



Full Circle

THE INDEPENDENT MAGAZINE FOR THE UBUNTU LINUX COMMUNITY

INKSCAPE SERIES SPECIAL EDITION

INKSCAPE SERIES
SPECIAL EDITION

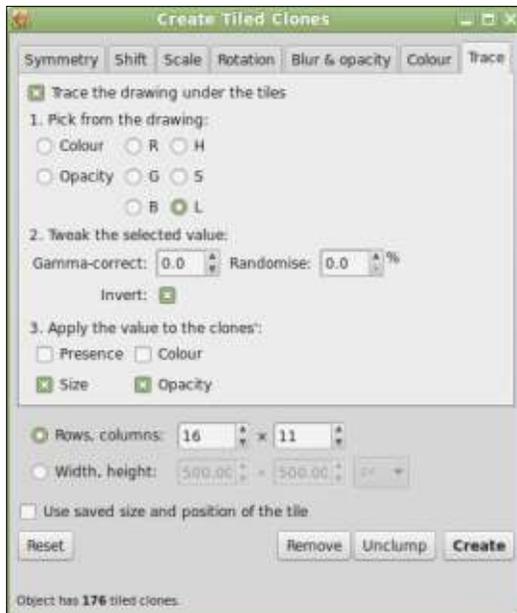


INKSCAPE
Volume Six Parts 36 - 42

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The last tab of the Tiled Clones dialog is labelled "Trace" and, unsurprisingly, it's used for tracing existing drawings or bitmap images to create an array of clones that are related to some aspect of the underlying image. Initially it looks complex, but it's actually far simpler than it appears.



After using the Reset button in the dialog, most of the fields in this tab become disabled. To activate tracing mode, you have to first check the box on the top line. From then on it's just a case of

choosing the options you want from each of the three numbered sections. These can be broadly described as:

- Which aspect of the image do you want to use as your source of data values?
- How do you want to modify those values?
- What features of the clones do you want those values to apply to?

To demonstrate, I'll use the familiar face of La Giaconda as a background image, with a red round-cornered square as the selected parent object for cloning. When tracing, the clones are first placed, sized and rotated in accordance with the other tabs in the dialog, then the background image is tested underneath each clone's position to extract a value that will be used to further adjust the clone.

In section 1, we need to tell Inkscape what value to extract. You can choose from a general

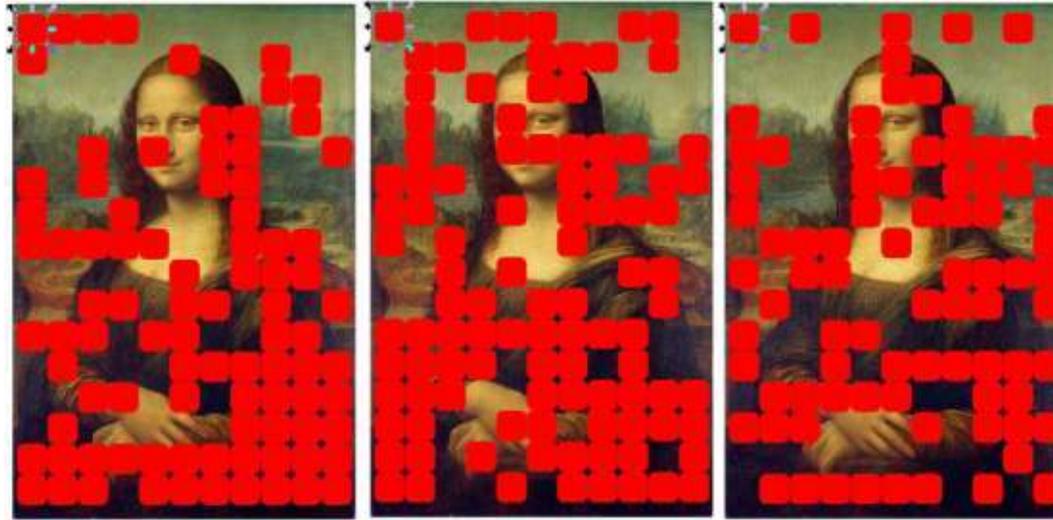
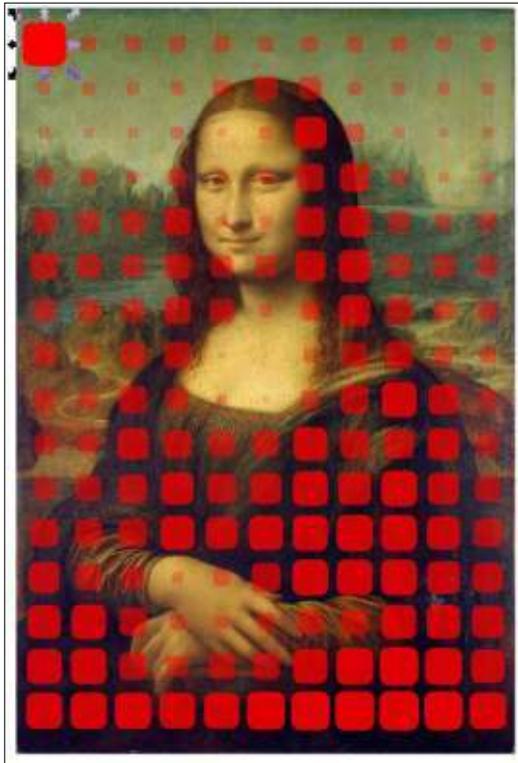
color value or one of the individual components of that color – Red, Green, Blue, Hue, Saturation or Lightness. There's also an option for Opacity, which extracts the alpha value from the underlying image. This section results in a single number for each clone. If "L" was chosen, for example, the dark parts of the image will yield a low number, whereas the light parts yield a high number.

Section 2 gives you the opportunity to modify the collection of numbers that you've created in section 1. You can adjust the "gamma", which allows you to shift the midpoint of the number range. This is best adjusted in small amounts once you've seen what the output looks like. Positive numbers will shift the mid-point upwards, negative values will shift it downwards. For example, when tracing a dark image using the "L" channel, you might want to shift the mid-point down – to better center the range within the values you're extracting. When tracing a light image, on the other hand, you might want to shift it upwards.

The Randomise field, as you might expect, just modifies each value from section 1 by a random number. The value in this field represents the maximum amount of randomness that is allowed. The Invert checkbox swaps low values for high values, and vice versa. It's used when you want low numbers from your light areas, and high numbers from the dark areas, for example.

Finally, section 3 is where we tell Inkscape what to do with the extracted, adjusted values. For each clone, you can use the corresponding number to modify any combination of Presence (the probability that the clone is created or not), Colour, Size and Opacity. The latter two are the easiest to explain: in both cases the original parent element represents the maximum value that is allowed. None of your clones can get any larger, or more opaque, than the parent. Instead, the generated values are used to reduce the size of the clone, or reduce its opacity (making it more transparent).

Let's take a look at an example. I've traced the Lightness values of La Giaconda, adjusting them with a Gamma of -1.0, and finally applying the results to the Size and Opacity of the clones. The parent object is in the top left, and you can see that dark areas (where "L" is low) result in small reductions of size and opacity. Light areas (where "L" is large) result in much bigger reductions. Checking the Invert control would have resulted in the opposite effect: large, opaque clones in the light areas and small, transparent ones in the dark areas.

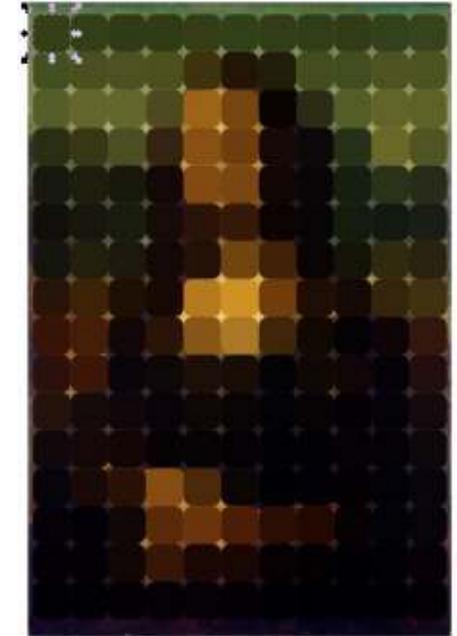


The Presence option in section 3 is, in my opinion, broken. A sensible way for this to work would be for values above a certain threshold to result in a clone being drawn, with values below that threshold producing no clone. That's not what happens though. Rather the value is used to adjust the probability that a clone will be drawn. Whether it actually is drawn or not then comes down to (weighted) luck. With "L" selected in section 1, it becomes likely that clones will be drawn in dark areas, and less likely they'll be drawn in light areas, but as it's all down to chance, it makes the results somewhat unpredictable. To make matters worse, the presence calculation, in all its randomness, is

performed every time you click the "Create" button. Click it again and the arrangement will be different. Another click, another arrangement. Just take a look at this example – all three images were taken using exactly the same settings, just by clicking the button three times. With such radically different results from the same input values, it's no wonder I question the benefit of this "feature".

The Colour checkbox is perhaps the most useful of all the options in section 3. To use it you first have to unset the fill of your parent object, just as we did last time when using the "Colour" tab. This option is a little different to the others because it doesn't use the

value from section 1. Instead, it takes the RGB value of the pixels under the clone and, after adjusting them in accordance with section 2, applies the resultant color to the clone. A picture describes it far better than a lot of words.



This effect usually works best with a large number of fairly small clones. That combination can bring a lesser computer to its knees fairly quickly, though, so be careful before you hit the Create button.

One limitation of this dialog is that each of the four options in section 3 is tied to a single set of manipulations in section 2. You

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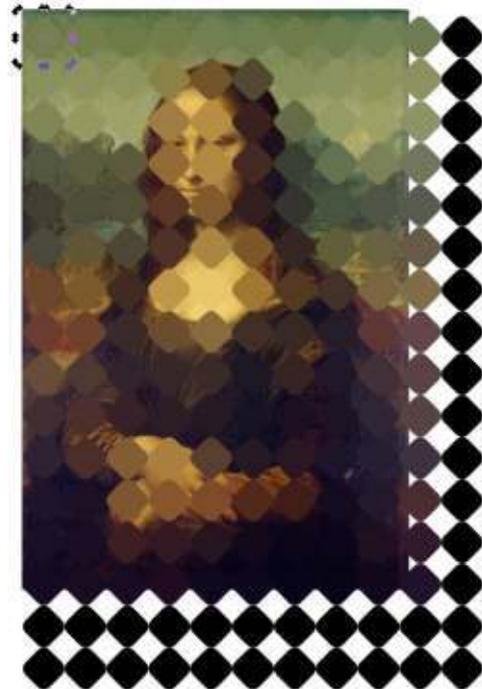
can't have Opacity set directly by the "L" value, whilst also having Size modified by the inverted value, or use a different gamma for the Colour and Presence. It's not usually a problem, but if you do need such combinations then you've little choice but to use the Tiled Clones dialog as a starting point, then manually adjust each clone afterwards.

The Trace tab can be used in conjunction with the other tabs if you want to add some rotation to your clones, or perhaps adjust their size or spacing. The latter can be especially useful if you need to tighten up the array when using the Size checkbox in section 3. You should also bear in mind that the examples I've given here are deliberately simplistic. Your parent object can be almost any shape or group. The background you're tracing, similarly, can be a collection of objects rather than a bitmap image. Just remember that cloning complex parents takes more processing power and memory, so prepare for slowdowns or even crashes if you push the complexity or number of clones too high.

To conclude our look at the

Tiled Clones dialog, I'm going to return to a couple of controls that I skipped over previously. The first is the "Use saved size and position of the tile" checkbox at the bottom of the dialog. Remember how Inkscape uses the bounding box of the parent as the basic unit of measurement throughout this dialog? This checkbox overrides that default to instead use the "saved" bounding box dimensions – where "saved" just means "the last value used before you checked this box".

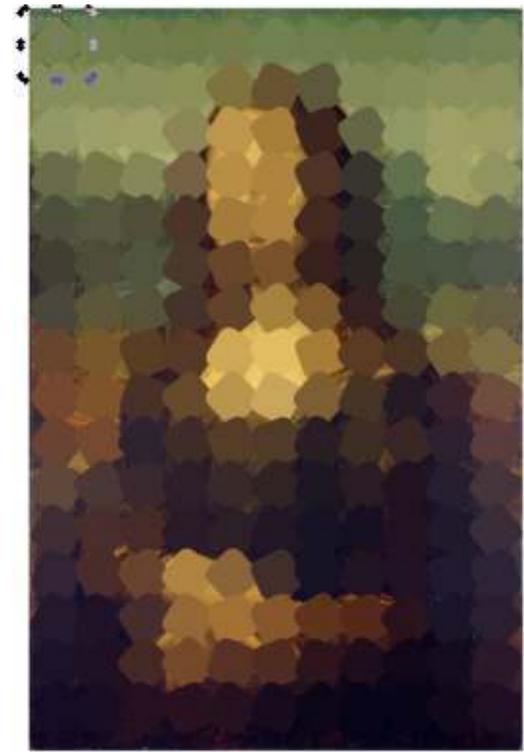
Consider our color trace of La Giaconda. By using 16 rows and 11



columns, my particular rounded square covers the space quite nicely. But what if I decide to rotate the square to make a diamond? Doing that increases the size of the bounding box, so my 16 rows and 11 columns now spills well over the edges of the background image.

One obvious solution is to reduce just the number of rows and columns, but that still leaves me with big gaps between the tiles. I could tweak the values in the Shift tab to compensate, but as I already had a tile placement that suited my needs, it's easier just to tell Inkscape to "save" that and re-use it for subsequent tiled clones.

Returning to the image as it was previously (by pressing CTRL-Z a few times) gets me back to a tile layout I'm happy with. At this point I can tick the "Use saved size..." checkbox to use that layout even while I change other parameters in the dialog, or make modifications that will alter the size of the parent's bounding box. Rotating the parent again, and adding a little variation with the Randomise field in the Rotation tab, produces a much better result.



The last control to cover in the Tiled Clones dialog is actually the first one. It's the pop-up menu on the Symmetry tab, which determines how the tiles are initially arranged, prior to any adjustments from the other tabs. Mathematically speaking, there are 17 possible symmetries for a two-dimensional pattern – see the Wikipedia page for "Wallpaper group" for more technical details. These symmetries are based on translating (moving), rotating and reflecting the parent object to create a repeating pattern, and the

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pop-up lists each symmetry by its mathematical title in "short" notation (such as "P1") followed by a description of the symmetry (such as "simple translation").

So far, I've only used P1 for this

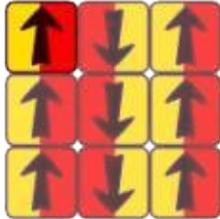
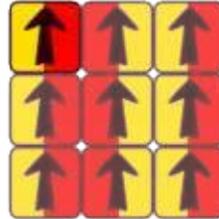
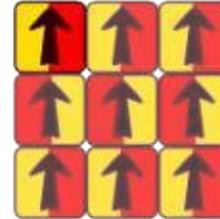
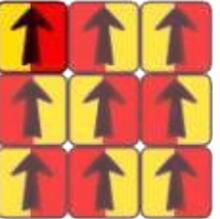
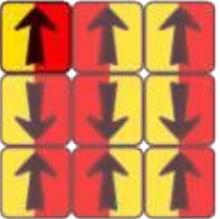
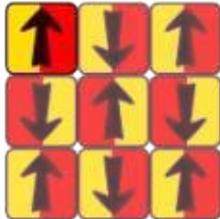
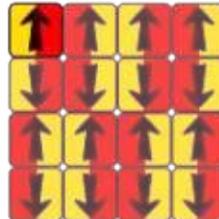
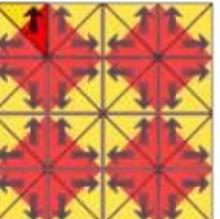
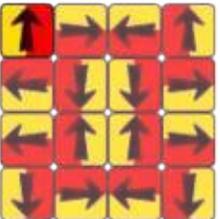
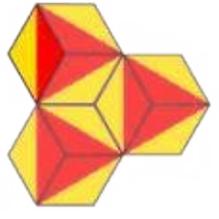
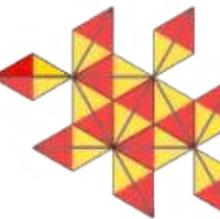
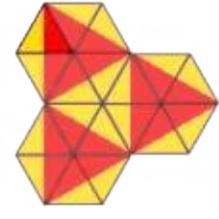
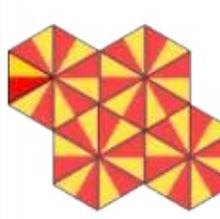
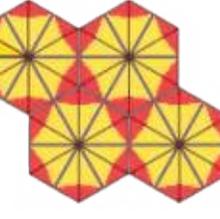
tutorial, because it's the simplest to understand when used with the other tabs in the dialog. Other symmetries can quickly lead to complex (and confusing) results, but they can be useful if you want to create tiled patterns or

kaleidoscopic art. Some work best with triangular arrangements of objects, others with more rectangular parents.

Unfortunately, however, it's very easy to confuse Inkscape

when using more complex symmetries. Even something as simple as switching your document from portrait to landscape mode can result in wildly misplaced clones. The following page shows examples of all 17 symmetries, but several of these had to be created in a fresh document and imported into the final image in order for them to work as expected. In a couple of cases, I was never able to produce the expected arrangement. They came close, but I had to manually arrange the clones a little to get the correct result. I've outlined those ones in red. If you do want to use the advanced symmetries, I recommend checking out this page in the official manual, which contains a similar set of images but with a little more detail:

<http://tavmjong.free.fr/INKSCAPE/MANUAL/html/Tiles-Symmetries.html>

<p>P1: Simple Translation</p>  <p>Rows: 3, Columns: 3</p>	<p>P2: 180° Rotation</p>  <p>Rows: 3, Columns: 3</p>	<p>PM: Reflection</p>  <p>Rows: 3, Columns: 3</p>	<p>PG: Glide Reflection</p>  <p>Rows: 3, Columns: 3</p>	<p>CM: Reflection + Glide Reflection</p>  <p>Rows: 3, Columns: 3</p>	<p>PMM: Reflection + Reflection</p>  <p>Rows: 3, Columns: 3</p>
<p>PMG: Reflection + 180° Rotation</p>  <p>Rows: 3, Columns: 3</p>	<p>PGG: Glide Reflection + 180° Rotation</p>  <p>Rows: 3, Columns: 3</p>	<p>CMM: Reflection + Reflection + 180° Rotation</p>  <p>Rows: 3, Columns: 3</p>	<p>P4: 90° Rotation</p>  <p>Rows: 3, Columns: 3</p>	<p>P4M: 90° Rotation + 45° Reflection</p>  <p>Rows: 4, Columns: 8</p>	<p>P4G: 90° Rotation + 90° Reflection</p>  <p>Rows: 3, Columns: 3</p>
<p>P3: 120° Rotation</p>  <p>Rows: 3, Columns: 3</p>	<p>P31M: Reflection + 120° Rotation, Dense</p>  <p>Rows: 2, Columns: 12</p>	<p>P3M1: Reflection + 120° Rotation, Sparse</p>  <p>Rows: 3, Columns: 6</p>	<p>P6: 60° Rotation</p>  <p>Rows: 2, Columns: 12</p>	<p>P6M: Reflection + 60° Rotation</p>  <p>Rows: 2, Columns: 24</p>	



Mark uses Inkscape to create three webcomics, 'The Greys', 'Monsters, Inked' and 'Elvie', which can all be found at

<http://www.peppertop.com/>

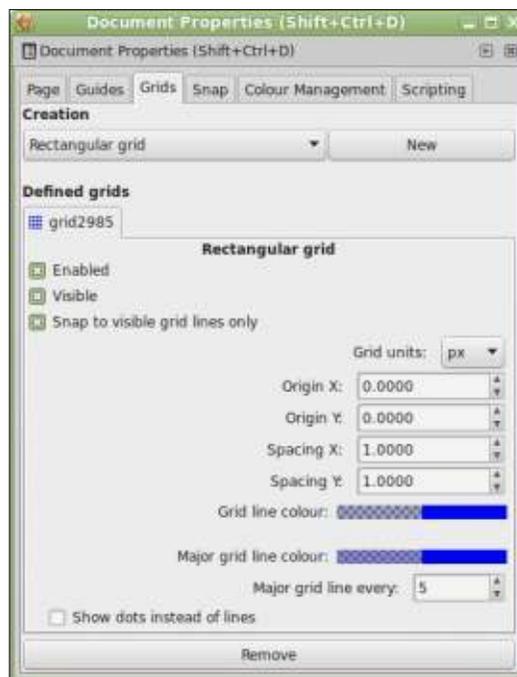


Over the past few instalments, I've detailed the workings of the Tiled Clones dialog. As well as producing some interesting, and often kaleidoscopic, visual effects, this dialog can be useful for creating particular arrangements of objects. Because the dialog's units are based on the bounding box of the parent object (rather than using explicitly stated dimensions), this approach isn't terribly useful for positioning objects at specific coordinates or locations, so the next few articles will look at the different tools Inkscape provides for these kinds of manipulations.

It's important to remember, however, that Inkscape is not a "computer aided design" (CAD) program, of the sort used by architects or engineers. If you want to create technical drawings that could be used by builders or manufacturing companies, there are other Open Source programs that might serve you better, such as FreeCAD, OpenSCAD, or QCAD. With each release, Inkscape gains more functionality in this area –

such as the new Measure tool in 0.91 – but it's still a long way from a fully fledged CAD application. With that limitation in mind, we'll start with the most obvious form of positioning: snapping to a grid.

Inkscape is rather flexible when it comes to grids. You can have more than one active at a time, and each one can be either rectangular (based on horizontal and vertical lines), or axonometric (vertical lines, plus two sets of angled lines). Usually, however, it's



easiest to work with just one grid at a time, most commonly a rectangular one. Launch Inkscape to create a new document, and, if there's no grid visible, try pressing "#" or use View > Grid to enable the display of the default grid. To edit this grid, or to add a new one, use the File > Document Properties menu, then select the Grids tab.

To create a new grid, select either Rectangular or Axonometric from the pop-up menu at the top, then click the New button. Each grid gets its own tab in the "Defined grids" section, with slightly different icons for the two grid types – but the icons are always blue, regardless of the color of your grid lines. They're named automatically, with no easy mechanism to change the name, and no distinction in naming between the two grid types. The use of similar, identically-colored icons and fixed, generic names means that managing numerous grids is less than straightforward, so it's best to stick with just one or two. The tab bar isn't scrollable –

the dialog just grows in size if you start to add too many; and there's also a practical limit imposed by the UI.

Each grid has three checkboxes that control snapping and visibility. These are in addition to the View > Grid option (toggled via the "#" key), so, for a grid to be visible, you need both of the top two checkboxes to be enabled and the View > Grid toggle to be on. Think of the toggle as a global way of showing and hiding all the possible grids at once, with the checkboxes being a way to more finely control what each individual grid contributes.

The first checkbox, "Enabled", simply switches the entire grid on and off. With it unchecked, the remaining options are all disabled and the grid plays no part in snapping or display. You might use this if you have multiple grids so that only one is switched on at a time – typically when swapping between rectangular and axonometric within the same drawing.



The second checkbox, “Visible”, has only a visual effect. With this unchecked, the grid will not be displayed, but can still play a part in snapping if the grid is enabled via the first checkbox. As it can be difficult and frustrating to snap to a grid you can't see, I strongly recommend always leaving this option checked.

The third checkbox, “Snap to visible grid lines only”, is slightly misleading with its labelling – though the tooltip is clearer. This checkbox concerns grid lines that are automatically suppressed as you zoom out. If you were to zoom out far enough, the grid lines would become so dense that they just appear as a solid colored background. Inkscape avoids this by hiding grid lines that would be drawn too densely, and would have been a hindrance rather than a help. With this option unchecked, you can still snap to these suppressed lines, but I recommend leaving it enabled so that you snap to only visible grid lines. This may require you to zoom in a little to get the precise snapping point you're looking for, but it's usually a good trade-off against the frustration of constantly mis-

snapping to invisible grid lines.

The remaining options in the dialog are used to define the displayed lines, and are fairly self-descriptive. You can position the origin of the grid – 0,0 is good for most drawings – and define the spacing between grid lines in both the x and y directions. As most people usually need a square grid it would be good to have an option to link these values, but it's no great hardship to simply enter the same value into each field. You can set the color, and opacity for the grid lines – it's usually best to keep the opacity low so that they are less dominant on the screen, and less likely to be mistaken for real lines in your drawing. By setting different colors or opacities for major and minor grid lines, you can create a “graph paper” effect. This becomes visible only when you're zoomed in closely enough, and, if you do decide to use this feature, it's best to make the major lines more opaque than the minor ones. Set the “Major grid line every” field to 0 if you want to disable this feature. Finally, the “Show dots instead of lines” checkbox does exactly what it describes, and results in a more lightweight view of the grid. Setting this option, or

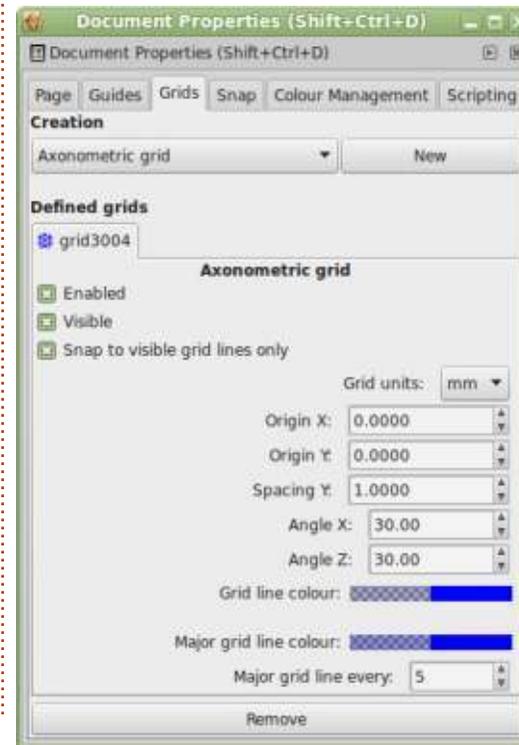
changing the line colors, can make it easier to work with multiple grids that are all active at the same time, should you need to.

The options for creating an axonometric grid are broadly similar to those for creating a rectangular one. There's only a single entry for spacing, and a couple of new fields for defining the angles of the x and z axes. The default values of 30° are fine for isometric drawings, though you might want to use 45° for an “oblique” projection. Setting either

of these too close to 0° or 90° results in rendering problems. Any value outside this range is capped, though that isn't reflected in the displayed number. Unfortunately, there's no “Show dots instead of lines” option for axonometric grids.

Also missing is the ability to create logarithmic or polar grids. Both are possible via extensions – though these create “real” SVG objects, rather than Inkscape grids, so they can't be toggled with the “#” key, and have to be snapped to via object snapping, not grid snapping. If you do have need of these grid types, however, you can find them under Extensions > Render. In 0.48, you're looking for the Cartesian Grid and Polar Grid entries, whereas in 0.91 they've both been moved into an extra “Grids” submenu. The image on the next page (top right) gives an example of grids produced using these extensions.

Going back to Inkscape's rectangular and axonometric grids, the setup we've done so far just lets you visually align objects. To really use them as layout tools, you'll also need to enable snapping. As with grids, there's a

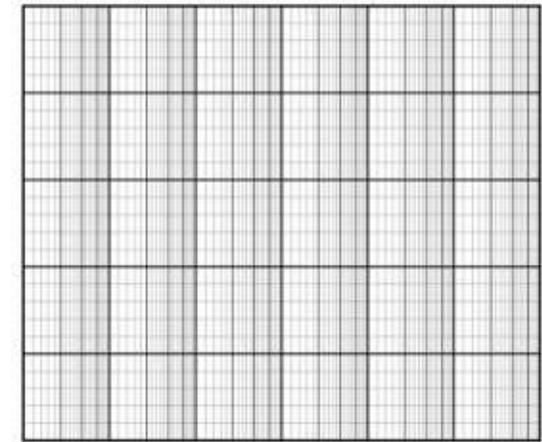
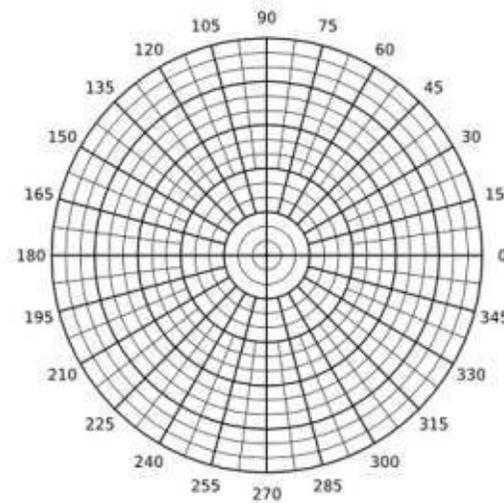
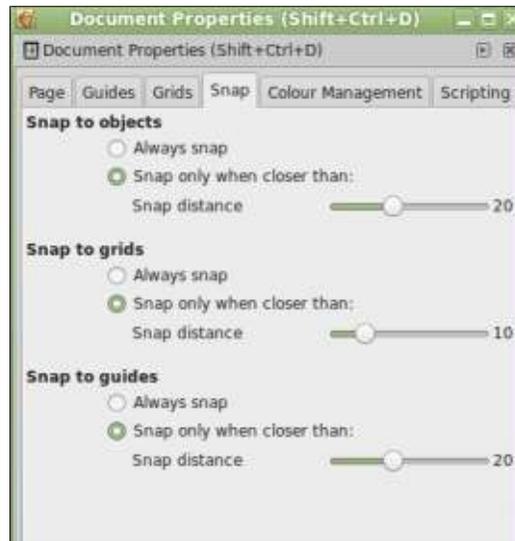


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global toggle for snapping: press the “%” key (Shift-5 on my keyboard) to trigger it, use the View > Snap menu entry, or click on the first icon on the Snap Controls Bar (button 1 in the screenshot below).

With snapping enabled, you also need to have either button 2 or 3 (or both) enabled. These dictate what parts of your drawing can be snapped: button 2 enables the snapping of bounding box corners, and kicks in when you resize or move an object using the Select tool; button 3 enables the snapping of nodes and handles, so has an effect when you initially draw an object, or subsequently edit it using the appropriate object-specific tool. Enabling either button makes a few others available that you can use to enable more specific snappings – such as snapping the center point of a bounding box, rather than just its corners – but most of the time I find that one of the main two buttons is good enough.

As well as defining which parts of an object should snap, we also have to tell Inkscape what we want them to snap to. Button 4 enables snapping to the grid. The button after it enables snapping to guidelines (covered in Part 16 of this series) – I usually leave this enabled as it has no effect unless you specifically add some guidelines, in which case you probably want it switched on anyway. The other button in this section enables snapping to the page border, which I find to be less useful for my own projects.



There's one final setting to look at (shown left) regarding snapping, so it's back to File > Document Properties, but this time select the Snap tab.

Within this panel, you can set how voracious Inkscape is in its efforts to snap. For each section, the “Always snap” option means exactly that: snap to the nearest snapping point, regardless of how far away it might be. This is useful if you absolutely have to draw to the grid to ensure dimensional accuracy. More generally, however,

“Snap only when closer than” offers a good trade-off between accuracy and freedom. With this mode enabled, you can freely place your objects, nodes and handles, unless they get close to a snapping point, in which case they will jump to that location. Exactly how close is set by the “Snap distance” slider. The values are measured in screen pixels, so zooming has an effect on the effective “hit area” in which snapping occurs: zoom in to give yourself more freedom, or zoom out to make snapping more likely.

Within File > Inkscape Preferences (Edit > Preferences in 0.91), there are “Grids” and “Snapping” panels that offer a few other options. The defaults are usually fine for most users, but if



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you find yourself heavily using grids or snapping, it might be worth taking a look to see if any of these settings can improve your workflow.

With a grid visible and snapping enabled, you should find it quite easy to create shapes that stick to the grid intersections. When you need to place nodes off the grid, you can either press the “%” to disable snapping (whilst leaving the grid visible), or more easily (on a US or UK keyboard, at least) you can press “#” to turn the grid off entirely, removing it as a snap target. Often, however, there's a requirement to place objects relative to one another, rather than to an absolute grid; that will be the subject of the next instalment...

NEW SPECIAL EDITIONS PAGE



It's not perfect, by any stretch of the imagination, but this new page on the site links to the most popular Special Edition topics. As of writing there are links to GIMP, Inkscape, LibreOffice, Python and Scribus Special Editions.

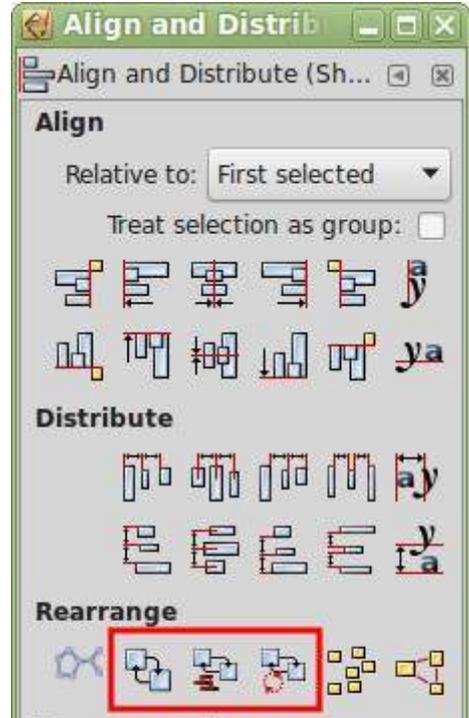
<http://fullcirclemagazine.org/special-editions/>



Mark uses Inkscape to create three webcomics, 'The Greys', 'Monsters, Inked' and 'Elvie', which can all be found at <http://www.peppertop.com/>



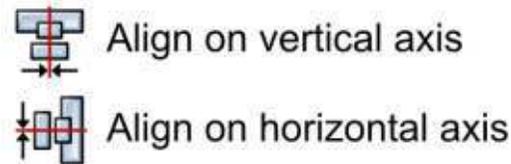
One common requirement when creating vector drawings is to align objects relative to one another. You might want a circle that's centered within a square, or a triangle that touches the top of the page. A related requirement is to distribute several objects evenly, with identical gaps between each of them. These types of arrangements are made easy with Inkscape's Align and Distribute dialog.



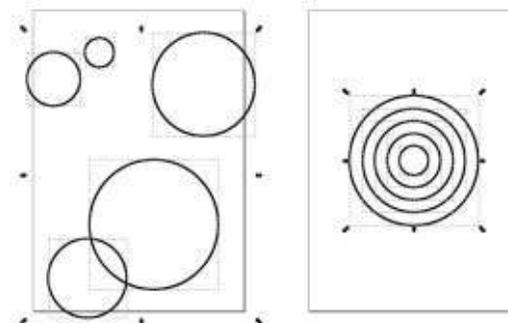
This dialog can be opened via the Object menu, the icon to the right of the main "Commands" toolbar, or by pressing CTRL-SHIFT-A. The screenshot was taken from version 0.91 and has a few minor differences to the 0.48 version that's still in many distributions' repositories: the buttons I've outlined in red are new to 0.91, and a few of the other icons have moved to new positions. For this article, I'll be concentrating on the Align section at the top of the dialog, which hasn't significantly changed between versions.

Let's start with an extremely simple alignment task: to center a circle in the middle of a page. Start by drawing a circle anywhere in the workspace – it doesn't even have to be inside the page. Now, with the circle selected, open the Align and Distribute dialog and select "Page" from the "Relative to" pop-up menu. There's no option to center both horizontally and vertically at once, so you have to click the "Center on vertical axis" button first, followed by the "Center on horizontal axis" button

afterwards (or vice versa, if you prefer). These buttons can be found, one above the other, in the two rows of icons within the "Align" section of the dialog.

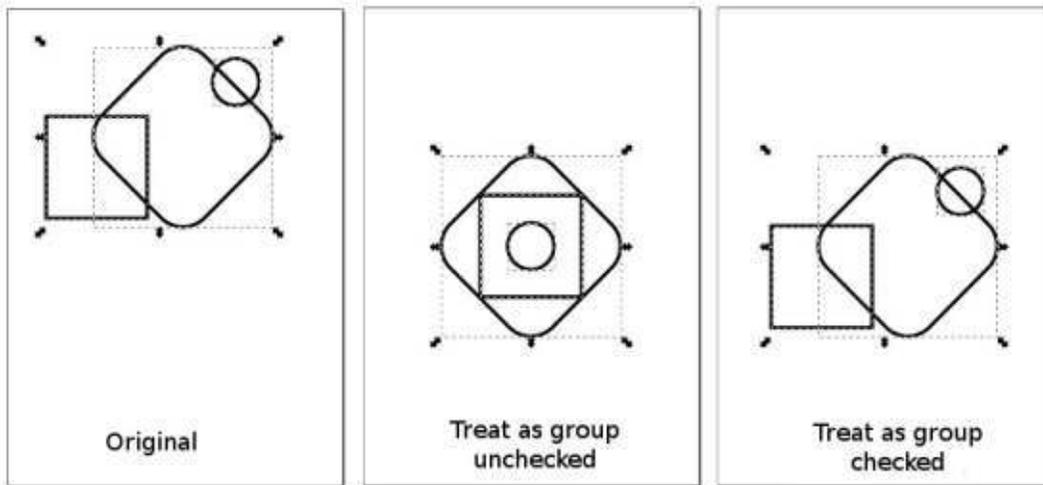


That was pretty straightforward, right? Now create three or four circles of different sizes, each with a stroke but no fill. Select them all and repeat the previous steps. If all went well you should now have a series of concentric circles all centered on the page. This example image shows the "before" and "after" arrangement of some circles that were centered in this way:



It's important to understand that you can align more than one object at the same time. Usually this reduces the number of steps you need to perform, but sometimes it can be confusing when an inadvertently selected object disappears behind a larger shape that you're trying to align. When dealing with multiple objects, you sometimes want to center the whole arrangement, whilst keeping the individual elements in the same relative positions. One approach is to group them all first: the buttons in the dialog will align the group, but won't descend into it to affect the individual elements. The same effect can be achieved by enabling the "Treat selection as group" checkbox in the dialog before you click on the alignment buttons, saving you the trouble of grouping and then un-grouping your objects (see illustration on following page, top left).

With "Treat selection as group" unchecked, let's take a look at some other possibilities. On either side of the two centering buttons



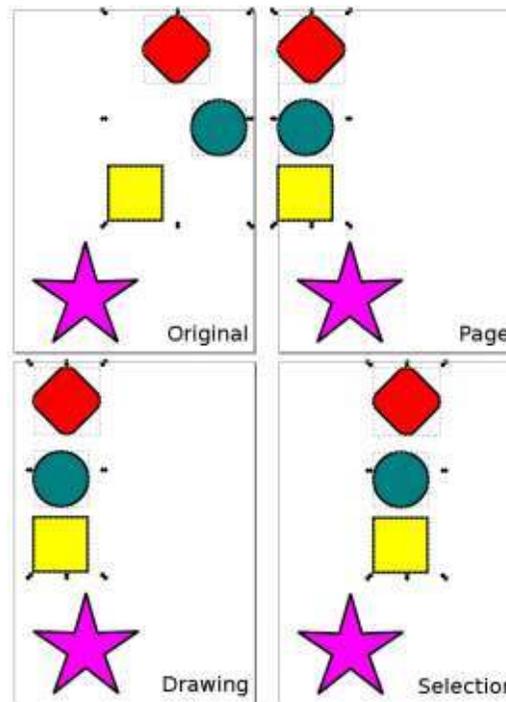
you'll find buttons for aligning the top, bottom, left or right edges of your objects. In practice, this refers to the edge of the bounding box for the objects – either the visual or the geometric bounding box, depending on how your Inkscape preferences are set. Most of the time this distinction isn't important, but it can drastically alter the results when a filter is applied to your objects and the visual bounding box is in use.

So far, we've only aligned things relative to the page. Using the pop-up menu you can select various other options. For now we'll look at "Drawing" and "Selection Area" (just "Selection" in 0.48). "Drawing" refers to an imaginary bounding box that encompasses everything you've

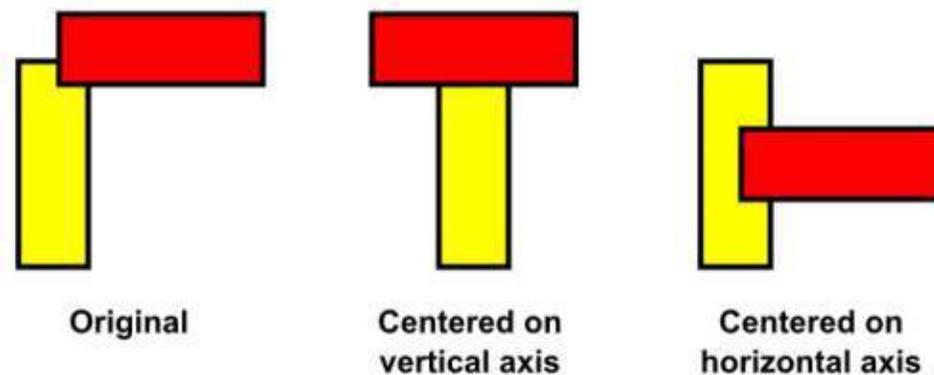
drawn in your image, whether it's inside or outside the page boundary. It stretches from the left edge of the leftmost object in your drawing to the right edge of the rightmost object, and the equivalent in height. "Selection", on the other hand, just refers to the bounding box that encompasses all of the currently selected objects.

In this example, I've created a few objects and selected all of them except for the purple star. Notice the difference as I use the "Align left edges" button, first with the page, then the drawing and finally the selection.

As well as aligning to the page, drawing or selection bounding boxes, objects can also be aligned



relative to one another. To do this you need to select at least two objects: one of them will remain anchored in its original position, and all the other objects will be aligned to it. Inkscape offers four options for choosing which of the



objects will be anchored: the first object you selected, the last one, the biggest object or the smallest.

Of these choices I recommend using only First Selected and Last Selected. They make it easy to determine what's going to move, and what isn't. When trying to align objects, you've usually got a good idea of the outcome you're trying to achieve, so being able to specify exactly which object is used as the anchor for alignment is more useful than some unclear definition of "bigger" or "smaller".

For example, suppose you have a rectangle that you duplicate and rotate through 90°. Which of the two is "bigger" and will be used as the anchor? They're both exactly the same area, but one is wider and the other is taller. The answer depends on what type of

alignment you choose: the buttons on the top row, which move the objects horizontally, consider the object with the largest width to be the “biggest”; the buttons on the second row, which move the objects vertically, consider the tallest object to be the “biggest”. In this example the red rectangle is a rotated copy of the yellow one, and the alignment mode was set to “Biggest object” before each of the centering buttons was pressed.

Clearly the use of “Biggest object” and “Smallest object” can cause problems and confusion if multiple objects are the same size, but it can also be misleading when an optical illusion leads you to think that (for example) a dark object is bigger than a similarly sized light object. There's a similar problem when selecting multiple objects at once, then using “First selected” or “Last selected” (Inkscape bases its choice of anchor on the z-index of the items in that case), leading to my rules for aligning objects relative to each other:

- Use “First selected”.
- De-select everything (click in the work area, away from any objects – or use Edit > Deselect).
- Select the object you want to

align to (the anchor).

- Hold shift and drag a rectangle over the objects you want to align.
- Add or remove individual objects from the selection by holding SHIFT as you click on them.
- Click on one alignment button from the top row and/or one alignment button from the second row to move the objects into place.

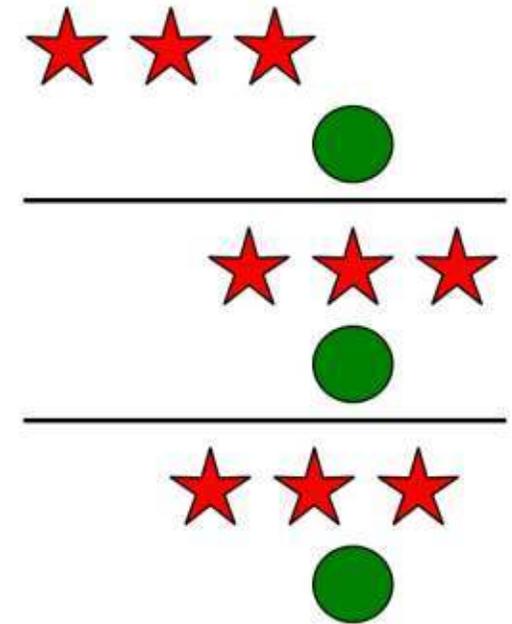
With that approach you'll always be in control of which objects are moved, and where they move to. The only variation that I ever use is when the objects I want to move are already selected – especially if it's a complex selection. In that case it's worth using “Last selected” and just holding SHIFT whilst clicking on the anchor object to add it to the selection. If the anchor is already selected, you can SHIFT-click to de-select it, then do the same again to re-select it, thus making it the last selected object.

When using First/Last/Biggest/Smallest you should note that the behaviour of the “Treat selection as group” checkbox changes somewhat – often in a counter-intuitive way. In these modes, the anchor object has to be part of the group, so you might

expect it to move along with everything else in order to maintain the relative positions of objects (as we saw when using the Page/Drawing/Selection modes). What actually happens, however, is that the anchor object remains stationary and all the other selected objects move as though they're grouped. In other words it becomes a “treat selection as group, except for the anchor object” checkbox.

Furthermore, the effect of this checkbox changes depending on the layout of your objects. In this example, I've drawn three red stars and one green circle, arranged per the top image. Using “First selected” mode I click on the circle, then hold SHIFT and drag a rectangle over the stars. Ensuring that “Treat selection as group” is checked, a click on the “Center on vertical axis” button should move the stars, keeping the circle in place. Logic might suggest that I'll end up with the second image, but actually what I get is the third one. What's going on?

It's our old friend the bounding box at play once more. Consider the bounding box of the first image – it's the total width of the



stars plus the circle. When centering the selection, it's this bounding box that's used for the calculation, even though the circle won't be moved with the other objects. The result is that the stars are moved so that the center of the original bounding box is centered with the circle, even though doing so results in a smaller bounding box afterwards.

There are two solutions to this dilemma: the most obvious is to group the stars then align the group to the circle with the “Treat selection as group” checkbox unticked. This turns a complex

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arrangement of four objects into a simpler problem involving just two – the circle and the group. It's the approach I used to produce the second image in the example. The other alternative is to click the "Center on vertical axis" button a second time: after the first press, the new bounding box is only as wide as the stars, so aligning again (with the checkbox enabled) results in the expected behaviour.

With everything you've read so far, you should be able to understand the behaviour of most of the alignment buttons in the dialog, but there are two that defy the rules: the last button on each row is purely used to align text objects.



These buttons align text objects to the vertical or horizontal baseline of other text objects. They ignore any non-text objects in the selection, pay no attention to the state of the "Treat as group" checkbox, and don't even honour the "Relative to" pop-up. If you're using Inkscape for some simple desktop publishing work – perhaps creating a poster or flyer – then they can be used to ensure that different sections of text adhere to the same baseline (the line that runs under the text, ignoring any descenders such as the tail on a "y"). This can give a more professional appearance. An alternative approach is to drag out a guide from the ruler (see part 16), enable snapping, and activate the "Snap text anchors and baselines" option. Regardless of your method, if you use multi-line text, then it's only the baseline of the first line that is snapped or aligned to, preventing completely separate pieces of text from easily sharing the same "baseline grid" as you might in a proper DTP program such as Scribus.

Perhaps the most important thing to remember about aligning in Inkscape is that, however you

align your objects, if you end up with an alignment you're not happy with, simply press CTRL-Z or use Edit > Undo to reverse the action. There's logic to alignment in Inkscape – even if that logic doesn't always produce the outcome you might initially expect.



Mark uses Inkscape to create three webcomics, 'The Greys', 'Monsters, Inked' and 'Elvie', which can all be found at <http://www.peppertop.com/>

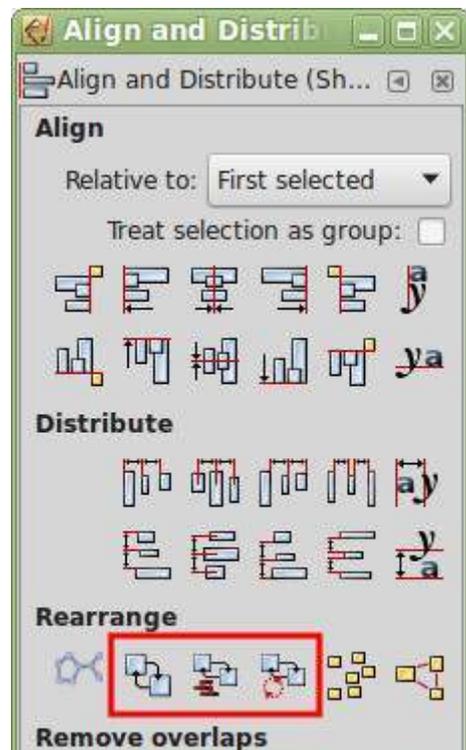


HOW-TO

Written by Mark Crutch

Inkscape - Part 39

Last time I introduced the Align and Distribute dialog, but went only as far as describing the Align part. This time I'll continue – not only onto the Distribute section, but down through the remaining sections of the dialog as well. Let's start with a reminder of what the dialog looks like, noting that there's been a little rearrangement of the buttons between 0.48 and 0.91, and the ones outlined in red are new to 0.91.



Much like the Align section, the Distribute part of the dialog is split into two rows of buttons, governing horizontal and vertical distribution, respectively. Using these, you can distribute a number of objects so that they're spaced evenly along the horizontal axis or the vertical axis. If you want to distribute along both axes – to create a staircase effect – you'll need to press a button from each row in turn.

As you might expect, the objects to be distributed are the ones that are selected on the canvas. Selection order doesn't matter, and you can't choose the anchor objects: everything is calculated implicitly from the positions of the elements. When distributing horizontally, for example, the objects furthest to the left and right will be left in place, with all the others being distributed between them. For vertical distribution, the rules are the same, except with the highest and lowest (by y coordinates) being left in place.

What this means, in practice, is that you need to get your first and last objects into the right place before trying to use these buttons. Often that involves snapping to the grid, or aligning to another object as described last time. Only once those are in the right locations should you select all the objects you want to distribute – including the first and last ones – and then click on one of the buttons.

The difference between each of the buttons is quite well represented by their icons. Considering each of the five buttons in the first row (I'm sure you can infer the equivalent functions for the second row), the buttons move your selected objects so that:

- The left edges of their bounding boxes are evenly distributed
- The centers of their bounding boxes are evenly distributed
- The right edges of their bounding boxes are evenly distributed
- The space between each bounding box is evenly distributed

- The space between baseline anchors of text objects is evenly distributed

That last one probably needs a little more explanation. Much like the text alignment buttons mentioned in the previous instalment, these two text distribution buttons work only with a selection of text objects. When you edit text in Inkscape, you may notice a small square below the text you enter. This is the baseline anchor, and its position varies depending on the text justification. These buttons move your text objects so that the baseline anchors are evenly distributed. Before rushing to use these buttons to distribute your text, however, do consider whether that's really what you want: usually the previous button (even spaces between objects) gives a better result.

Often you'll find that the difference between distribution options is negligible, especially when the objects are all similarly sized. When you start to distribute



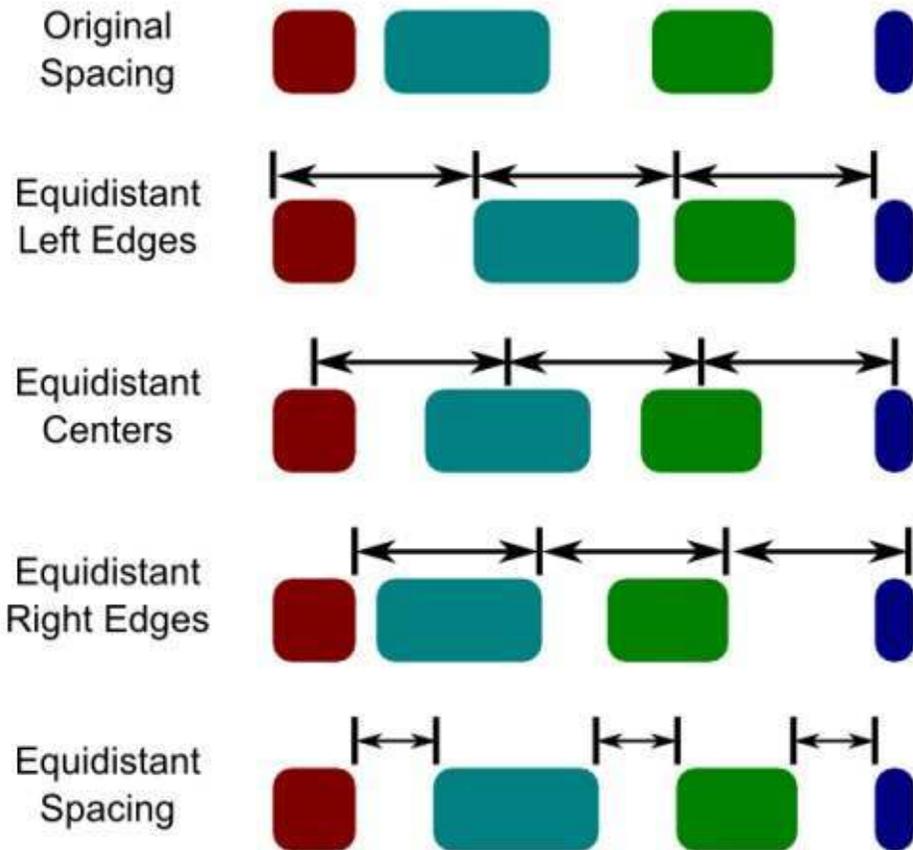
differently sized elements, however, the differences can be significant, as you can see from the image shown below.

Continuing downwards, the layout of the dialog diverges between versions 0.48 and 0.91. For the latter, the next section of the dialog is labelled as “Rearrange”, and consists of six icons of varying provenance:

- Arrange Connector Network:

Moved from the “Connector network layout” section in 0.48

- Exchange positions, selection order: New to 0.91
- Exchange positions, stacking order: New to 0.91
- Exchange positions, clockwise rotate: New to 0.91
- Randomise centers: Moved from the “Distribute” section in 0.48
- Unclump objects: Moved from the “Distribute” section in 0.48



The first of these works only if your selected objects form a network that was created with the Connector tool (see part 27 of this series for more details). It's just a duplicate of the same button in the Connector tool controls – except that this one offers fewer settings. My advice is to use the dedicated connector toolbar if you need this functionality, but really you're better off using a different application altogether for anything more than a trivial connector layout.

Have you ever wanted to swap the positions of two objects? To move the left one to the right, and the right one to the left, for example? In that case the three new buttons in 0.91 are for you. With two objects selected, their positions will be swapped, but if you have more than two things selected then the first moves to the position of the second, the second to the third, the third to the fourth, and so on. The last moves to the position of the first.

But what determines which object is first, second or third? That's simply down to which button you click. The first button bases it on which order the objects

were selected in – so it's best to hold shift and click on each one individually to ensure you know the selection order. The second button uses the stacking order, or z-index, of the selected objects. The one on top is moved to the position of the one beneath it. That moves to the position of the one beneath that, and so on down the stack. The bottom object is moved to the position of the topmost item. Note, however, that it's just the positions that are changed, not the z-indexes, so the stacking order remains the same. The final button swaps the positions of the selected objects in a “clockwise” direction, based on the x and y coordinates of each object.

Whilst these buttons are a welcome addition, I hope that their functionality will be expanded further in a future release. There's no option to reverse the order, for example. If you want to rotate 100 objects one step anti-clockwise you currently have to do it by clicking the clockwise button 99 times!

The “Randomise centers” button does exactly as its name suggests. Click it and your selected

objects are randomly moved around. This may be useful if you've used the Spray tool or Tiled Clones dialog to create a lot of objects that you then want to randomly distribute – but the same effect can often be better achieved by using the Randomise fields in the Tiled Clones dialog, or with the Tweak tool (see part 22).

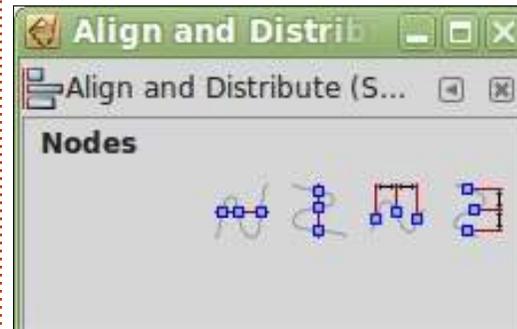
The final button in this section is described as “Unclump objects”. In practice, it moves your objects a little in order to more evenly space the edge-to-edge distances. You can apply it repeatedly, but it will eventually reach equilibrium. It can be useful for neatly arranging objects in two dimensions – think of it as a 2D equivalent to the “equidistant spacing” buttons in the Distribute section. Be careful if your objects overlap too much, as it can tend to pull them all together into a single pile rather than separating them out – the exact opposite of “unclumping” in my book!

In fact, separating objects out is really the job of the last section in this dialog: Remove overlaps. The spinboxes allow you to specify the minimum distance between bounding boxes in both horizontal

and vertical directions, whilst clicking the button at the right will actually perform the operation. You can use the H and V parameters to push your objects further apart by setting them to values greater than 0 (in pixels). You can also enter negative values, but doing so won't pull your objects closer together: because this is the minimum spacing, it simply means that already overlapping objects can continue to overlap to some degree. Do note that the calculations are based on the rectangular bounding boxes, though, so if you're working with objects such as circles you can sometimes find that their movements aren't what you expected. Take a look at the bounding boxes to see what really happened.

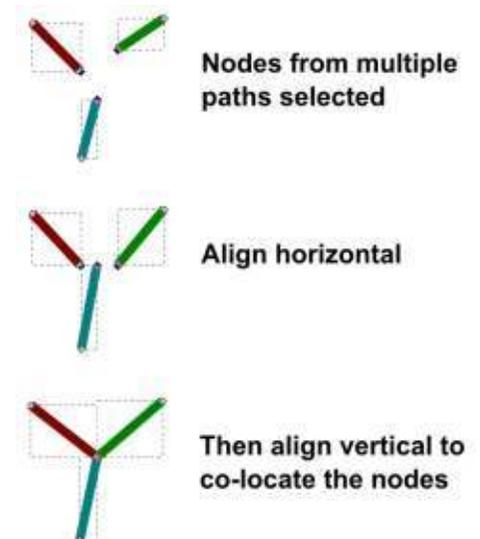
If you look again at the screenshot of this dialog, you might be forgiven for thinking that I've covered all of it, but that's only because you've been misled by a slight oddity in this dialog. On first opening it, there's a section at the bottom labelled “Nodes”, with four additional buttons – as seen in last month's screenshot. As you start to select objects, however, that section disappears from sight. In

practice, it's still available, but only when you switch to the Node tool in the main toolbar. On doing so, the dialog changes completely to just show this:



To use this mode, you must first select some nodes using the Node tool. You can even select nodes from multiple different paths, if you wish. Clicking on the first button will align the nodes along a single horizontal line that lies halfway between the top and bottom of the nodes' bounding box. The second button does the same trick along the vertical axis. There's no option to align to the top, bottom, left or right of the box, nor to the first node selected. If you need a specific alignment then the best approach is to set a guide at the right place, align horizontally or vertically, then drag the still selected nodes to the guide, preferably with snapping enabled.

Clicking both of the alignment buttons in succession is a quick way to collapse all the nodes down to a single point, and can be particularly useful for ensuring that nodes from different paths are co-located, such as when trying to fake the appearance of a connection between more than two paths at a single point. Unfortunately all the selected nodes move, with no option to use one as an anchor point, so, whilst it's a quick way to co-locate them, it's not so useful if you need them at a specific position. It's also important to note that this is just a visual effect – there's no native support for co-located nodes in SVG – so you have to take care to select all the relevant nodes if you need to move them later.



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The last two buttons in Node mode distribute the selected nodes evenly. Like the equivalent tool for objects, they are distributed between the nodes that are positioned furthest to the left and right (or top and bottom for vertical distribution).

That concludes our tour of the Align and Distribute dialog. It may not offer all the options of a fully-fledged CAD application, but once you get used to the features it does have, it can quickly become an invaluable addition to your toolbox. If you want to produce good looking diagrams with evenly spaced, neatly-aligned content, it's well worth spending a little time becoming familiar with its capabilities.



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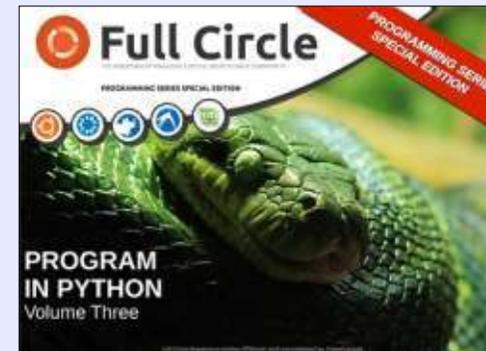
PYTHON SPECIAL EDITIONS:



<http://fullcirclemagazine.org/issue-py01/>



<http://fullcirclemagazine.org/issue-py02/>



<http://fullcirclemagazine.org/python-special-edition-issue-three/>



<http://fullcirclemagazine.org/python-special-edition-volume-four/>



<http://fullcirclemagazine.org/python-special-edition-volume-five/>



<http://fullcirclemagazine.org/python-special-edition-volume-six/>



To celebrate the incredible achievement of 100 editions of Full Circle Magazine, I'm going to take a break from the usual tutorial format, and instead list 100 useful tips for working with Inkscape. Some of these have previously been mentioned in this series, others have yet to be covered – whilst there are a few that would probably never have seen the light of day if it wasn't for this celebratory change of style.

INSTALLING INKSCAPE

1. The easiest way to get Inkscape onto a Linux machine is simply to install it from your distro's repositories. This may still get you version 0.48.x, but for most people, that's probably good enough to work with until your next major distribution upgrade.
2. The version after 0.48.x is 0.91 – there was a jump in version number to give a better indication of how well developed the program is. If you want to get 0.91 onto an older Debian or Ubuntu based distro, your best bet is to

install from the Inkscape Developer's PPA: <https://launchpad.net/~inkscape.dev/+archive/ubuntu/stable>

3. If you need to use Inkscape on a Mac, make sure you check out the official FAQ first as the need for XQuartz on OSX throws up a few issues.
4. If you usually use a laptop you might be tempted to try using the trackpad with Inkscape. Whilst you might get away with it for small creations or edits, for any serious work with Inkscape you really need a mouse with at least two buttons and a clickable scroll wheel.
5. Equally you might think that a graphics tablet would be a good purchase, but you really should try before you buy. Whilst a tablet can be a real boon for some graphics programs, such as GIMP, Krita or MyPaint, the vector nature of Inkscape makes a tablet far less useful than you might expect. For some calligraphic styles it may work well, but if you just want to draw something freehand it's

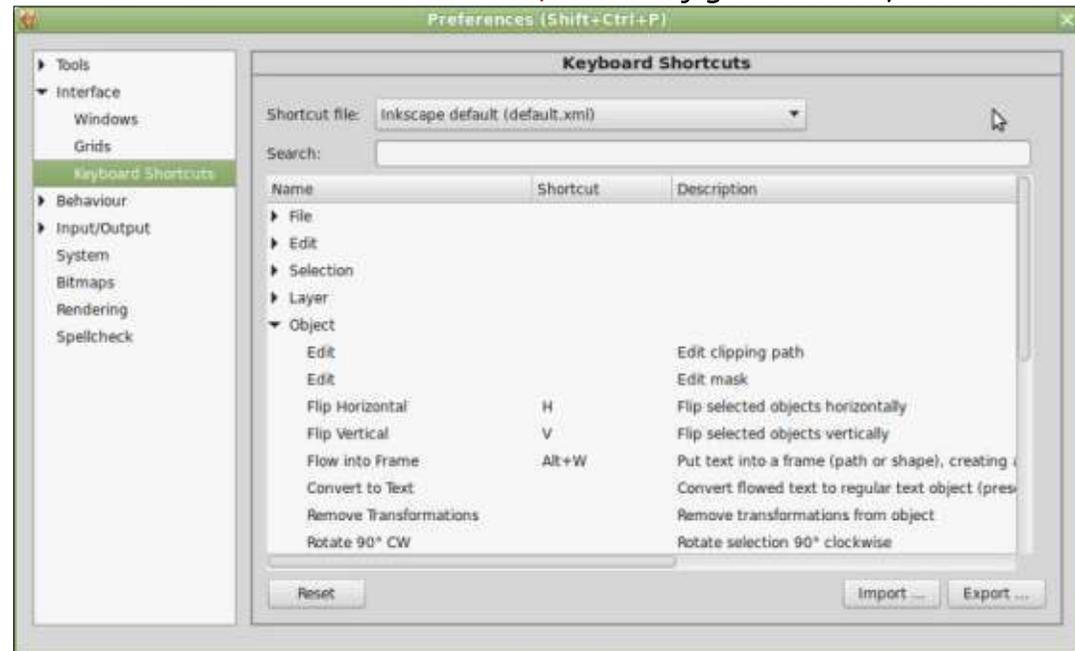
probably easier to use a pencil and paper, then scan your work and trace over it manually.

6. Another one for laptop users: Inkscape's easier to use with a full-sized keyboard. Some of the keyboard shortcuts use the numeric keypad, making them rather inconvenient on a cut-down keyboard.
7. That said, version 0.91 does allow you to configure the keyboard shortcuts much more easily than earlier releases, so,

with a bit of work, you might be able to get away with a smaller keyboard. Head to Edit > Preferences > Interface > Keyboard Shortcuts, then click on the shortcut you want to change and press the new key combination you want to use.

THE BASICS

8. Keep an eye on the status bar! This is perhaps the most important tip for using Inkscape, as it not only tells you what you've currently got selected, but also



offers details about the various keyboard modifiers you can use with each tool.

9. Use the context menus on the status bar widgets for fast access to some commonly used options and defaults.

10. The spinboxes on the tool control bar also have useful context menus. Unfortunately the spinboxes inside dialogs tend to be less useful.

11. In 0.91 you can do simple arithmetic inside spinboxes, saving you from having to perform the calculations elsewhere and copy

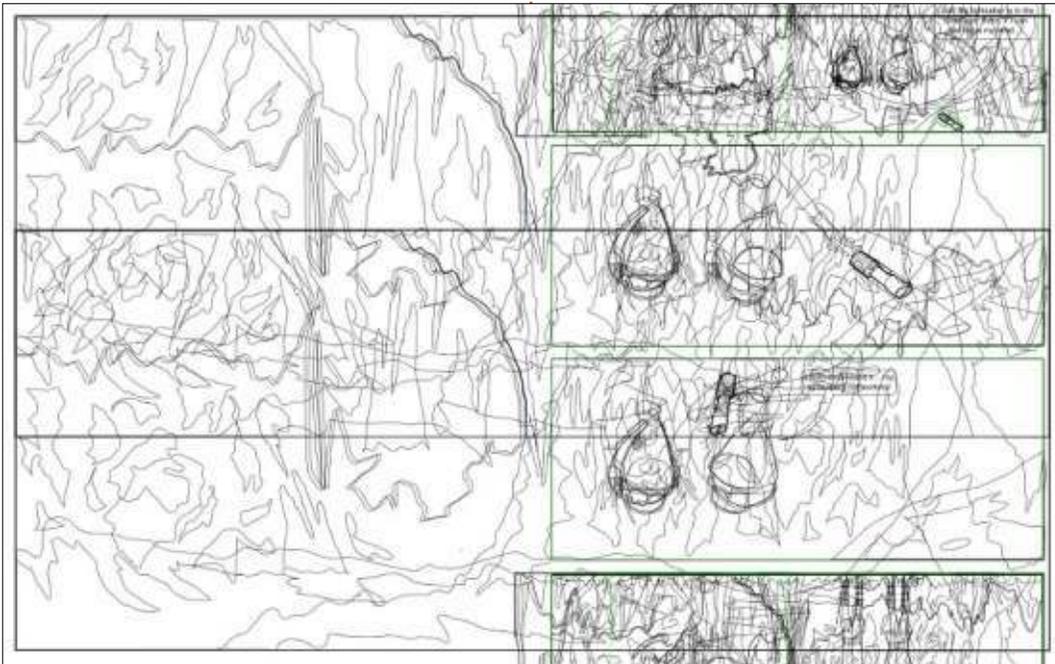
the results in.

12. Can't see an object when you draw it? Start by checking the following:

- That your fill and/or stroke both have a color, and aren't transparent.
- That your stroke has some thickness to it.
- That your layer is opaque.

View with filters off (see the "Filters" section), in case you've blurred it away to nothingness.

- Is it a circle or arc? Make sure the arc handles are far enough apart.
- Check the object dimensions – perhaps it's just very, very small.



This can happen if you accidentally release the mouse button whilst dragging.

- Did you draw it inside an already clipped group?

13. If you've lost your object entirely, use View > Display Mode > Outline to see everything, even transparent objects, as simple outlines.

14. Use the area outside the page boundary. Objects placed here won't appear on screen if your SVG is loaded into a web browser, and it's easy to omit them when exporting to a PNG, so this is a good place to keep temporary notes, copies of objects that you might need again, or just to use as a scratch-pad. I find it to be a great place to hide the Easter Eggs in my comics!

KEYBOARD SHORTCUTS

15. The keyboard shortcut preferences of 0.91 offer a useful way to view the existing shortcuts. For a more comprehensive overview, or for 0.48 users, use the reference document here: <https://inkscape.org/en/doc/keys.html> – it's from version 0.46, but

almost everything still applies to the more recent versions.

16. If you're using Linux and finding that the whole window moves when you try to ALT-drag an object, try holding the Windows key down as well.

17. Don't work at full-screen size. Reduce the size of the window to speed up redraws, especially when using filters. Undock dialogs to make this more practical.

18. Selecting an object also switches the active layer – use this as a quick way to draw something on the same layer as an existing object.

19. Use the CTRL key to "control" your movements:

- When drawing, to keep to integer ratios. This is the easiest way to draw circles and squares.
- When moving objects or nodes, to only move horizontally or vertically.
- When rotating or skewing, to only move by fixed amounts, as set in the preferences.
- When scaling, to scale proportionally.
- CTRL + drag up/down using the star/polygon tool to get properly

aligned shapes.

- Use CTRL+Mouse Wheel to quickly zoom in and out, regardless of which tool is currently selected.

20. If you really want fine control of the zoom level, use the input field at the far right of the status bar.

21. Press and hold Q to quickly zoom any selected objects to fill the window. With the object zoomed, focus a different window or dialog and release the Q key to “fix” the zoom at that level. Once back in the main window, make the edits you need to, then just tap the Q key to zoom back out again.

22. Use a middle-click (on the mouse wheel) to pan. Combined with the zooming tips above, this will help you navigate around your canvas in record time!

23. Press the spacebar to quickly toggle modes from your current tool to the selection tool and back. Be careful on 0.91, though, where the default “spacebar activates pan” setting interferes with this unless your mouse is absolutely stationary.

24. Whilst dragging an object

around, press the spacebar to stamp a copy of it. Unfortunately 0.91's pan setting also interferes with this. Again, make sure the mouse is stationary first.

25. Use the cursor keys to move selected objects around. Hold ALT to move by smaller amounts. Most usefully, hold SHIFT to move in steps that are independent of your zoom level. This means you can move an object “out of the way”, then zoom in to tweak it, before moving it back by the same amount, knowing it will end up in its original position.

26. Use the “<” and “>” keys to scale objects, or “[” and “]” to rotate them. Hold ALT to scale or rotate by a smaller amount.

GUIDES

27. Create guides by dragging from the rulers. Drag from the ends of the rulers, for a guide angled at 45°.

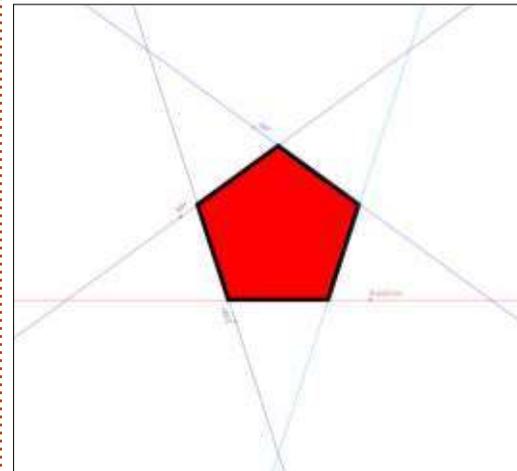
28. Move a guide by dragging it with the mouse. Rotate it by holding SHIFT while dragging.

29. Double-click on a guide to

bring up a dialog that lets you make fine adjustments.

30. Delete guides using this dialog, or by simply moving the mouse over the guide until it changes color, then pressing the delete key. There's also an Edit > Delete all Guides menu on 0.91.

310 With 0.91 you can change the color of a guide, and even give it a label.



32 You can quickly show and hide all guides using the “|” key.

33. You can also create guides from objects by selecting the object then using the Object > Objects to Guides menu entry. This doesn't delete the original object and is especially useful if you need

to match an odd angle in your design.

34. Edit > Guides Around Page does the same for the page outline, putting the guide origins at the four corners. This is handy if you want to create a background rectangle that exactly matches the page size: just enable snapping to guides and off you go.

GRIDS & SNAPPING

35. You can create multiple grids via File > Document Properties > Grids. They can be either rectangular or axonometric (angled, allowing for isometric and oblique grids). If you need polar or logarithmic grids, however, you'll have to fake it using the options in the Extensions menu.

36. You can show or hide the currently active grid(s) by pressing the “#” key. When the grid is hidden it isn't used for snapping.

37. If you do want to turn off snapping entirely, you can toggle it with the “%” key.

38. Don't enable too many snapping options at once: it makes

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it tricky to draw as the image becomes more complex and full of potential snap points.

39. Use File > Document Properties > Snap to adjust how fiercely snapping is applied. With 0.91 there are also a few extra checkboxes to allow for snapping to clipping and masking paths, without you having to release them first.

PATHS

40. Get familiar with paths. They're the basic unit of construction in Inkscape – just about any other object can be converted to a path via the Path > Object to Path or Path > Stroke to Path menu options. Remember that this is a one-way conversion, so keep a copy if you'll need to edit the original.

41. When drawing paths with the Bézier tool, use single clicks to roughly outline the shape you want with individual nodes, then adjust the curves afterwards. It's a lot easier than trying to drag each point to bend the path as you go along.

42. Use Boolean operations to

construct complex shapes out of simpler ones.

43. Can't bend a path? One or both of the handles missing? Holding SHIFT will let you drag the handle out of the node. If you still can't bend it, check that you don't have the Spiro live path effect present (Path > Path Effect Editor), as this significantly affects the way that paths can be manipulated.

44. You can select multiple nodes by dragging a selection rectangle over them, by SHIFT-clicking on individual nodes – or a combination of both. You can also select nodes from more than one path at a time, which can sometimes be invaluable.

45. Click a path segment to select the nodes at either end. SHIFT-click path segments to add pairs of nodes to your selection.

46. Select the nodes at the end of a path segment then press the INSERT key, or SHIFT-I, to create a new node in the middle. The original nodes and the new ones all remain selected, so you can press INSERT multiple times to quickly create a large number of new nodes.

47. You can rotate node selections using the “[” and “]” keys. Hover over a node – even one that's not selected – to use it as the center of rotation. If you want to rotate about the center of the selected nodes, make sure your mouse pointer is not hovering over any other node.

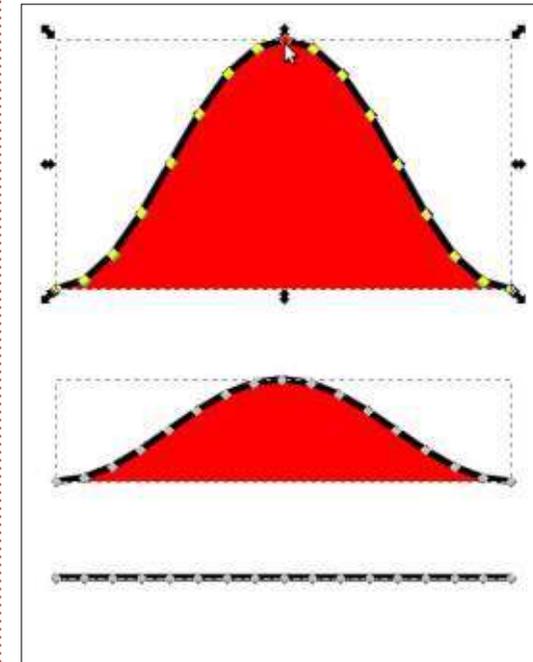
48. The “<” and “>” keys also work on node selections.

49. For a different take on rotating and scaling node selections, enable the “Show transformation handles for selected nodes” button on the tool control bar. This will give you handles like those of the selection tool, but applying to the selected nodes rather than whole objects. Just like the selection handles, clicking an already selected node will toggle between the scale mode and rotate & skew.

50. Hold CTRL-ALT when moving a node to move it along the path itself. Unfortunately it works with only straight path segments, but does work with multiple nodes selected – they'll all move in the same direction as the one you're dragging. This is great for changing

the size of a path without affecting its angles.

51. With multiple nodes selected, hold ALT when dragging one of them and the others will move by a proportional amount, based on their proximity to the node you're moving. This can best be seen by putting lots of nodes on a path, selecting all of them, then ALT-dragging a node near the center.



CLIPPING AND MASKING

52. Use clipping to constrain an object or group to the shape of a clipping path, with a hard edge.

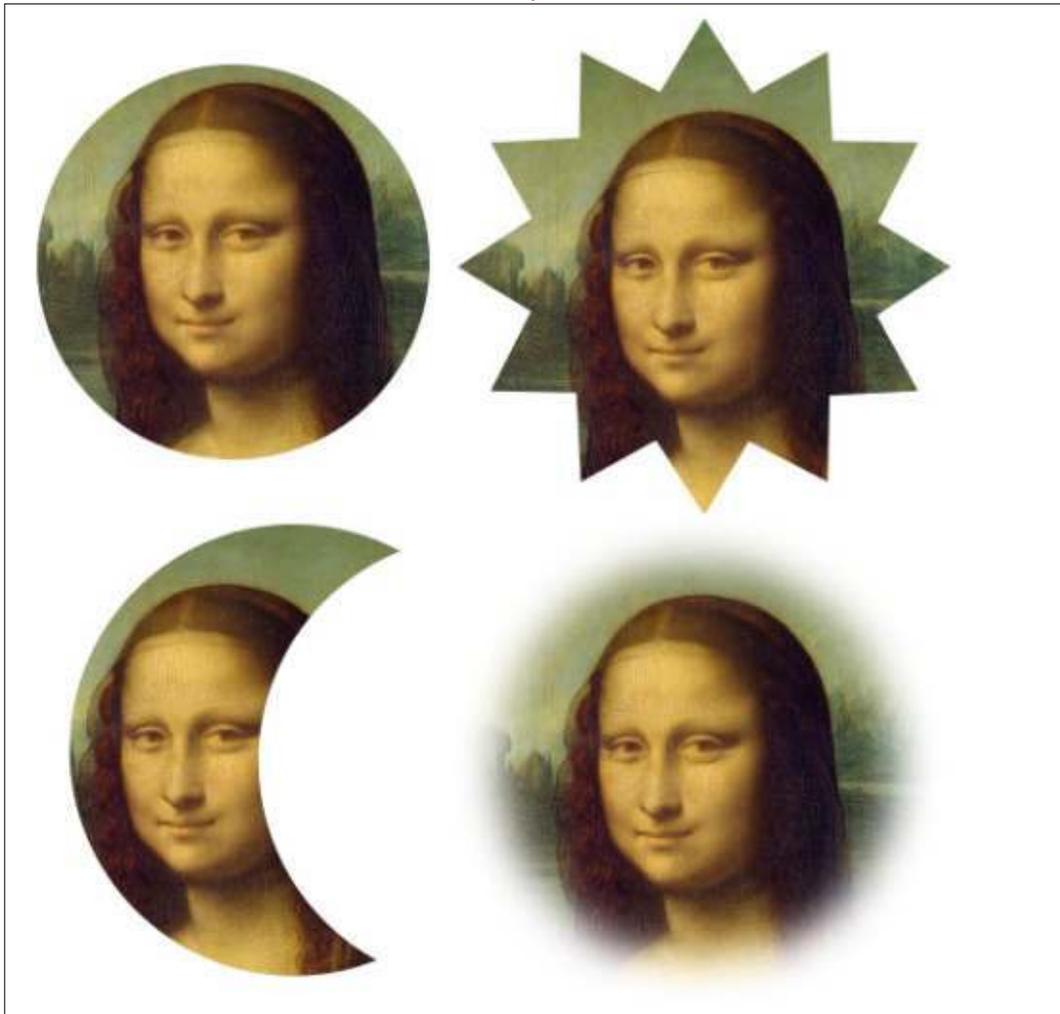
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This can be used to simulate an object disappearing below another.

53. When clipping, always convert primitive clipping shapes, such as rectangles or circles, into paths first. That way you can use node editing to modify the shape of the path without having to release the

clip, making it easier to make fine adjustments.

54. Unfortunately the SVG standard has no option for an “inverse” clipping path. Instead you have to do the job by hand: create the path you want, then use the Boolean “Difference” operation to remove it from a rectangle that



covers the whole object. That gives you a rectangle with your path cut out of it, which you can then use to clip your original object.

55. Use masking, rather than clipping, where you want a soft edge or to affect the opacity of the masked object. Unfortunately you have to release the mask to make adjustments.

56. Masks are based on grayscale values from 0 (black) to 255 (white). Use gradients from white to transparent instead, to get a better idea of the effect you'll have. The transparent parts of the mask will become transparent in the final image, the white parts will be opaque. This makes it slightly counter-intuitive, because the bits you can see through the mask will disappear, and the bits you have covered up will be visible, but it's still easier than working with a black and white mask that completely obscures the drawing below.

57. You can use clipping and masking on bitmap images to create interesting shaped pictures, or to crop them to a specific size.

58. Group each image before you

do this, then you can enter the group and move it around after clipping in order to adjust the position.

WORKING WITH BITMAPS

59. Always link your images, rather than embedding them. If you want to embed to redistribute the file, use Extensions > Images > Embed Images... to convert them before saving the file with another name.

60. Right-click on an image and select Image Properties from the context menu. Edit the URL to a relative path if you want to redistribute your work, or even just move it around on your hard drive. In other words, if you want to use “picture.png” in your drawing, put it into the same directory as the Inkscape file, then drag it into your editing window. Edit the URL to just read “picture.png” instead of the full path, and it will continue to work provided it's kept in the same directory as the SVG file.

61. Try to use high-resolution bitmaps scaled down, rather than small ones scaled up, if you can. It gives Inkscape more data to work

with if you want to export your final design.

62. When exporting PNG files, always use File > Export Bitmap (File > Export PNG Image in 0.91), not Save As... Cairo PNG. The latter loses transparency and sometimes introduces other issues into the exported file.

CLONES

63. If you have lots of identical objects in your image or design, using clones can significantly reduce your file size. It also means that you can modify all of them at once, simply by changing the original.

64. Keep an eye out for situations where you can break your objects down into smaller sub-units, then only clone certain parts. When drawing comics, I've found this to be a quick way to produce characters in similar poses where only the head or mouth changes.

65. If you've created lots of tiled clones, you can easily unlink them by just deleting the original. This requires your preferences to be set so that deleting the original

unlinks the clones, rather than deleting them.

66. If you're having trouble selecting the original object, select a clone if it and press SHIFT-D.

67. Transform your clones then clip or mask them to provide simple "zoom" or "pan" effects.

68. Group objects before cloning if you want to clip the original. Apply the clip to the group and you can still enter the group to clone the full-sized, unclipped version within it. Then just cut and paste that clone outside the group to wherever you want it.

69. You can move clones between layers. Cut them from one layer and paste into another, or just select them and use SHIFT-PAGE UP/DOWN.

70. If you want to copy clones to another drawing, group them together with the original first, otherwise you'll just end up pasting an "orphan clone". Alternatively you can use Edit > Clone > Unlink Clone to turn them into real copies first.

TEXT

71. When creating text, make sure you click once on the canvas, then type. Don't click-and-drag a box. The latter creates "flowed text" which has compatibility issues if you're using your image outside of Inkscape.

72. If you do create flowed text, use Text > Unflow before distributing your image.

73. Select characters, or put the text cursor between them and use ALT plus the usual keys to move (arrow keys) and rotate ("[" , "]") parts of the text.

74. To ensure that your image appears exactly as you expect it to on other people's machines, regardless of the fonts they have, convert text to paths using Path > Object to Path. This will result in a group of paths, one for each individual glyph.

75. If you want a single compound path, select the text and use Path > Union (CTRL-+).

76. To put text onto a path, select both, then use Text > Put on Path.

Use Path > Reverse to switch the text between the "inside" and "outside" of the path.

77. Don't use Inkscape's SVG Font Editor. Unfortunately the SVG Font format never became mainstream, and even more peculiarly it's not supported by Inkscape. Yes, the Inkscape developers wrote an editor for a font format that you can't actually use in Inkscape!

FILTERS

78. Filters are part of the SVG standard, and can be used to introduce textures and effects that just aren't possible with pure vectors. Creating your own filters is confusing but the program does come with a good selection of predefined filters that are worth exploring.

79. Each filter consists of a chain of effects, each with its own parameters. If you add a filter to an object, then add another, the individual chains of both effects will be combined to create a longer chain. You can't easily remove one of the filters after that's happened, so when auditioning filters, remember to apply one,

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then undo before applying the next one.

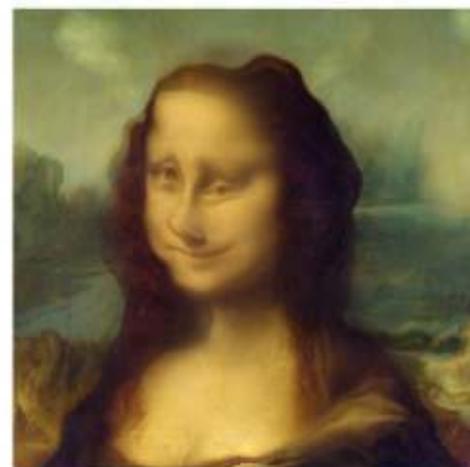
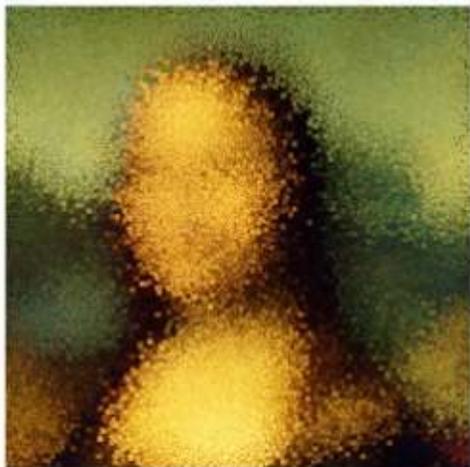
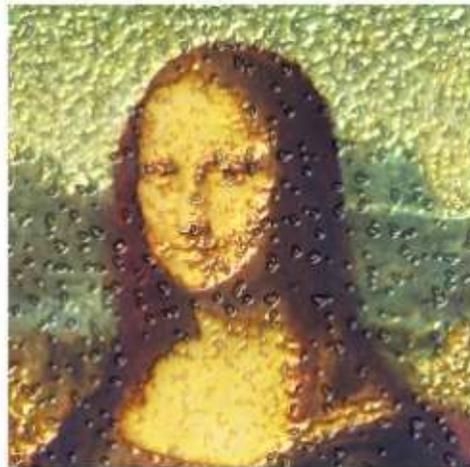
80. If you do want to use multiple filters, but still keep the chains separate, group your objects between each filter. In other words, group the objects and apply filter one, then group the result and apply filter two to that group,

then group the result... and so on.

81. Filters slow rendering down – sometimes quite significantly. Use the different options in View > Display Modes to regain some speed if you don't need to see the filtered objects all the time. If you can put the filtered objects onto another layer, you can speed things

up by hiding that layer temporarily.

82. If you want to regain some speed, but still see a filtered object for reference, use Edit > Make a Bitmap Copy to create a bitmap “snapshot” of your object. Then you can use the “No Filters” display mode and use the bitmap as a temporary reference point.



83. With 0.91 came the ability for predefined filters to prompt for parameters, making it possible for the filter creator to expose the main settings to the user. As a result, some 0.48 filters look like they've disappeared, but have actually just been grouped together into a single filter with parameters.

84. Many filters have a Live Preview checkbox. You should always use this to see what the result of the filter will look like before you commit. The “live” nature means that it can slow things down, especially when you want to tweak lots of parameters, so in that case you can uncheck it, change the values, then check it again when you're done to see what effect your changes will have.

SAVING YOUR WORK

85. Use File > Vacuum Defs (0.48) or File > Clean Up Document (0.91) before saving, to remove behind-the-scenes fragments of SVG that are no longer used in your document. You should definitely do this before sending the file on to anyone else.

86. Are you distributing your file to other people? Use File > Document Metadata (0.48) or File > Document Properties > Metadata (0.91) to set metadata such as the drawing's title or a list of contributors' names.

87. Save as Plain SVG if you want to put a file online without all the Inkscape metadata. Save an Inkscape copy as well, though, in case you have to edit it later.

88. If file size is a concern, save as Optimised SVG. It loses some precision, but probably nothing you'll notice unless you've drawn a really tiny image. In exchange it can reduce the file size considerably. If you need to do this for lots of images, use the "Scour" utility from <http://codedread.com/scour/>

89. To save storage space on your server or desktop, use the compressed (svgz) save options. The files will be identical to the originals, but gzipped. The downside of this is that not all file managers will show previews for svgz files, and Firefox won't load them directly from disk (it will load them from a web server, though).

90. When saving to other vector formats, such as PDF, make sure you convert your text to outlines first. Do this manually, rather than just using the checkbox in the export dialog, as the latter doesn't always produce the right results with some fonts.

USING SVGs ONLINE

91. If you want to keep the file sizes down on your web host, you might choose to serve compressed (svgz) files. Unfortunately the default configuration for most web servers doesn't deal with them correctly. Try it out, and badger your ISP if it doesn't work. If they won't fix it globally then, for Apache at least, you can get it to work by putting these two lines into a .htaccess file on your host:

```
AddType image/svg+xml svgz
```

```
AddEncoding gzip svgz
```

92. If you've got plenty of space on your host, however, it's probably not worth trying to serve svgz files. Most web servers will gzip files on-the-fly, so this format is good only for keeping storage space and server load down, rather

than reducing bandwidth.

93. Are you creating SVGs for Wikipedia or other mediawiki based sites? Use Wikimedia's SVG Check tool to test for common problems first. This can also be useful for general checking of SVGs prior to putting them online. https://commons.wikimedia.org/wiki/Commons:SVG_Check

94. If you're a web developer, take a look at the structure of a simple SVG file. It's an XML format, which opens it to manipulation in the browser using the usual Javascript DOM calls. This lets you insert, remove, move or modify parts of your SVG image dynamically. If you haven't done much work with XML before, you might need to read up on XML namespaces – and use the namespace-aware versions of the DOM calls – in order to get things working correctly.

95. SVG supports a standard called SMIL for animation. Unfortunately this is being phased out in some browsers, and was never supported in Internet Explorer. There's work on a more general web animation framework to replace it, but it's not ready yet.

If you need to animate an SVG file right now, Javascript is the best cross-platform way to do it.

FURTHER INFORMATION

96. Obviously one of the best ways to learn about Inkscape is to read all the tutorials in Full Circle Magazine. Another option is the official Inkscape manual, written by Tavmjong Bah, Inkscape developer and member of the W3C SVG working group. Unfortunately it hasn't been updated for 0.91 yet, but almost all the content is still relevant. You can read it online at <http://tavmjong.free.fr/INKSCAPE/> but it's also available in dead-tree format if you prefer.

97. There are some great community resources for Inkscape, but I'm going to call out three in particular:

- <http://www.inkscapeforum.com> – a friendly and helpful forum, with some extremely experienced Inkscape users.
- <http://inkscapecommunity.com> – frequented by many of the same people as above, but better organised if you're looking for tutorials, guides or reference material.

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• <http://www.inkscapeforum.it> – an Italian forum, but with a small international section. There are other localised Inkscape communities around the globe though, so if English isn't your first language, do search to see if

there's already something in your native tongue. If not, why not start a site yourself?

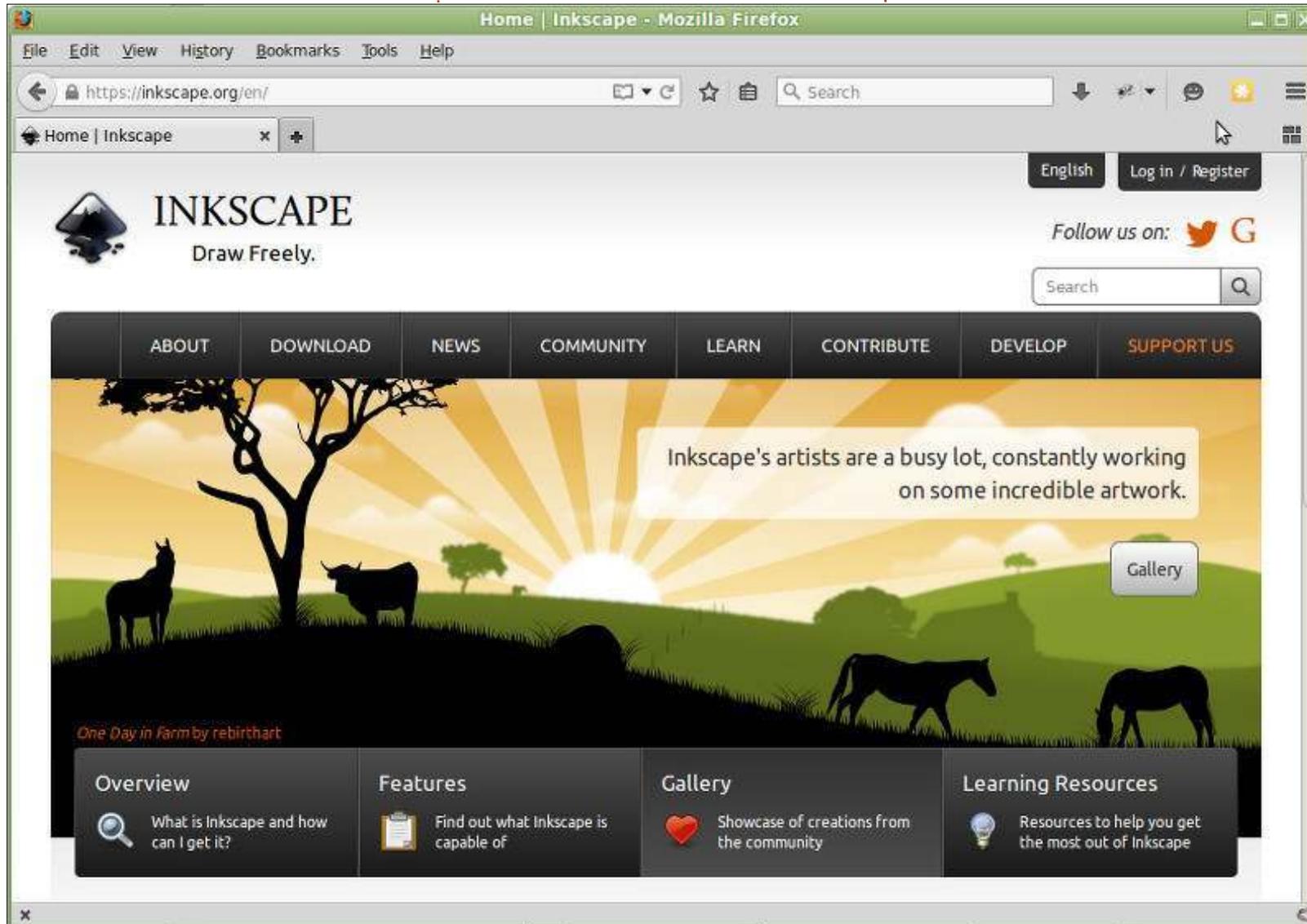
98. A bit of a blatant plug, but at my own site, www.peppertop.com, you can find over 200 comic strips,

all of them at least partly created with Inkscape. You can even download the source to most of them, so you can see how some of these tips and tricks have been used in practice. Every Greys strip has at least one Easter Egg hidden

in it somewhere, usually to be found by opening the Inkscape file and investigating. How many can you find?

99. Do you know your way round C++ or Python? Why not consider becoming an Inkscape developer in your spare time. See <https://inkscape.org/en/develop/> for more details.

100. Not a developer, but still want to help? There are other ways to contribute, see <https://inkscape.org/en/contribute> for details. Don't forget that you can also make a financial donation.



Mark uses Inkscape to create three webcomics, 'The Greys', 'Monsters, Inked' and 'Elvie', which can all be found at <http://www.peppertop.com/>



HOW-TO

Written by Mark Crutch

Inkscape - Part 41

After last month's special celebratory detour, we return to finish the subject of aligning and positioning objects in Inkscape. We've already seen a variety of approaches, from grids and snapping through to tiled clones and the Align and Distribute dialog, but we still have two dialogs to consider. They both live near the bottom of the Object menu: "Transform...", and "Arrange..." ("Rows and Columns..." if you're still using 0.48.x).

The Transform dialog provides a more precise approach to moving, scaling, rotating and skewing objects when compared with simply dragging the selection handles using the mouse. In the world of SVG, every object can have a transformation applied to it. Rotate or skew an object, then look at it in the XML editor and you'll see that there's no obvious "rotate" or "skew" attribute, but rather a single "transform" attribute which holds a matrix that defines the cumulative effects of any transformations you may have applied. The details of this matrix

are a little too mathematically intense for this series, but it's enough to know that each object can have its own matrix applied, and that a single matrix can combine the effects of moving, scaling, rotating and skewing into a single set of numbers. The Transform dialog is essentially a more user-friendly way of tweaking that matrix.

On opening the dialog from the menu, or using the CTRL-SHIFT-M shortcut, you'll be presented with a simple interface featuring a

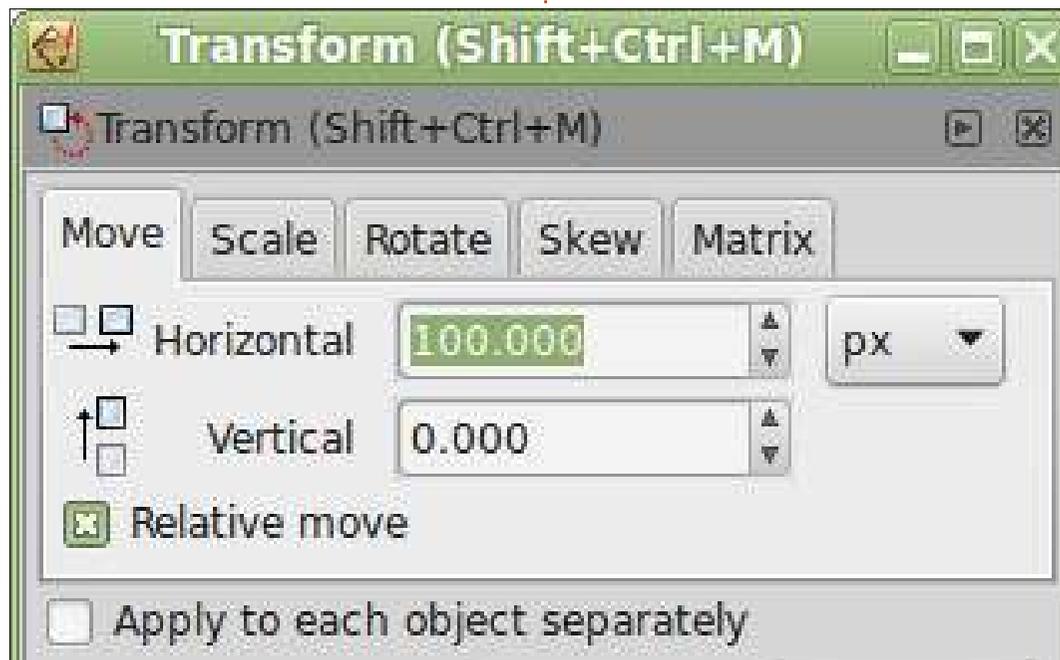
handful of tabs, each with just a few fields. This dialog has seen little change between 0.48 and 0.91.

The fields on the Move tab allow you to move your selected objects by a specific distance, when the "Relative move" checkbox is enabled. Disable this, and you can move your objects to absolute x and y coordinates. In addition, the current absolute coordinates are displayed in the fields. With 0.91, just about every spinbox in Inkscape lets you enter

simple calculations, so there's a good argument for never enabling this checkbox in that version. Want to move your shape 50 pixels to the right? Just append "+50" to the number in the "Horizontal" box, then hit Return and watch the field update with the newly calculated value.

Positions and movements are based on Inkscape's own coordinate system which has the positive y axis running upwards from the bottom of the page (remember, this is the opposite of SVG's coordinate system, which has the origin at the top left, with the positive y-axis running downwards). Similarly, the selected objects are placed such that the bottom left corner of the bounding box is at the specified coordinates, with no option to use a different corner, or even the center of the box as the reference point.

The "Apply to each object separately" checkbox is effectively the opposite of the "Treat selection as group" checkbox in



the Align and Distribute dialog. If you select multiple objects and leave this un-checked, then the transformation will be applied as though all the objects were grouped. With it checked, each object is individually transformed. When relatively moving things, there's little difference, but, for an absolute move, it results in all the items being placed at the same position on the page. It's also particularly relevant when using the other tabs, where the results can differ significantly due to the state of this checkbox. Consider the Rotate tab: there's a huge difference between rotating a group of separate objects and rotating each object individually.

The Scale, Rotate and Skew tabs in this dialog really need no additional explanation as the fields are all straightforward to understand. It's important to note, however, that only the current tab's values are used when the Apply button is clicked. You can't queue up a collection of movement, rotation and skewing to apply as a single operation, but instead have to press the button with the Move tab to the fore, then again with the Rotate tab selected, and so on.

On the subject of the Rotate tab, there has been a slight change with version 0.91: this release adds buttons to determine whether rotations should be clockwise or anti-clockwise. The corresponding field accepts both positive and negative values in either release of Inkscape, so the buttons just make the existing functionality more obvious, rather than adding anything new.

The last tab, Matrix, allows you to directly manipulate the six values in the SVG matrix transformation. With the "Edit current matrix" checkbox enabled, you can modify the transform

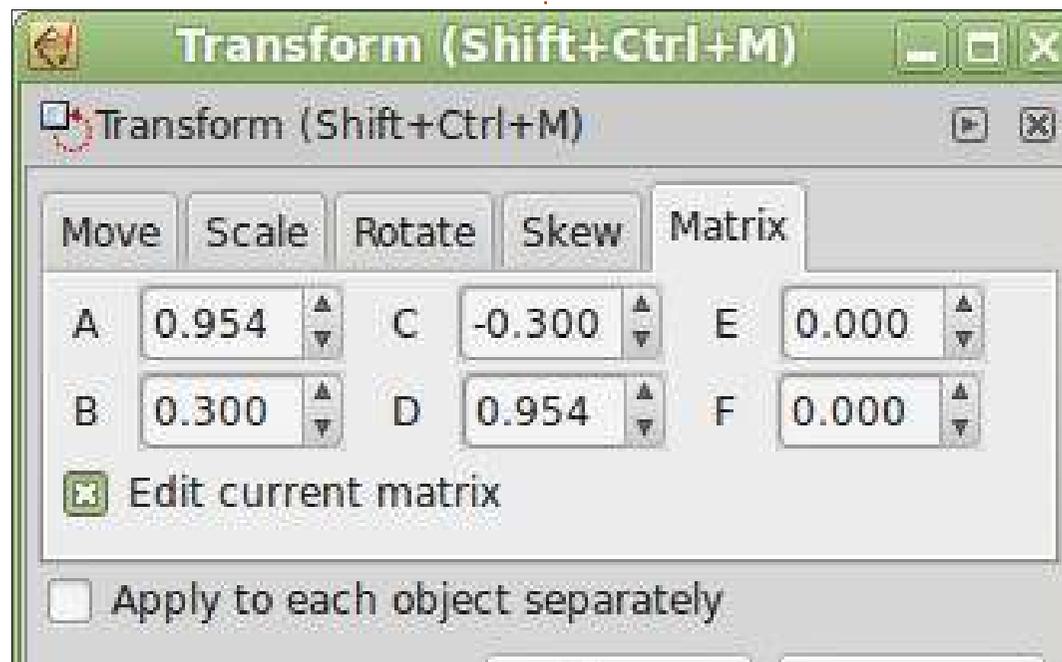
that's currently being applied to the selected element, if there is one. With this unchecked, any changes you make in this tab will be mathematically combined with the existing matrix to produce a new, cumulative matrix. If you are mathematically inclined, and wish to play around with this tab, I recommend reading the SVG specification for coordinate systems and transformations: <http://www.w3.org/TR/SVG/coords.html>

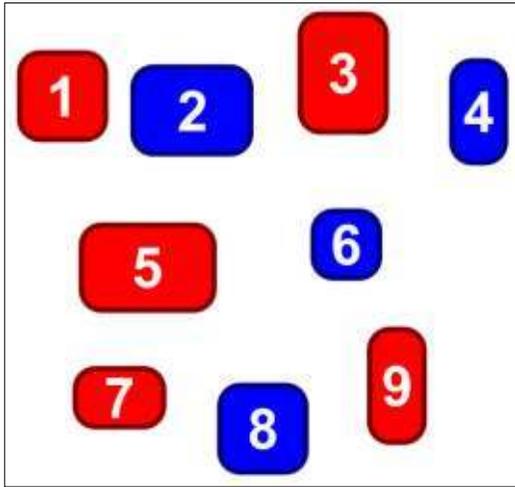
It's worth noting that SVG's transform attribute does allow for a series of individual translate(), scale(), rotate(), skewX() and

skewY() functions to be used, rather than just the matrix() operation that combines them all. From an authoring perspective, it would be far nicer to store a 45° rotation in the SVG file as rotate(45), rather than matrix(0.707,0.707,-0.707,0.707,0,0), but there's no option in Inkscape to do that, unfortunately.

The last feature we'll consider in this part of the series is the dialog that can be found via Object > Rows and Columns... (0.48) or Object > Arrange... (0.91). The latter lays the interface out a little more neatly and adds a second tab, so I'll describe that version. 0.48 users should be able to work out the differences in the first tab, but you'll just have to look on in envy when I describe the Polar Coordinates options in the second.

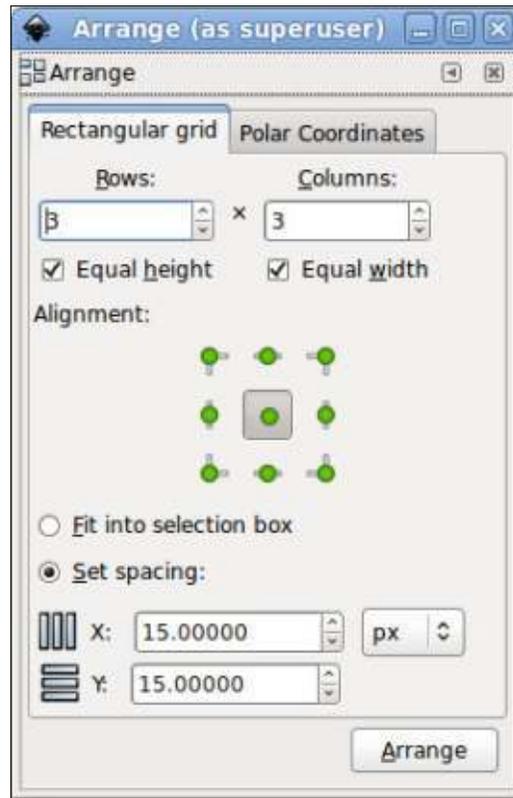
Let's start by creating a few objects to arrange. I've deliberately used different sizes, and semi-randomly placed them. I've numbered them from left to right, top to bottom, to make it easier to see which object moves where – once they're arranged using the dialog.





On selecting these nine objects and opening the dialog, it's possible to set various combinations of rows and columns, ranging from 1x9 to 9x1. These fields are dynamic: as items are added to, or removed from the selection, the rows and columns will change; similarly as each field is manually altered so the other will change to ensure that you don't end up with an impossible combination for the number of elements that are selected. In this example, I've set the arrangement to 3 rows by 3 columns.

You can think of this dialog as creating a number of conceptual cells which are arranged in rows and columns, then your objects placed within them. They're "conceptual" in that they're never



really created, or drawn, on the canvas, but serve as a tool to more easily describe how Inkscape arrives at its final layout. The height of each cell is determined by the height of the tallest object in the row, and the state of the Equal Height checkbox. If left unchecked, then the height of each row is free to change to suit the tallest object within it; if checked, all the rows will be the same height, equal to the tallest object in any of the rows. An analogous calculation is carried out to

determine the width of each cell, too.

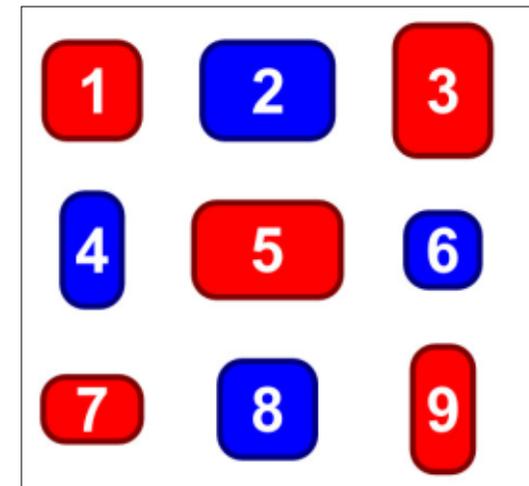
With the dimensions of each cell calculated, they are now distributed into their final positions. If the "Fit into selection box" radio button is active, they are evenly distributed to fit within the dimensions of the original selection's bounding box. This gives you the ability to distribute the objects within a specific area by carefully positioning two opposing corner objects.

Alternatively you can select the "Set spacing" option, and enter values for the X and Y fields. In this mode the cells will be arranged with the specified amount of space between the columns (X value) and rows (Y value). These numbers can be negative if you want to make the cells overlap. Note that 0.48 allows these numbers to be specified only in pixels whereas 0.91, as you can see from the screenshot, has a pop-up menu from which to choose different units.

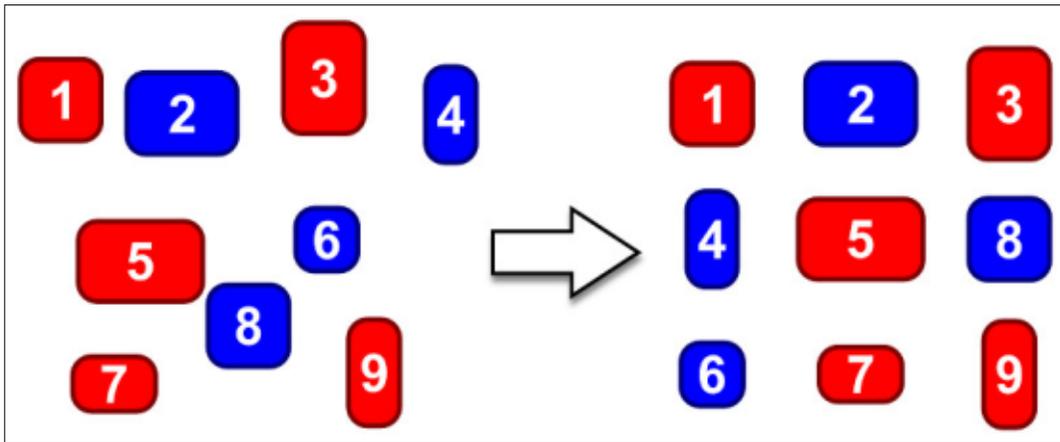
With these imaginary cells conceptually placed on the canvas, it's finally time to move your objects into them. The "Alignment"

buttons let you define how to place each object within its cell, allowing for any of nine relative positions (though you'll probably just use the center button most of the time). Note that 0.48 had the same nine possibilities available, but laid out as a pair of three-option radio buttons which specified the horizontal and vertical alignments separately.

Having distributed our virtual cells, and aligned the objects within them, the result is something like this:

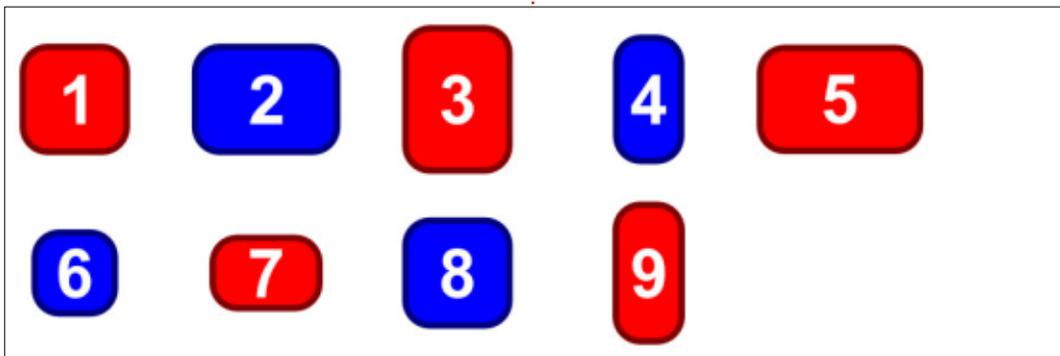


It's important to understand how Inkscape chooses the order for the arrangement. Whereas other parts of the application use an object's z-index or selection order, this dialog is only concerned



with the placement of the objects on the canvas. They're ordered from left to right, top to bottom, and laid out in the same way. You can see this effect quite clearly if I move the blue "8" object up a little, leaving its z-index the same, then reapply the arrangement:

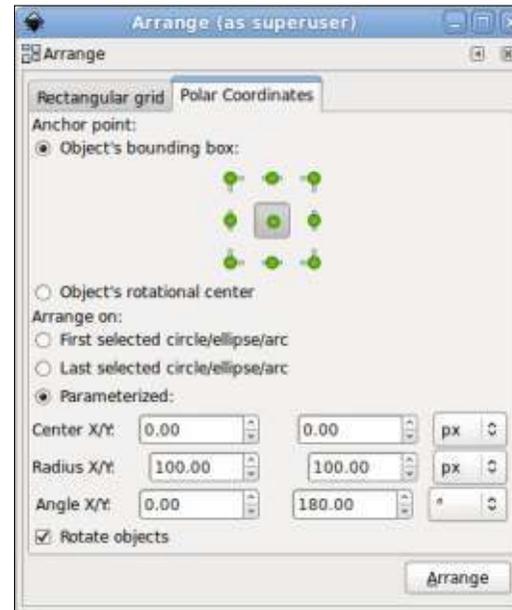
Because the objects are laid out from left to right, top to bottom, some arrangements can lead to an empty space in the bottom right corner. Here are the same nine objects in a 2x5 arrangement:



Note that there's no way to get the blank space to be anywhere other than the bottom right cell. If you want a different alignment you'll have to manually alter the results afterwards. It's also not possible to have more than one blank cell – the dynamic nature of the Rows and Columns fields will stymie any attempts. Trying to put these nine objects into a 2x6 arrangement, expecting six objects on the top row, and three on the bottom, just leads to the same result as before and the fields

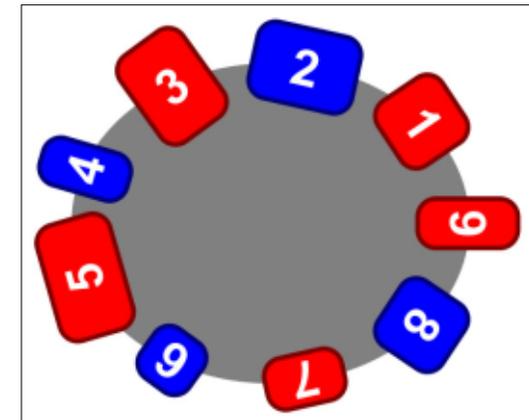
adjusting themselves to 2x5.

The second tab of this dialog allows you to place objects in a polar arrangement. You can either draw a circle, ellipse or arc as a guide on which to place your objects, or you can enter the parameters for such a shape within the dialog itself.



The easiest way to do this is to draw a target shape (circle, ellipse or arc) that you wish to place your objects on. Send it to the bottom of the z-order, then select all the objects you wish to arrange plus the target itself. Ensuring that "First selected..." is active, click the Arrange button. With our previous

selection of nine rounded rectangles, and a grey ellipse as the target, the result is something like this:



As you can see, the objects have been arranged anti-clockwise, starting from the top right. To make them run clockwise from the top left, flip the ellipse horizontally first. For clockwise from the bottom right, flip it vertically. For anti-clockwise from the bottom left, flip it both horizontally and vertically before creating the arrangement.

If the target object is your only circle, ellipse or arc in the selection, it doesn't really matter whether you use the "First selected..." or "Last selected..." option. If you do have more than one, however, you should ensure that you select the target first,

then add everything else to the selection ("First Selected...") or select everything else, then add the target to the selection ("Last selected...").

If you don't wish to create an additional object on the canvas to use as a target, the "Parameterized" option reveals additional fields (shown in the screenshot) to let you specify the details of the target arc to use. Realistically, it's almost always easier to draw an arc on the canvas to use as the target. You'll get visible feedback as to where your objects will be placed, and you can simply delete the arc once your arrangement is done, if you don't want it left in the drawing.

The specific position of each object on the target shape is set using the "Anchor point" section in the top half of the dialog. You can specify one of nine positions on the object's bounding box – so choosing the top-left button, for example, would position the objects such that the top-left corner of each individual bounding box is placed on the target. The center button is the most common choice here, and is the one I used for the previous image. An

interesting alternative is to use the "Object's rotational center" option. This will position each object so that its rotational center is placed on the target, allowing you a finer degree of control over the placement of each individual object.

The "Rotate objects" checkbox determines whether your objects will be rotated when they are arranged, or left with their original orientation. The previous image was made with this checked; had it been left un-checked, all of the positioned objects would have retained their original orientation, such that the numbers would all have been the right way up.

There's a small bug that you may have to work around: whilst writing this article, I found that the Polar mode would occasionally place all my objects on top of each other, rather than spacing them out around the target shape. I was able to reliably fix this by undoing the placement, then shifting the target object up (SHIFT-Up arrow), then back down to its previous position (SHIFT-Down arrow), before repeating my arrangement attempt.

That concludes our look at the



myriad ways in which you can arrange and position objects within Inkscape. Amongst them there should be something to suit most artistic requirements. From snapping to grids, tiled clones to polar arrangements, Inkscape has far more ways to position your shapes than initially meets the eye.



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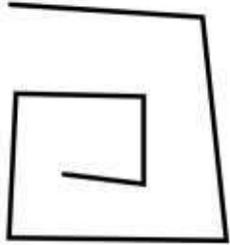
<http://www.peppertop.com/>



This month we're going to start looking at Live Path Effects (LPEs). These are a way to add more powerful capabilities to paths – such as drawing a pattern that follows a path (for creating ropes and chains), or rendering a path as though it's been roughly sketched. There are 13 LPEs in version 0.48, increasing to 15 in 0.91 with a slight change of UI as well.

Let's dive straight in with a relatively simple LPE: Spiro Spline.

Draw a path using Bézier tool, consisting of straight lines forming a simple spiral type of shape. Something like this:



Now select the path and open the LPE dialog using the Path > Path Effects... menu option (Path Effect Editor... in 0.48). At this

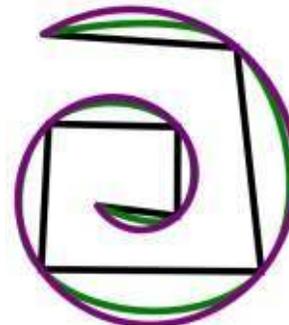
point, the user interface diverges. To add the Spiro Spline LPE to your path:

- In 0.48.x, select "Spiro spline" from the drop-down list of effects at the top of the dialog, then click on the Add button next to it.
- In 0.91, click the "+" button at the bottom left of the dialog. This will open another dialog listing the available effects. Scroll down and select "Spiro spline," then click the Add button. The second dialog will close, adding the effect to the list in the main dialog.

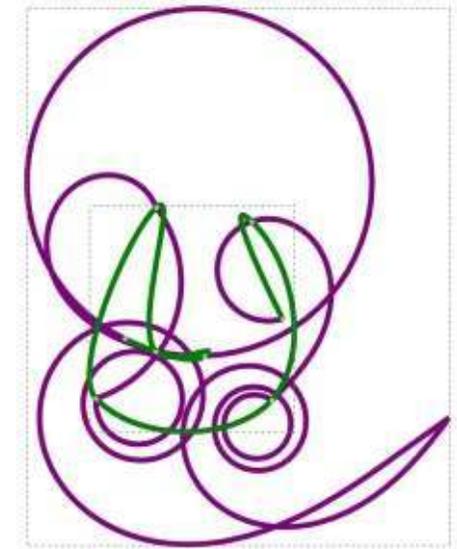
With the Spiro Spline effect added to your path, you might be a little underwhelmed to see that there's been no change to the appearance of your spiral. This is because the spiro algorithm works only on paths where some of the nodes are smooth or symmetrical. Currently, all the nodes in our shape are corner/cusp nodes. Double-click on the path to both select it and switch to the node tool, and you should see that all the nodes have the diamond-shaped handles that represent cusp nodes. Press CTRL-A to select

them all, and use the buttons on the tool control bar to change them to smooth, symmetrical or auto-smooth. Immediately you should see the effects of the spiro algorithm, as your square spiral turns into a super-smooth version.

You may be forgiven for thinking that your new spiral is just a normal result of switching to smooth nodes, but that's not the case. In the LPE dialog, you'll notice that the Spiro Spline entry has an "eye" icon next to it. Click that to toggle the effect on and off, and you'll notice that the spiro version of the path is noticeably smoother than the normal version. Here's the original (black), smooth (green), and spiro (purple) versions of the path – overlaid on top of each other so you can more easily see the differences between them.



The real difference comes when you start to manipulate the path: spiro splines are indifferent to changes in the node handles, so the most practical way to modify the path is to move the nodes themselves. The algorithm is a little unstable, and can sometimes shoot off into wild shapes as you do so; undoing your edit, or moving the nodes a little more, will generally get things back on track. For example, this image shows a green original path, plus the same path with the spiro LPE added in purple, demonstrating just how out-of-control the spiro algorithm can get!



As well as moving nodes, there's one other way to manipulate spiro paths: straighten some sections. Simply select the end nodes of a segment and use the "Make selected segments lines" button on the tool control bar to straighten it. The spiro algorithm will ensure a smooth transition between straight and curved segments. If you need to introduce a sharp transition into your path, you first have to convert one of your smooth nodes into a corner node. That alone isn't usually enough to do the job though – moving the adjacent node to one side will usually also alter the path on the opposite side in an effort to maintain the spiro path's smoothness. The secret is to move the handles of the corner node so that they're no longer co-linear, then you'll be able to move the spiro paths on either side as you would expect, with a sharp transition occurring at the corner node.

The spiro algorithm was originally created by Raph Levien for font design (see <http://www.levien.com/spiro/> for more details), but it can also be useful for flowing, organic shapes



such as plants, leaves, and... tentacles. It's so useful, in fact, that Inkscape has dedicated buttons on the Bézier and Pencil toolbars which automatically add the Spiro Spline LPE to any lines you draw with them. Select the Pencil tool and ensure that the smoothing is set to about 50% - a little either way won't make much difference. On the tool control bar (shown above), enable Spiro mode using the second button on the bar:

Now it's time to draw something on the canvas: the kind of shape that suits spiro mode. Try drawing a circle, keeping it as neat as you can, and finishing in the starting node. As you draw you'll see a green line indicating your path, regardless of your current fill and stroke settings – don't worry, that's just a guideline that won't be visible when you've finished. Unless you have supernatural control over your muscles, the green path is likely to be bumpy and distorted; yet, on releasing the mouse button, it will be replaced with a nicely rounded circle. If your

original path was extremely rough, you might not get a perfect circle, but the final shape will certainly be a lot smoother than your hand-drawn efforts.

Select the path you've drawn, and, in the Path Effects dialog, you should see that the Spiro Spline effect has been added. Toggle the visibility button (the eye-shaped icon) to see how the spiro version compares with your original path. Now try the process again with a different shape – a figure of eight, or a spiral. As you can see, for some shapes it's a lot easier to create something neat and smooth using spiro mode.

When using the Bézier tool in spiro mode, the icon on the tool control bar is the same, but the drawing process is a little different. I usually suggest drawing Bézier paths as a series of straight line segments by single-clicking to place each node, then going back in Node Edit mode to add curves afterwards. If you take that approach with spiro mode enabled, you'll get a series of corner nodes

which, as we've seen, don't really play a role in the spiro algorithm. Instead you need to click-and-drag as you place each node, in order to set the curves as you go along. Personally, I find this to be much harder to control, but give it a try to see if you're better at it than me! You can always lay down straight segments with spiro mode enabled, then explicitly change some points into cusp nodes afterwards. It's not a huge workflow improvement, but does save you a trip to the Path Effects dialog to manually add the LPE.

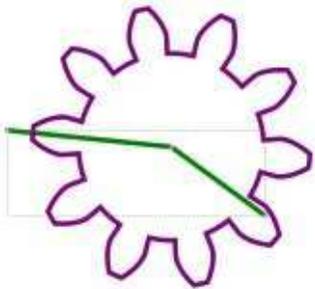
One big problem with having spiro buttons on these two tools is that it's easy for newcomers to Inkscape to enable them, then forget about it. A common question on the support forums is, "why can't I change the shape of my path using the node handles?" The answer is usually because the Spiro LPE has unintentionally been added, so watch out for that if you find yourself similarly stuck.

Let's move on to another LPE: Gears.

You first have to draw a path with at least three nodes – to begin, I'll use exactly three so that

it's clear what the relevance of each one is. With your path drawn and selected, open the Path Effects dialog and add the Gears LPE. You should immediately see your path replaced by a gear. Double-click on it so that you can see the three nodes and move them around. It should quickly become apparent that the nodes are used to set:

- 1) The angle of the first gear tooth, relative to the center point.
- 2) The center point of the gear.
- 3) The radius of the gear (from the center to the mid-point of the tooth).



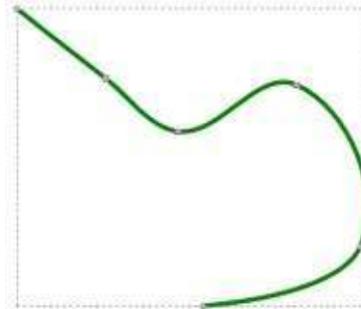
With your gear selected, switch to the Bézier tool. The start and end nodes of your path should be visible: click on the end node, then double-click somewhere else on the canvas to add another segment to your path. Now the path has four nodes, and you should find that a second gear has been added, centered at the new end node.

You can repeat this process to add more nodes, and hence more gears. Applying the Gear LPE to any path with more than three nodes follows the same rules: the first three nodes define the parameters for the first gear, and any subsequent nodes set the center points for additional gears in the chain. Once you've got a few gears on screen, switch to the node tool to move their centers, noting how Inkscape automatically adjusts the radius and number of teeth in the process. Try dragging the first node around the second one to crank your gear train into life (after all, it is a LIVE path effect).

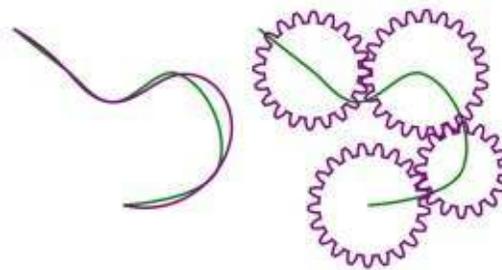
As well as the values that are implicitly set by the positions of the nodes, there are two additional parameters required to fully specify the effect. These can be found at the bottom of the Path Effects dialog, in fields labelled "Teeth" (the number of teeth on the first gear), and "Phi" (the "tooth pressure angle" - set it to about 20 for realistic looking teeth). Almost all LPEs populate this part of the dialog with a UI of some sort, and in some cases the number of additional parameters is rather excessive (watch out if

you're working on a small screen!).

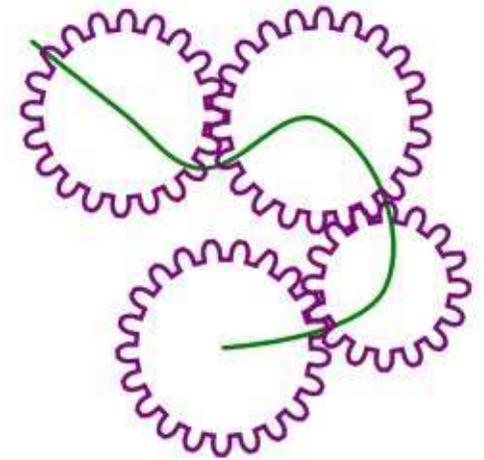
You may have guessed from the UI that it's possible to apply more than one LPE to a path. In programming terms you can think of an LPE as a function that takes a path as an input, and produces another path as an output, allowing you to chain them together. Be aware, however, that the order in which you chain them is significant. Consider this simple path, made up of cusp nodes:



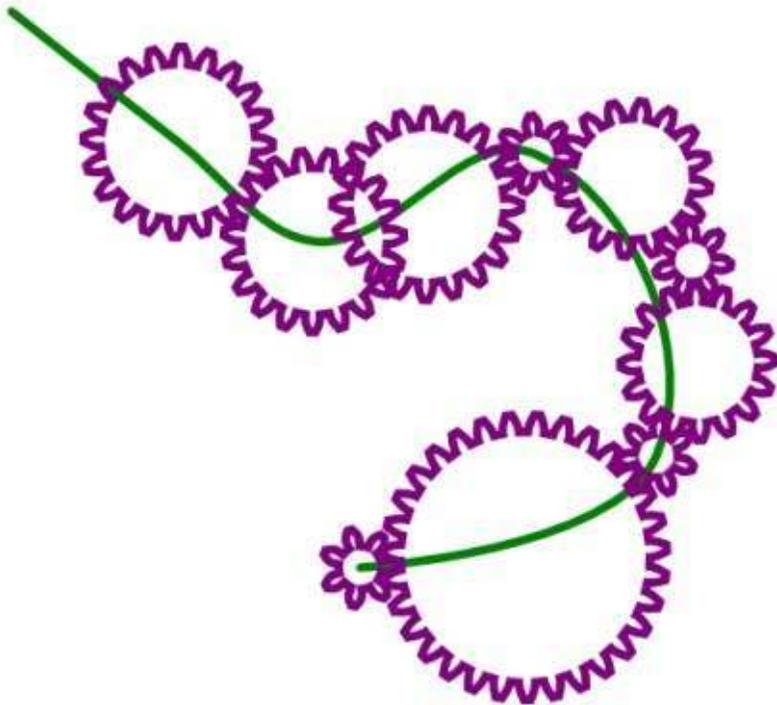
If we apply either the Spiro Spline or Gears LPE to the path we get the results we'd expect:



But if we apply both LPEs to the path, the effects differ greatly depending on the order. We'll start with the least surprising combination: Gears first and Spiro Spline second.



It may not be easy to see, but the only real effect is that the teeth of the gears have become more rounded (though each gear also has one tooth that's misshapen). Thinking about our chain of LPEs the general effect makes some sense: the first LPE outputs a composite path in the shape of the gears, then the spiro algorithm is applied to that path, smoothing out any cusp nodes that are present in it. But what happens if we apply the Spiro Spline LPE first, and the Gears LPE second?



Now we've got a load more gears! This is because the path that is created by the Spiro Spline LPE has more nodes than our original input path. Although we drew 6 nodes, the spiro version of the path actually has 13, so when the second LPE runs it creates a lot of extra gears. We could have predicted this result had we only kept an eye on Inkscape's status bar: when an LPE is active it shows the number of nodes in the output path, not the number in the original path. Try using the Gears LPE again, and have a look at how many nodes that generates!

Why not practice drawing naturalistic curves and mechanistic gears, then next time we'll continue to look at some of the other LPEs that are available.



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