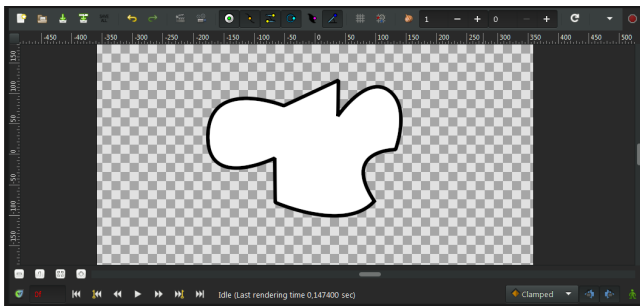
Keep in mind, however, that during this construction, there is nothing stopping you from just moving it if you don't like where you placed a vertex or a tangent. Honest! If you want to remove a vertex, right click on it and select "Delete Vertex". Want to split the tangents? Right click on the tangent and hit "Split Tangents". Want to loop the Spline? Right click on the first vertex and select "Loop Spline".



When you are finished placing vertices, you must exit construction mode in order to actually create the Spline layer(s); there are 2 ways to do this:

1. Switch to another tool.
2. Press the "Create" button at the bottom of the Tool Options Panel (it's the icon that looks like a gear).

For now, just go ahead and switch to the [Transform Tool](#), because we are done with the Spline Tool.



Editing Splines

Ok, we now have a nice pretty white region with a thick black outline. Since we checked "Create Region" and "Create Outline" in previous steps, you'll notice that there are two layers that we have created — the [Outline](#) and the [Region](#) in the Layers Panel. Despite

the fact that they are two separate layers, their vertices parameter has already been [linked](#) — so you can select either one and move its handles around and the other one will also change.

If you want to manipulate the vertices *after* you have created the layers, it is very easy to do so. Just click on one of the layers and have at it. If you want to remove a vertex, right click on it and hit "Remove Item (smart)". Want to insert a point somewhere? Right click on the segment where you want to insert something and hit "Insert item (smart)".

This may appear to be leading to a mess of layers. And yes, if you aren't using the software properly, that is exactly what you will get. But there is a way to make this more sane. As mentioned in the [previous tutorial](#), you can [group](#) layers into hierarchy.

One quick thing to mention before I finish up. You can change the width of an outline at each vertex. You do this by selecting the outline layer (NOTE: you must select the Outline Layer, the Region Layer has no width data) and tweaking with the width handles. By default, these are masked. To show them, press **Alt5** or click "Toggle width handles" button at the top of the canvas window (the fifth one from the left). Repeat to hide them again. You can also see other things to mask via the [Canvas Menu](#) **Caret**: "View/Show/Hide Handles".

Using tablet to draw shapes

If you have a [graphic tablet](#) you can use Draw Tool to create Splines.

Synfig Studio supports pressure sensitivity, but you need to configure it first. Go to "File/Input Devices..." from toolbox menu. In the "Input" dialog find your tablet's stylus device and set its "Mode" to "Screen". Click "Save" and then "Close".

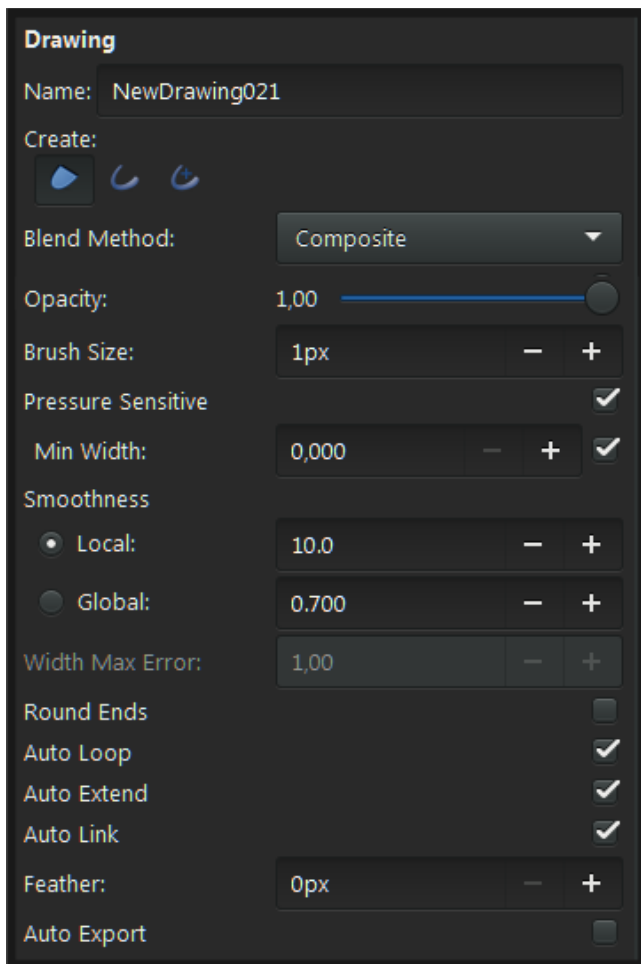
Now grab your stylus, create a new file and click on the Draw Tool button in the toolbox. Set the default line width value to be big enough — say, 15pt — otherwise you will not notice any pressure sensitivity effect. Choose brown as the [default fill color](#).

Note

Steps above should be done with the stylus of your tablet, not the mouse. Synfig Studio remembers settings for each input device independently. That's why if you set those options with your mouse device they will not have any effect when you switch to stylus.

In the Tool Options Panel, make sure that you have the same options as shown on the screenshot below.

Now let's draw something like a curvy mountain background. Start drawing a line from the left border to the middle of the canvas. Try to vary your stylus pressure while you are drawing. Stop near the center of the canvas. This is your first line. Notice the new outline layer created in the Layers Panel.

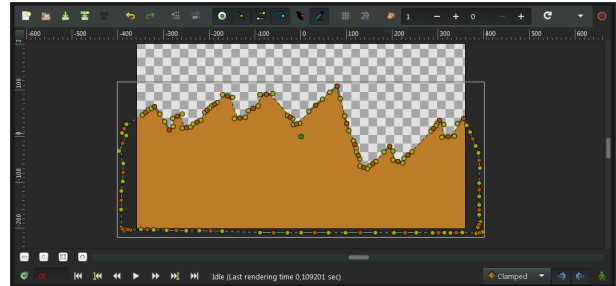


Point your stylus at the last handle of your new Spline and continue drawing to the right border of the canvas. When you finish, look at the Layers Panel again. There's still only one outline layer. Synfig Studio is smart enough to figure out that you don't need a new outline layer and properly extends the last one. You can extend the Spline from both ends, but if you start drawing from any other place of the canvas a new outline layer will be created. Though your first line will remain selected and nothing stops you from extending it later.

Back to our artwork. In the Tool Panel hit the button with the bucket icon to fill the outline we just created. A region layer will appear at the top of the layer we are working with. Select the outline layer and press the "Raise Layer" button in the layers panel to put the outline layer on top of the region.

Extend a line from both sides down to the corners of the canvas to make the fill appear at the bottom. Great.

Go ahead and add a few more lines on top of the filled area to give it a mountain-like look. If brown handles are in your way, you can hide them by clicking the "Toggle vertex handles" button at the top of the canvas window (the second one from the left).



The Draw tool is great for drawing complex shapes, but you end up with a bunch of handles, which are hard to manipulate with the Transform Tool in the way we described above. There are two solutions here.

First, you can increase the "Smooth" value in the Tool Options Dialog while using Draw Tool. That will reduce the count of vertices produced at drawing time, but will make your shape less detailed.

Second, you can use Smooth Move Tool to deform an existing shape. Go for it and click the Smooth Move Tool button in the toolbox. The trick about this tool is that it affects *selected handles only*. Press and hold your left mouse button in an empty place of the canvas. Drag to create a selection box. Release the mouse button when you are done. Or just hit **Ctrl-A** to select all handles. Now you can deform the selected segments of Spline. You can change the size of the influence area by tweaking "Radius" in the Tool Options Panel.

What about outline width? There is a Width Tool for that purpose. It is designed for increasing or decreasing the width of a line much like you would with a pencil on paper. Click the Width Tool button in the toolbox, move your stylus over the line you want to change, press and move the cursor back and forth along the line, like you are scratching something. The width of the outline will be increased at the places where you moved the cursor. If you want to decrease the width, just hold "Ctrl" while scratching. Easy!

If you don't want width handles to be displayed, during usage of the Width Tool, just turn them off by pressing the "Toggle width handles" button at the top of the canvas window.

Other ways to create Splines

Is that all? Not yet. You can use Circle, Rectangle, Star and Polygon tools to create Splines too. Just check the "Create Outline" and "Create Region" options in the Tool Options Panel when using those tools.

Creating geometric primitive as Spline gives you a better control over it's shape and look. For example, if you want a deformed star, then you can use the Star Tool to create it as outline and region Splines and then use the Transform Tool to deform it.

Now you are ready for the [last tutorial](#) in this section. Hang on!

Animating Shapes

Basic settings

In the [previous tutorial](#), you have learned to create shapes with the [Spline Tool](#), in this tutorial we will learn how to create a simple animation of a growing flower using [Splines](#).

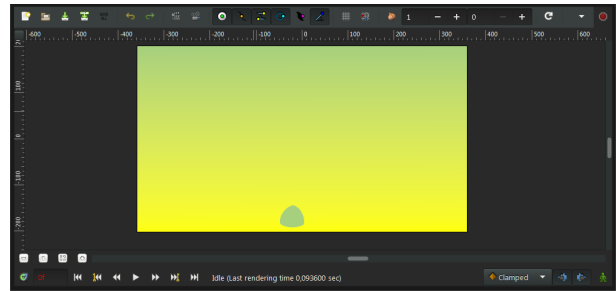
Start Synfig Studio — a new animation will be created. If you already have Synfig Studio started, select "File/New" in the toolbox.

First, we need to create a gradient for a background. Click on the outline and fill colors in the [Toolbox](#) to select the colors of our gradient. You can also directly edit the gradient by clicking the gradient line in the toolbox.



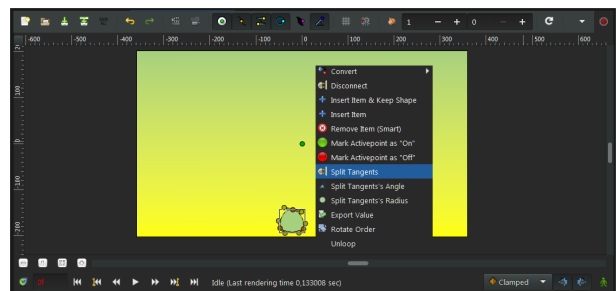
Select the [Gradient Tool](#) and drag your cursor vertically across the canvas to fill it with the gradient.

Next, select the [Spline Tool](#) and in the Tool Options Panel, make sure that only "Create Region Spline" is checked. In the toolbox, set the fill color to green. Draw a kind of triangle with the Spline tool. To close the shape after drawing the 3 vertices, right click on the first vertex and choose "Loop Spline".



Now that the trace of the form is closed, select the transform tool (or any another tool) to generate the proper form.

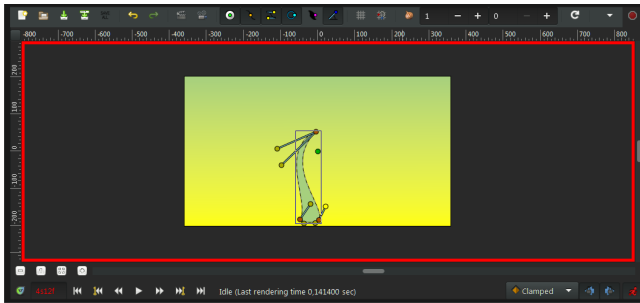
This will be the base of the stem. You can tweak the tangent handles (red dots) a bit to make a rounder triangle. With the [Transform Tool](#), right-click on each vertex and select "Split Tangents", so the tangent handles of each vertex can be moved separately.



Animate the stem

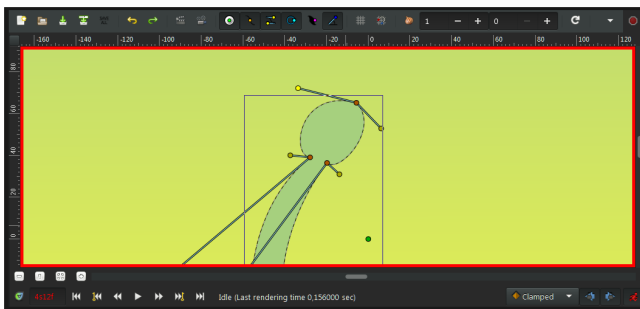
In the Canvas Menu, select the [caret menu](#) icon in the upper left hand corner, where the rulers intersect, and then select "Canvas/Properties". Go to the "Time" tab, set the "End time" to "6s" and click OK button.

Click at the beginning of the timetrack ("0f"), then, in the [Keyframes Panel](#) (the one with a key icon) click the button with a "+" icon (add a new keyframe). [Keyframes](#) allow us to *settle down* the scene; i.e. on a keyframe, every element of the scene will have all its properties remembered. Click again on the timetrack, at "4s 12f" (ie 4.5s at 24 fps). Press the green circle at the bottom right of the canvas (or whatever icon you have there, depending on your icon theme) to switch to the [Animate Editing Mode](#) (the circle is now red).



With the [Transform Tool](#), select the green sprout, and move the upper vertex up to make a stem. You can play with the vertex handles to bend the shape a bit if you want.

While you are still at "4s 12f", right-click on the stem border, close to the top, and choose "Insert Item". Do the same on the other side of the stem. Right click on those new points and choose "Split Tangents". Then try to make a shape that looks like the one on the image, to create the flower bud.



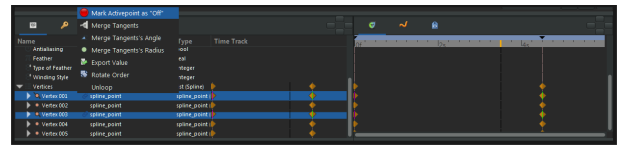
Now if you click on "2s" (for example), you'll see that the shape of the bud is slightly visible, even if the sprout is rather small, and even if the bud handles are invisible.

Let's say we want the bud to appear only at 3s 12f, and be full size at 4s 12f.

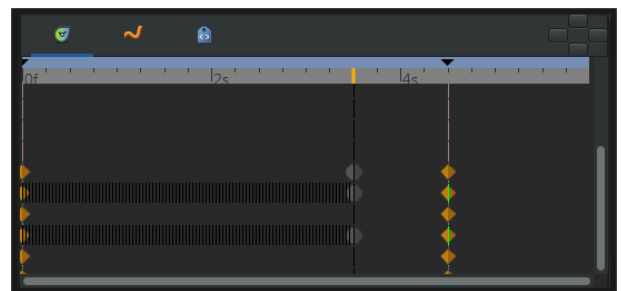
Click on "3s 12f" on the timetrack. Now take a look at the "Parameters" and "Timetrack" panels at the bottom. You'll see that each parameter in the [Parameters Panel](#) matches a row in the [Time Track Panel](#). The last parameter is the vertices list. Click on the small arrow on the left to unfold the list.

Each brown diamond (or [waypoint](#)) stands for a recorded value (here the vertices positions were recorded at 0f with the keyframe, and at 4s when we moved some vertices or vertices handles). The two vertices we added to make the bud are marked with green and red vertical line on their

0s and 4s waypoints. Right-click on them in the parameters list, and select "Mark Activepoint as Off".



The panel should now look like this, the grayed part being the part where the bud vertices have no effect on the stem.



For example if you click on "2s" or even "3s" now, the bud shape is not visible. It starts to appear only a little after 3s 12f.

However, the shape of the stem may not look very nice during its growth between 0 and 4s. Make sure you're still in Animate Edit Mode, and tweak the shape at various moments in time, to get something you like.

The animation of the stem is now finished, but it still lacks the petals. You can watch a preview of your animation: Go to "File/Preview", validate, wait for the preview to be generated, and watch.

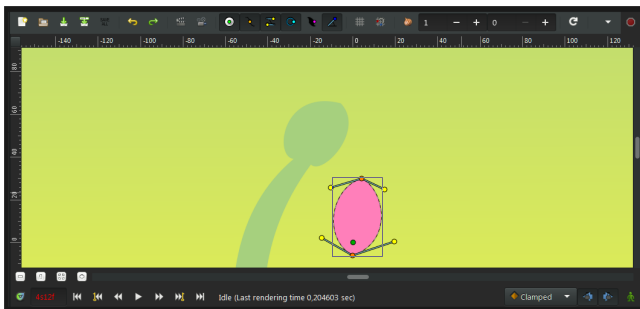
Note

Previews are often pixelated and blurry, but the final render will be clean-cut. Higher quality previews are obtainable by using higher values for 'Quality' and 'Frames per second' in the preview dialog window.

Adding the petals

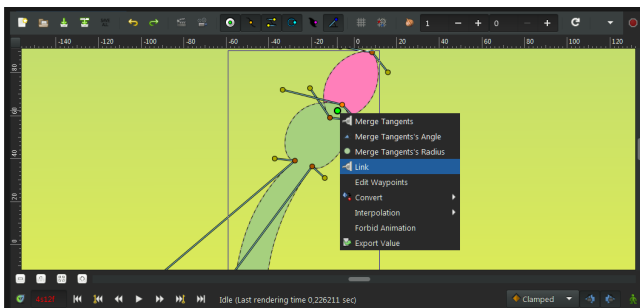
Now leave the "Animate Editing Mode" by clicking on the red circle at the right bottom of the canvas.

Change the fill color to pink, and create a petal with the Spline Tool. You'll notice that the green [handle](#) that allows easy movement of a shape is at the center of the canvas. Select all the vertices of the petal with **CtrlA** and move them close to the green handle (with the Transform Tool), as shown.



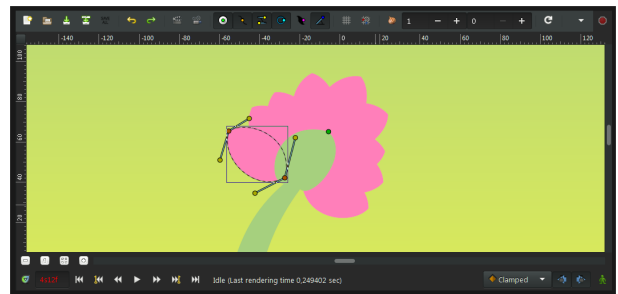
Then drag the green handle very close to the top of the bud. Hit **CtrlA** again to select all vertices of the petal and tweak it a bit with Rotate Tool. Also, in the [Layers Panel](#) select the petal layer and put it **under** the stem layer. Click on the petal to select it, then ctrl-click on the stem. Both objects should be selected.

Now click on the vertex at the top of the stem and ctrl-click on the green handle of the petal (both should appear in a lighter color, as they are selected). Then right-click on the stem top vertex, and select "Link". The petal will move a bit as the green handle is snapped on the stem vertex.



Now that there's a link between the petal and the top of the stem, when the top of the stem moves, the petal will follow the move. (And if the green handle of the petal moves, the top of the stem will move, but we don't want to do that here.)

On the Layers Panel, select the newly created Petal layer and duplicate it (with the third button, on the bottom of the Layers Panel). On the canvas, press **CtrlA** to select all the vertices of the duplicated petal, and move them a little, so the petals are no longer overlaid. (Don't move the green handle, just the orange ones). Repeat the process several time, to get something looking like this image.



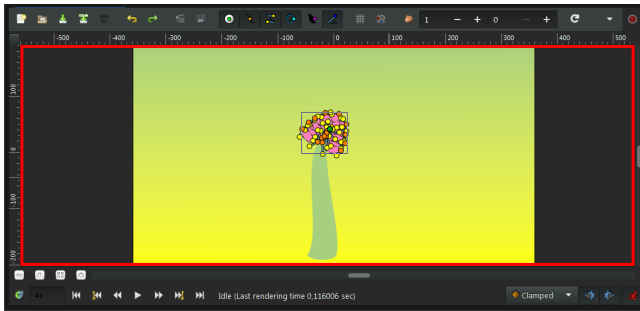
Note that the duplicated petals are also linked to the stem. If you go back to the first keyframe, you'll see that the petals are visible. We don't want that. We want the petals to appear and bloom almost at the end of the growth.

Hiding the petals

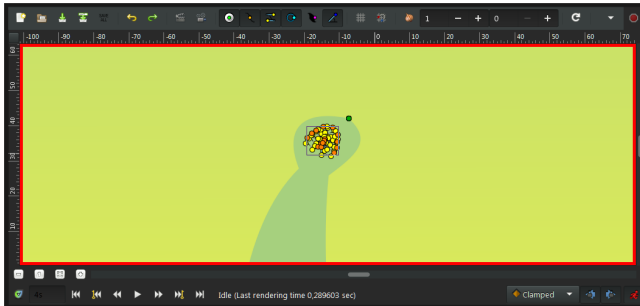
Let's say we want the petals to appear a little after 4 seconds in the animation, and be full size at 5 seconds, instead of being visible and full size all the time.

Switch to "Animate Editing Mode" again by clicking on the green circle at the bottom right of the canvas. But if we will go to "4s" and modify them, then they also change at "5s". Because the shape/position of the petals is not fixated at this moment of time by any waypoints or keyframes. That means that we need a keyframe at "5s". On the timetrack, click to place the cursor at 5 seconds. On the [Keyframes Panel](#), click on "+" to add a new keyframe.

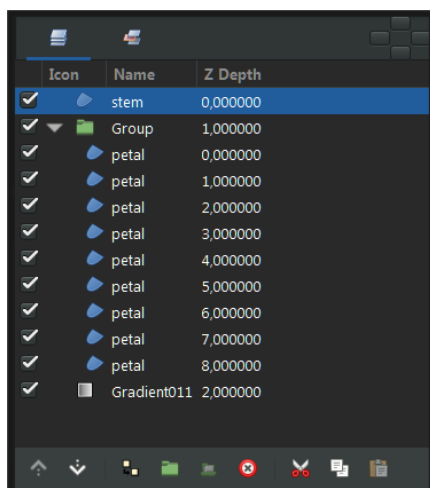
Now click on "4s", and on the Layers Panel, select all the petals layers (with ctrl+click), then press **CtrlA** to select all the petals vertices.



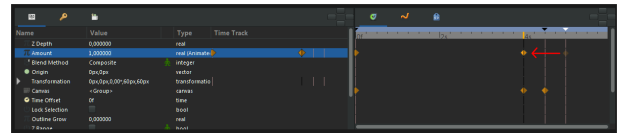
Scale them down with the [Scale Tool](#), and move them, so they are hidden by the stem, as shown.



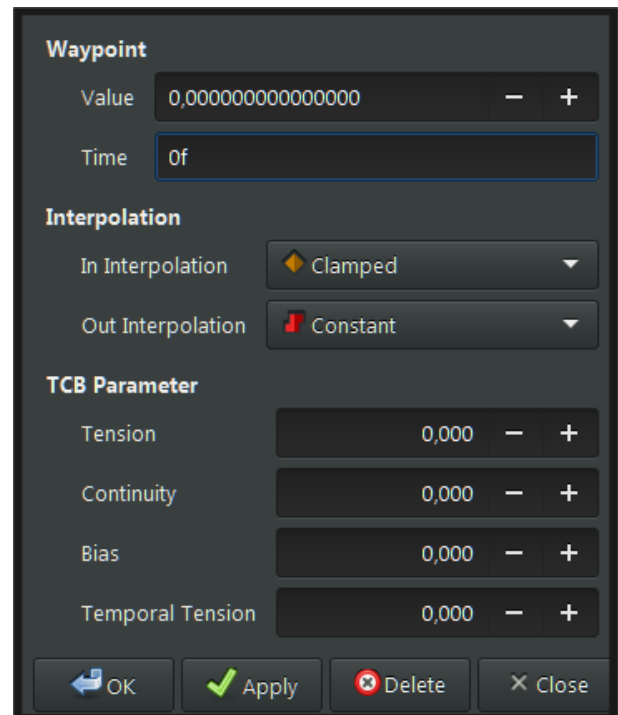
From 4s to 5s, the petals will now appear and bloom. But notice that we have a keyframe at 0s which also remembers petals shape. That makes the problem — the petals are still visible from the first keyframe to the 4s keyframe. We could either make the petals tiny and hidden tweaking their size on every frame from 0s to 4s, or we could make them invisible on this interval. Let's choose the second solution. To make things easier, we are going to [group](#) the petal layers into an [Group Layer](#). With all the petal layers selected, right-click on them on the Layers Panel and select "Group". You can rename the layers to make things more understandable.



Select the **Petals** Group Layer and jump to the first keyframe. In the Parameters Panel, set the "Amount" value to "0". The petals are now invisible on that keyframe. Note that two waypoints were added in front of the "Amount" parameter, one at 0s and the other at 5s. Drag the 5s waypoint to 4s, so that the opacity of the petals will be 1 at 4s.



There is still one problem left: from 0s to 4s, the opacity of the petals slowly increases, making the petals visible when they shouldn't. To solve this, we will change the Amount interpolation method. Right click on the Amount waypoint at 0s, and select "Edit". A new dialog will appear, in which you can choose the In and Out interpolation. Set the Out Interpolation to "Constant".



Tip

You can also change waypoint Out interpolation by right-clicking on it and selecting "Out/Constant".

This means that *after* that waypoint, the Amount value will remain constant, until another waypoint is encountered. So from 0f to 4s the Amount value will be equal to 0, and at 4s it will suddenly changed to 1, and make the petals visible, as expected. Alternatively, we could have achieved the same effect by setting the In Interpolation of the waypoint at 4s to "Constant".

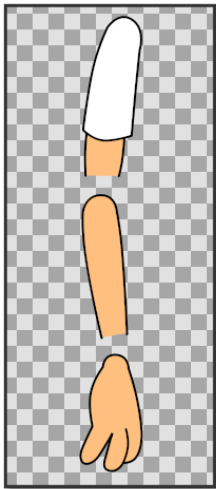
Notice how (half of) the waypoint changes from a green circle (meaning smooth animation of the amount parameter) to a red step (meaning that the amount parameter is suddenly stepped).

Now you're done. The stem grows for 4.5 seconds and then stays still the last 1.5 seconds. The petals are hidden until 4 seconds, and then grow quickly between 4 and 5 seconds, and stay still the last 1 second too.

Click on "File/Render" to render your animation. Select any format you want, and ensure that "Use current frame" option is unchecked (otherwise, one frame only will be rendered). In the next and last part we will be covering basic usage of the bone system in Synfig.

Basic bone Tutorial

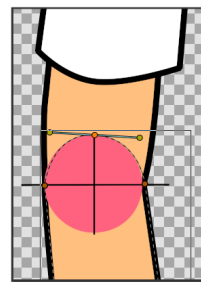
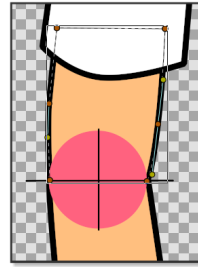
Introduction



In this tutorial we are going to rig an arm with fixed joints using the [Skeleton Layer](#) and three bones. The arm consists of three parts: the **upperArm**, the **lowerArm** and the **hand**. (pic.1) Each part is grouped in its own layer and the three groups are again grouped in a layer that is called **arm** (pic.2).

Icon	Name	Z Depth
✓▶	crosshair	0,000000
✓▶	crosshair	1,000000
✓▶	arm	2,000000
✓▶	upperArm	0,000000
✓▶	lowerArm	1,000000
✓▶	hand	2,000000

In *picture 4* and *picture 5* we can see how the horizontal crosshair line matches the straight line of the bottom of the upper arm and at the same time the outline of the circle of the crosshair matches the top curved outline of the lower arm.

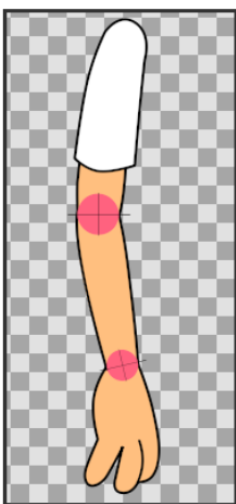


The same principle is applied to the hand and the bottom part of the lower arm. The crosshairs also mark the centre of the rotation point that will later be used when placing the bones. Before placing the bones we can align the [Group Transformation Widget](#) (press control and move the left corner handle of the [Group Transformation Widget](#) to move it.) of the **lowerArm** group and the

hand group with the crosshairs of the elbow and the wrist to check if the joints rotate correctly.

Don't forget to bring the arm into its original position by pressing undo. (Don't worry if the hand does not rotate with the elbow when you check the elbow joint by using the [Group Transformation Widget](#).)

Prepare The Joints

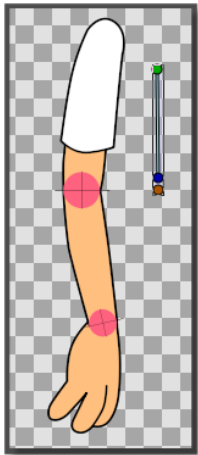


Before we start rigging the arm we have to prepare it to make sure that the joints properly rotate. In *picture 1* we can see that the lower side of the upper arm is straight and does not have an outline, while the upper part of the lower arm has an outline that is curved. The bottom part of the lower arm does not have an outline and is also straight. The joint of the hand is also curved with an outline. To make sure that

the joint parts of the arm rotate correctly, we made them with the help of a couple of crosshairs (picture 3).

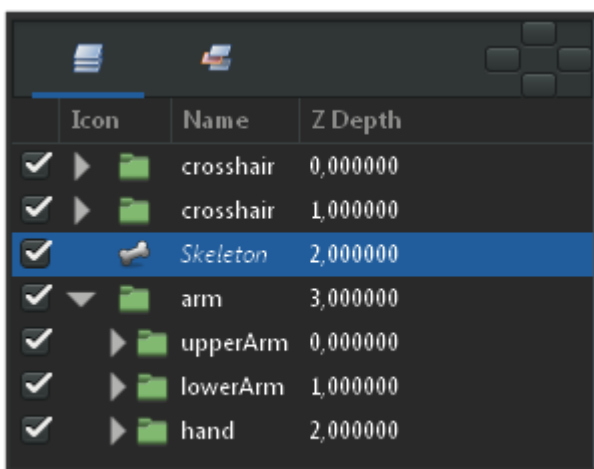
Adding The Bones

Now it's time to add a [Skeleton Layer](#) that will provide the bones we need to rig the arm.

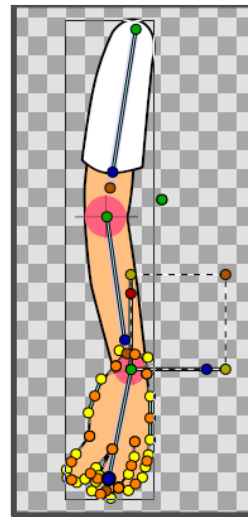


Right-click on any layer in the [Layers Panel](#) and choose "New Layer/Other/Skeleton". A new [Skeleton Layer](#) (pic. 7) will appear in the [Layers Panel](#) alongside with a small bone in the canvas (pic.6). Put the [Skeleton Layer](#) above the **arm** group if it is not already there. The green handle of the bone is the origin of the bone and is used to move the bone in place and is also its centre of rotation. The blue handle is

used to rotate the bone. The orange handle determines the length of the bone is used to stretch the bone and its contents. The first bone is the parent bone and should be moved toward the shoulder and stretched so that it almost reaches the outlines of the first crosshair of the elbow. Right-click on any of the handles of the parent bone and select "Create Child Bone". Move the green origin point of the child bone so that it matches the crosshair of the elbow and stretch it until it almost reaches the crosshair of the wrist. Right click on any of the handles of the child bone and create another child bone. Move the green origin point of the second child bone so that it matches the crosshair of the wrist (pic.8). Stretch the bone until it reaches the end of the fingers.

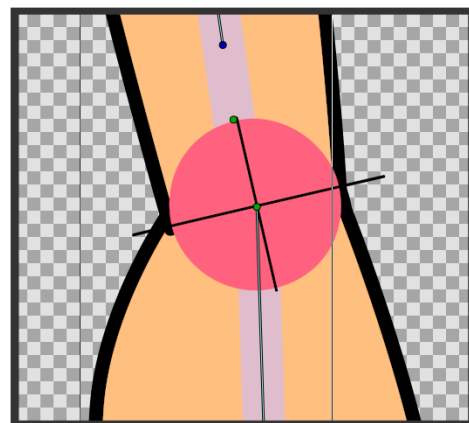


Attaching The Bones



Now that the [Skeleton Layer](#) is in place we have to attach the bones to the parts of the arm. In the [Layers Panel](#) click on the **upperArm** group, right-click and "Select All Child Layers". Then press CtrlA in the canvas window. With everything in the **upperArm** group highlighted, Ctrl-click on any bone in the

canvas window and right-click on any of the handles of the parent bone and click "Link to Bone". The **upperArm** group is now linked to the parent bone. Go the [Layers Panel](#) again and select the **lowerArm** group. Right-click and "Select All Child Layers". Press CtrlA in the canvas window and Ctrl-click on one of the bones. Then right-click on any of the handles of the first child bone and select "Link to bone". The **lowerArm** group is now linked to the second child bone. In the [Layers Panel](#) select all the child layers of the **hand** group and press Ctrl-A in the canvas window. Ctrl-click on any bone and then right-click on any of the handles of the second child bone and select "Link to bone" (pic.8) The hand is now linked to the second child bone and the entire skeleton is now linked to the arm.



Tip

Making a crosshair in Synfig is easy. Draw a circle. Draw the outlines of a square and align them with the circle. Draw an X using the corners of the square as a reference. Delete the square. Group the circle and the X. Rotate 45 degrees using the [Group Transformation Widget](#).

