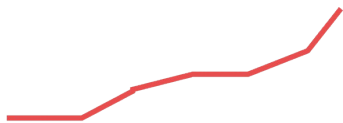


Why it's not easy to convert .SVG files into .VEC files

Lets examine the history of vector graphic files. Graphic files were initially vector files because the early computers had very little memory. The first micro computer I used to create graphics had 48K bytes not the 4G byte that are common on low end PC's today.

The first animation package I used, whilst a student on my BA Animation course was AutoDesk Animator. You can download the files for a PC from the internet and try using it.

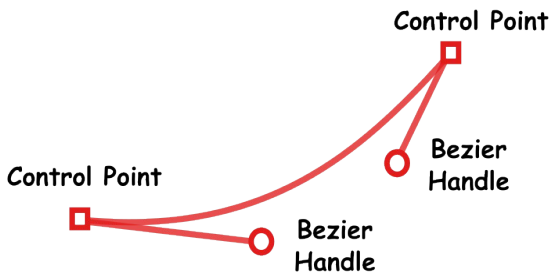
Holding even a 640 x 480 graphics image, called 480p in say 16 colours took more memory than was available when the graphics software was loaded. So we used line graphics, which were converted to pixels at the stage when the video files were produced. In this process only one image was in memory, this was written to the video file and then the next image was converted to pixels and so on.



An Approximation to a Curve used in Early Graphics Programs




1st Generation Bezier Curve used in VEC Files



2nd Generation Bezier Curve used in SVG Files

Before this the only graphics programs for single images composed all shapes up of a collection of straight lines. These packages worked on mini computers which were very slow by modern standards and had less memory than 64K bytes. What memory they had was shared between 8 to 10 users on a time slicing basis. Thus the number of straight lines which a shape could contain was strictly limited.

So because of the different formats of SVG and VEC files conversion from one to the other is not a trivial task.

This illustration on the page 3 shows a line drawn on a vector layer with the  tool and the bezier function switch off.

The shape shown on the right is a similar complexity to the first shape drawn using Pencil2D tools and the listing on the left is it's SVG file. You can see that it's structure is totally different to a VEC file.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!-- Created with Inkscape (http://www.inkscape.org/) -->

<svg
  width="210mm"
  height="297mm"
  viewBox="0 0 210 297"
  version="1.1"
  id="svg6542"
  xmlns="http://www.w3.org/2000/svg"
  xmlns:svg="http://www.w3.org/2000/svg">
  <defs
    id="defs6539" />
  <g
    id="layer1">
    <path
      style="opacity:0.78;fill:none;stroke:#e21d1d;stroke-width:0.5;stroke-dasharray:none"
      d="M 39.638298,112.02127 C 42.0545,100.54094 40.053467,87.293724 56.87234,81.574467 c 24.147878,-
5.035517 34.039134,13.095978 46.53191,27.000003 3.82803,17.90513 11.64685,33.81487 4.02128,57.4468
-12.787387,14.7538 -21.888659,37.69896 -47.680849,23.5532 -12.862734,-22.00069 -19.498896,-47.89298
-20.106383,-77.5532 z"
      id="path6663" />
    </g>
  </svg>
```

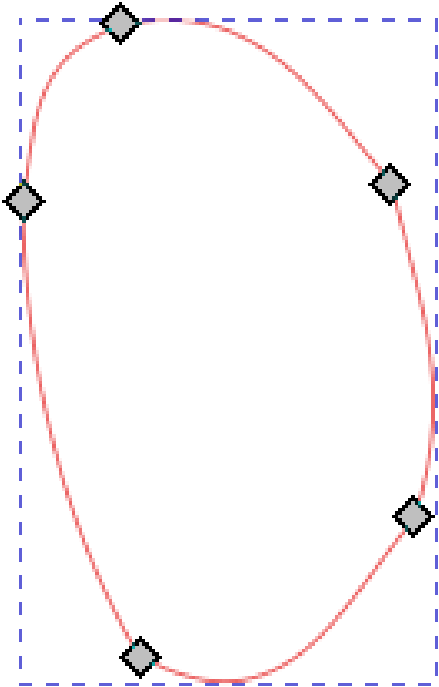
The line starting with d="M 39.638298,112.02127 continues until -20.106383,-77.5532 z" three lines below on this printout.

The M indicates the initial position M signifying move to this position.

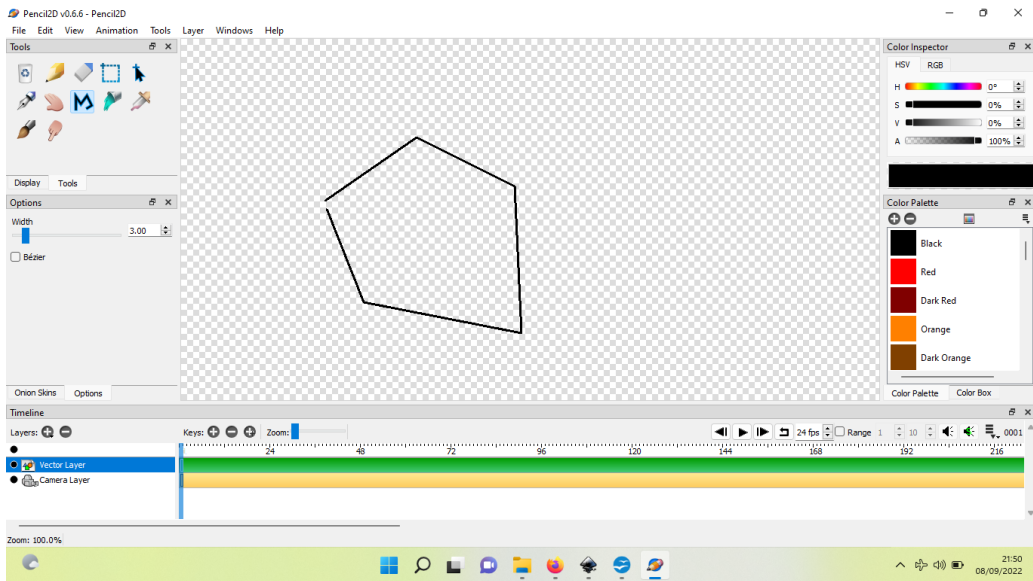
The numbers between the M and the Z define the Bezier curve between these two points.

The Z indicates that the line join at this point.

Please note that the file is saved as 'Plain SVG' from within Inkscape. To see the difference between SVG and VEC compare this listing with the one on page 5.



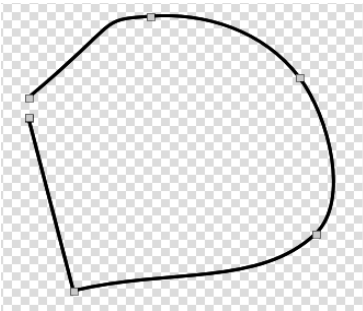
Using Pencil2D tools to Produce Hand Drawn Animation Using Vectors



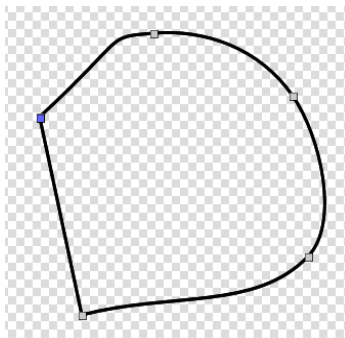
If you now use the smudge tool, click somewhere on the lines which compose the shape.



The shape changes to that shown on right. The squares along the lines are the control points. These can be moved by hovering over a point, it will change colour to red, you can now move it. The colour change when the cross hairs, shaped like a + sign are inside the control point.



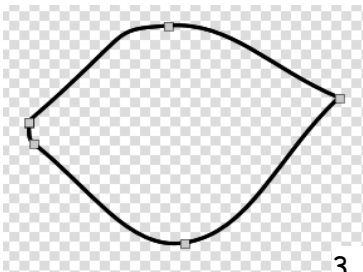
The curves are defined by Vector curve smoothing in the *General Preferences*.



You can move one of the end point over the other as shown on the left. Note that the first and last line segment at this point are straight lines.

Better results can be obtained by using the brush tool to draw the initial line.

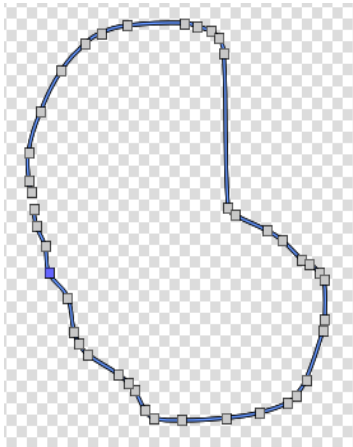
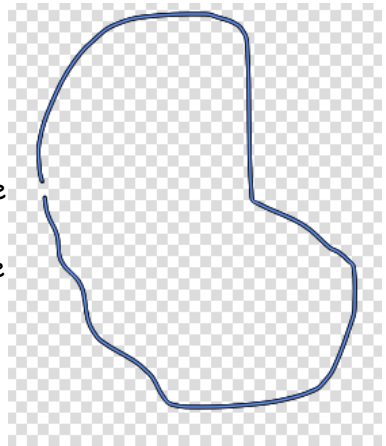
Each point on these lines will generate a line within the VEC file.



```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE PencilVectorImage>
<image type="vector">
  <curve width="3" variableWidth="false" invisible="false" filled="false" colourNumber="0" originX="-279.5" originY="-44"
originPressure="0.5"/>
  <segment c1x="-192.881" c1y="-122.026" c2x="-217.262" c2y="-120.052" vx="-168.5" vy="-124" pressure="0.5"/>
  <segment c1x="-118.462" c1y="-128.052" c2x="-86.9" c2y="-88" vx="-32.5" vy="-64" pressure="0.5"/>
  <segment c1x="-94.1" c1y="-18.8" c2x="-126.286" c2y="39.5838" vx="-186.5" vy="49" pressure="0.5"/>
  <segment c1x="-223.486" c1y="54.7838" c2x="-242.523" c2y="6.6227" vx="-275.5" vy="-26" pressure="0.5"/>
  <segment c1x="-279.723" c1y="-30.1773" c2x="-277.973" c2y="-36.1273" vx="-279.5" vy="-43" pressure="0.5"/>
  <segment c1x="-279.573" c1y="-43.3273" c2x="-279.536" c2y="-43.6636" vx="-279.5" vy="-44" pressure="0.5"/>
</curve>
</image>
```

c1x and C1x are the x.y coordinates of Bezier Point 1
c2x and c2y are the x.y coordinates of Bezier Point 2
Vx and Vy are the x.y coordinates of the Control Point
Pressure is the line width

The illustration on the right is a line drawn using
the brush tool, before the smudge tool is used.

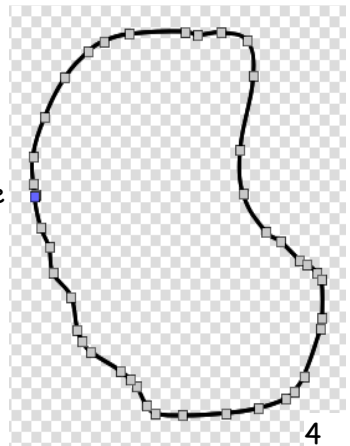


The squares are the
controlpoints that have
been generated by the
drawing process. There
are many more and
their position is
governed by the shape
drawn.

These points can be moved around to edit the
shape. And the two end points can be moved to
create a continuous curve.

If you examine the VEC file created you'll notice
that it has more lines than the first example, see
next page.

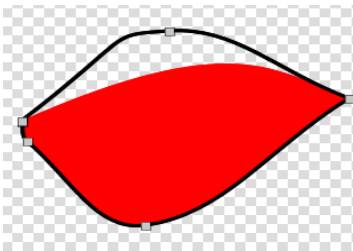
Incidentally the originX="-187.5" originY="-6 is the
coordinates of the center of the image and the curve
width="3" sets the width of the line to 3 points.
ColourNumber="0" sets the line colour to colour 0,
which black in this case. variableWidth="true"
doesn't do as it says on the tin, because there's no
way to vary line width.




```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE PencilVectorImage>
<image type="vector">
  <curve width="3" variableWidth="true" feather="1" invisible="false" filled="false" colourNumber="0" originX="-187.5" originY="-6"
  originPressure="1"/>
  <segment c1x="-189.06" c1y="-11.8903" c2x="-188.932" c2y="-10.1557" vx="-189.188" vy="-13.625" pressure="1"/>
  <segment c1x="-189.731" c1y="-20.9989" c2x="-190.756" c2y="-26.5331" vx="-189.498" vy="-33.1082" pressure="1"/>
  <segment c1x="-187.053" c1y="-45.8889" c2x="-184.684" c2y="-51.3787" vx="-179.93" vy="-62.0147" pressure="1"/>
  <segment c1x="-174.289" c1y="-74.633" c2x="-171.205" c2y="-80.6773" vx="-163.513" vy="-91.2438" pressure="1"/>
  <segment c1x="-157.132" c1y="-100.009" c2x="-152.924" c2y="-103.374" vx="-144.748" vy="-110.344" pressure="1"/>
  <segment c1x="-140.435" c1y="-114.022" c2x="-138.048" c2y="-115.631" vx="-132.29" vy="-117.864" pressure="1"/>
  <segment c1x="-124.909" c1y="-120.726" c2x="-121.137" c2y="-122.076" vx="-111.9" vy="-123.082" pressure="1"/>
  <segment c1x="-94.9214" c1y="-124.93" c2x="-84.1789" c2y="-125.184" vx="-66.7503" vy="-125" pressure="1"/>
  <segment c1x="-62.1564" c1y="-124.951" c2x="-60.7003" c2y="-123.606" vx="-56.8438" vy="-122.5" pressure="1"/>
  <segment c1x="-52.5065" c1y="-121.256" c2x="-50.0046" c2y="-120.967" vx="-46.2656" vy="-119.125" pressure="1"/>
  <segment c1x="-43.1612" c1y="-117.595" c2x="-41.6108" c2y="-116.829" vx="-39.7354" vy="-114.07" pressure="1"/>
  <segment c1x="-37.4562" c1y="-110.718" c2x="-36.1995" c2y="-109.159" vx="-35.8792" vy="-103.848" pressure="1"/>
  <segment c1x="-33.3054" c1y="-61.1712" c2x="-35.6699" c2y="-36.1813" vx="-32.5" vy="5.89951" pressure="1"/>
  <segment c1x="-32.2182" c1y="9.64117" c2x="-29.8977" c2y="9.33242" vx="-27.25" vy="10.7083" pressure="1"/>
  <segment c1x="-17.5664" c1y="15.7403" c2x="-11.5857" c2y="17.1174" vx="-1.67188" vy="21.9193" pressure="1"/>
  <segment c1x="3.29713" c1y="24.326" c2x="5.73907" c2y="25.572" vx="9.95703" vy="28.7298" pressure="1"/>
  <segment c1x="16.5135" c1y="33.6384" c2x="18.7502" c2y="37.1343" vx="25.2643" vy="42.0853" pressure="1"/>
  <segment c1x="27.3237" c1y="43.6506" c2x="29.2348" c2y="43.5518" vx="31.391" vy="45.0204" pressure="1"/>
  <segment c1x="34.8014" c1y="47.3432" c2x="36.3004" c2y="48.7108" vx="39.1807" vy="51.5638" pressure="1"/>
  <segment c1x="40.9138" c1y="53.2804" c2x="42.5298" c2y="53.3894" vx="42.9246" vy="56.4444" pressure="1"/>
  <segment c1x="44.2571" c1y="66.7564" c2x="43.7077" c2y="73.9012" vx="43.4989" vy="84.9813" pressure="1"/>
  <segment c1x="43.4378" c1y="88.2216" c2x="43.1368" c2y="89.7272" vx="42.2497" vy="92.2453" pressure="1"/>
  <segment c1x="37.1645" c1y="106.681" c2x="34.7822" c2y="114.059" vx="28.5681" vy="127.366" pressure="1"/>
  <segment c1x="26.1457" c1y="132.553" c2x="24.2334" c2y="134.446" vx="20.6584" vy="138.48" pressure="1"/>
  <segment c1x="18.4285" c1y="140.997" c2x="17.3878" c2y="142.329" vx="14.0558" vy="143.743" pressure="1"/>
  <segment c1x="6.02381" c1y="147.152" c2x="1.62872" c2y="148.478" vx="-7.75174" vy="150.538" pressure="1"/>
  <segment c1x="-17.6076" c1y="152.703" c2x="-22.9909" c2y="153.33" vx="-34.035" vy="154.307" pressure="1"/>
  <segment c1x="-47.6741" c1y="155.513" c2x="-55.4303" c2y="155.979" vx="-69.4597" vy="155.996" pressure="1"/>
  <segment c1x="-78.1908" c1y="156.006" c2x="-83.5893" c2y="156.267" vx="-90.9362" vy="154.375" pressure="1"/>
  <segment c1x="-94.9168" c1y="153.35" c2x="-95.6186" c2y="151.549" vx="-97.7786" vy="148.703" pressure="1"/>
  <segment c1x="-101.526" c1y="143.766" c2x="-102.177" c2y="140.075" vx="-105.705" vy="134.919" pressure="1"/>
  <segment c1x="-107.307" c1y="132.578" c2x="-108.517" c2y="131.817" vx="-110.602" vy="129.959" pressure="1"/>
  <segment c1x="-113.655" c1y="127.241" c2x="-115.034" c2y="125.734" vx="-118.551" vy="123.48" pressure="1"/>
  <segment c1x="-127.944" c1y="117.462" c2x="-133.798" c2y="115.61" vx="-142.878" vy="109.28" pressure="1"/>
  <segment c1x="-146.246" c1y="106.932" c2x="-147.402" c2y="105.23" vx="-149.672" vy="101.785" pressure="1"/>
  <segment c1x="-151.678" c1y="98.742" c2x="-152.488" c2y="97.027" vx="-153.57" vy="93.0602" pressure="1"/>
  <segment c1x="-156.048" c1y="83.974" c2x="-154.866" c2y="77.0087" vx="-158.574" vy="69.1526" pressure="1"/>
  <segment c1x="-162.778" c1y="60.2492" c2x="-169.037" c2y="59.9548" vx="-173.35" vy="51.1613" pressure="1"/>
  <segment c1x="-176.155" c1y="45.4419" c2x="-174.418" c2y="39.4426" vx="-176.37" vy="32.8703" pressure="1"/>
  <segment c1x="-178.329" c1y="26.2747" c2x="-180.951" c2y="24.6192" vx="-183.128" vy="18.2417" pressure="1"/>
  <segment c1x="-184.523" c1y="14.1554" c2x="-184.912" c2y="10.4332" vx="-185.301" vy="6.71091" pressure="1"/>
</curve>
</image>
```

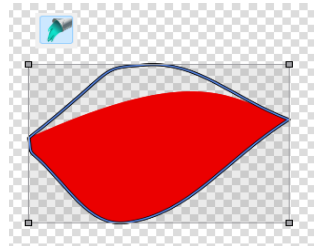
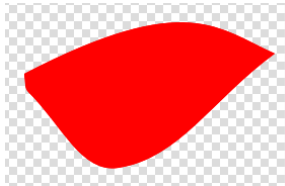
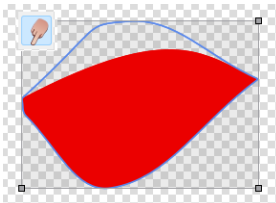
So I think if you want to experiment with Pencil2D vectors the best way is to play with the vector tools rather than dream of the possibilities of drawing using Inkscape, saving as an SVG and then importing it into Pencil2D.

This is because the mathematics of the conversion is complex. When you import SVG graphics into Adobe Animate or Moho Studio Pro the conversions are usually slightly different to the initial SVG file. These programs use 2nd Generation Bezier Graphics too.



You will also notice that when the shape is filled, the fill does not completely fill the complete shape. There is no way currently to achieve this and the best way to proceed is to colour the line an invisible colour.

Create a new colour and set the Alpha value to zero, then select the line using the  select tool, then using the fill tool outside the selected area change the line colour to the new invisible colour.



The blue line in the illustration above is the invisible line, to hide it use the smudge tool outside the shape and then click the mouse right button.

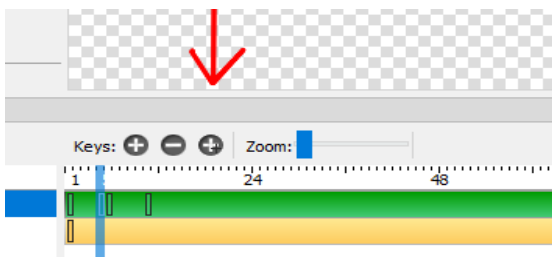
```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE PencilVectorImage>
<image type="vector">
  <curve width="3" variableWidth="false" invisible="false" filled="true" colourNumber="24" originX="-279.5"
originY="-44" originPressure="0.5">
    <segment c1x="-192.881" c1y="-122.026" c2x="-217.262" c2y="-120.052" vx="-168.5" vy="-124" pressure="0.5"/>
    <segment c1x="-118.462" c1y="-128.052" c2x="-86.9" c2y="-88" vx="-32.5" vy="-64" pressure="0.5"/>
    <segment c1x="-94.1" c1y="-18.8" c2x="-126.286" c2y="39.5838" vx="-186.5" vy="49" pressure="0.5"/>
    <segment c1x="-223.486" c1y="54.7838" c2x="-242.523" c2y="6.6227" vx="-275.5" vy="-26" pressure="0.5"/>
    <segment c1x="-279.723" c1y="-30.1773" c2x="-277.973" c2y="-36.1273" vx="-279.5" vy="-43" pressure="0.5"/>
    <segment c1x="-279.573" c1y="-43.3273" c2x="-279.536" c2y="-43.6636" vx="-279.5" vy="-44" pressure="0.5"/>
  </curve>
  <area colourNumber="1" filled="0">
    <vertex curve="0" vertex="-1"/>
    <vertex curve="0" vertex="1"/>
    <vertex curve="0" vertex="2"/>
    <vertex curve="0" vertex="3"/>
    <vertex curve="0" vertex="4"/>
  </area>
</image>
```

The above listing is the first shape draw with the vector line tool filled, with the lines hidden, using colour 24. The filled="true" signals that the shape is filled and the lines like <vertex curve="0" vertex="-1"/> are required for each of the control points. One of these points, the second in this example is outside the filled shape.



If we examine the curve with the larger number of control points, we can achieve a more complete fill.

You can achieve a shape with a line around it in true traditional cartoon fashion by drawing the shape, with the brush or pen tool, colouring it the desired colour. Then duplicating the shape using the duplicate button.



Then colour the copy black enlarge it both in terms of width and height and then copy the initial shape with the black line changed using the Invisible colour. It will look the same but if you duplicate the whole shape and move one shape over the other they will look correct and not look like the second image below.



When drawing characters and props in traditional hand drawn animation if the arm is in front of the body, you cannot see the body shape through the arm.

You'll also notice that using a black shape with the coloured shape on top allows you to have a line of varying width too.