

vectors

Pen tool

MAKING A FEW POINTS ABOUT BÉZIER'S

BY LIDKA SCHUCH

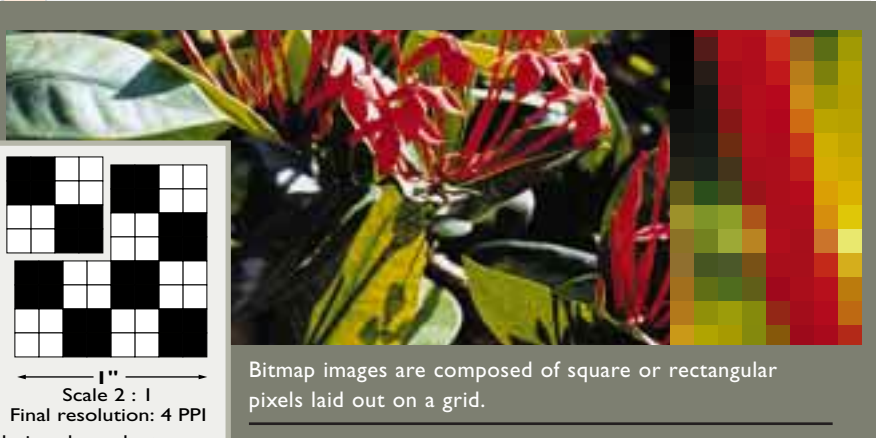
THE BÉZIER PEN TOOL — PROBABLY THE MOST DIFFICULT DIGITAL GRAPHICS TOOL IN precision drawing to learn, it is also the most important one. We owe its existence to French mathematician and engineer Pierre Bézier, the father of modern PostScript vector-based page description language. In early 1970 (yes, it was only twenty-something years ago) Pierre Bézier figured out a way to describe segments of curves using simple mathematical equations called functions. Originally, he applied this idea to his design of the first numerically controlled mechanical cutting device — the first cutter that gave us numerical rather than freehand control over drawing shapes.

When the development of WYSIWYG interfaces finally made digital technology ideal for the graphics industry, vector technologies became a vital part of the whole digital scheme.

Precision drawing, resizable fonts, resizable artwork — it is vector-based PostScript language that makes these all possible.

To explain the workings of the Bézier pen, let's look at the fundamentals of bitmaps and vectors.

LET'S START WITH BITMAPS

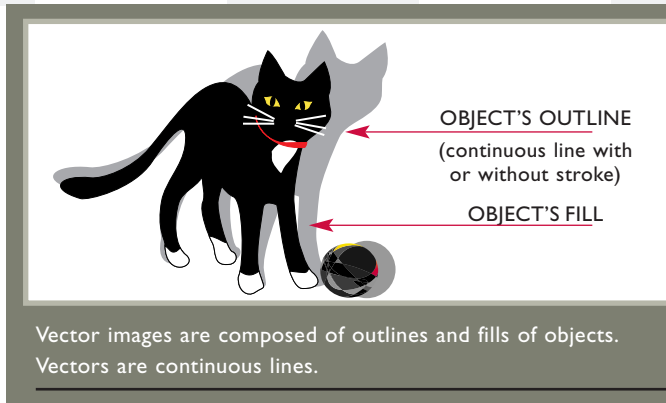


Bitmaps are great for images with a multitude of tones, laid out in an unpredictable and chaotic manner — such as in photographs and paintings. To create or edit an image like this, we need to have control over each and every pixel (the smallest element in a picture). Bitmaps offer just that. But a computer has to store, retrieve and process information about each individual pixel, which can slow it down. Also, since pixels are square blocks laid out on a grid, quality is affected by resizing. This means that bitmaps are resolution-dependent. So, bitmaps are great for raster images printed or displayed on a monitor, but ...

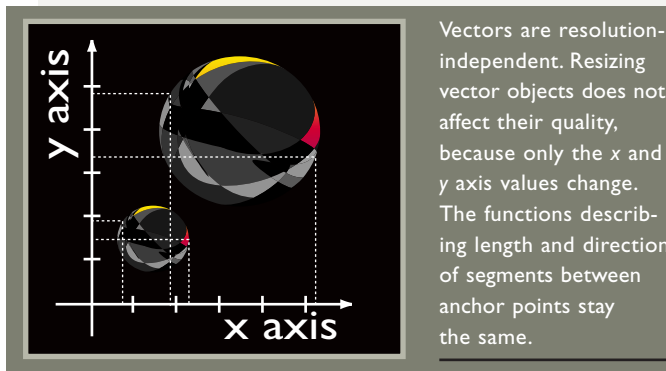
WHAT ABOUT LINE ART?

What matters in line art is the opposite of raster image requirements. In line art we want defined shapes and solid colors. Vectors give us just that: control over the shapes and fills of objects. Therefore, vector art is also called object-oriented art.

Since a computer only has to remember locations of points on an *x* and *y* axis and a few simple functions can



describe the length and direction of segments between these points, we reap the benefits of vector speed and clean, well-defined shapes, drawn with continuous lines. Vector art is also resolution-independent: we can resize objects freely



without loss of quality. When we resize an object, only the *x* and *y* axis values change, but the equations (called functions, in this case) stay the same. Drawing programs, like Adobe *Illustrator* or Macromedia *Freehand* are examples of vector-based applications used for creating and editing line art.

BITMAP, RASTER, VECTOR, OBJECTS — BUT WHERE DOES BÉZIER COME IN?

The Bézier pen exists in both environments. Adobe *Photoshop* and other commercial bitmap-based programs have this tool. If they didn't, how could we draw clipping paths and other complex selections that require a precise drawing instrument?

The technique of using the Bézier pen comes from real-life needs, and a vector creation environment

makes it possible. On a computer, as in real life, few of us can precisely draw a complex curve, or even a simple circle. Our wrists just don't turn smoothly enough and our hands are slightly shaky, even when we use tablets and pens (never mind an awkward mouse!).

The beauty of the Bézier pen is simple. It allows us to draw curves (called paths) in segments. We can pause when we need to, and start again when we need to. When compared to real-life rendering, this digital tool reminds me of a plain, old French curve!

Below are ten simple rules that should help you master Bézier creation:

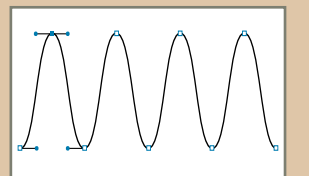
10 RULES FOR MASTERING BÉZIER'S

1. To draw **STRAIGHT** lines, place anchor points by **CLICKING** only.
2. To draw **CURVES**, place anchor points by **CLICKING AND DRAGGING** directional handles out of an anchor point.

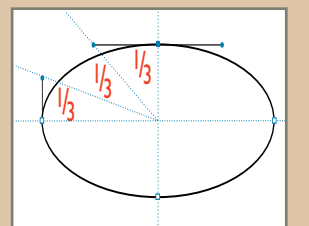
3. **PLACE ONE ANCHOR POINT FOR EACH CHANGE OF DIRECTION.** Imagine the shape in your head before you start drawing. If you are a beginner, draw a little sketch on paper first and mark all changes of direction. Then, draw it on the computer, looking at your sketch and placing anchor points where your marks are.



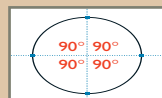
4. **USE AS FEW ANCHOR POINTS AS POSSIBLE.** Place them only where the path changes direction. This will assure that your paths are smooth and that they will print faster.



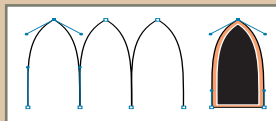
5. **DIRECTIONAL HANDLES SHOULD BE ABOUT ONE-THIRD OF THE DISTANCE BETWEEN ANCHOR POINTS.** One-third left in the middle is for averaging the force pulling from each handle.



6. For curves moving in **ONE DIRECTION**, place an **ANCHOR POINT EVERY 90°**.

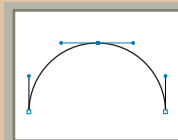


7. For curves **CHANGING DIRECTION AT A CUSP CORNER** (pointed — e.g. drawing an arch), place **ONE ANCHOR POINT AT EVERY CUSP CORNER**.



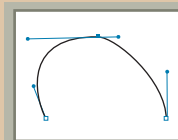
8. As there are only two main kinds of paths we can draw (straight or curved), there are also two main kinds of anchor points: **STRAIGHT point (CLICK ONLY)** and **CURVE point (CLICK AND DRAG)**.

9. There are three kinds of curve anchor points: **SYMMETRICAL**, **SMOOTH**, and **CUSP (or corner)**.



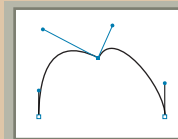
SYMMETRICAL:

Directional handles form a straight line and can be stretched in direct proportion to each other. Keeps the same curvature on each side of the anchor point.



SMOOTH:

Directional handles form a straight line but each handle can be stretched individually. Allows different curvature on each side of the anchor point.



CUSP (or CORNER):

Directional handles can be stretched and directed individually. Allows the curve to bend sharply.

In Adobe *Illustrator* and *Photoshop* an anchor point is symmetrical only while it is being placed. When you come back to edit it, it becomes a smooth point. If you need it to be symmetrical again, you can drag the directional handles out of it using the Convert Direction Point (Converter) tool. From every other path-editing tool there is a keyboard shortcut to momentarily change it into the Converter tool.

The Converter tool also toggles between:

CURVE/SMOOTH and **CURVE/CUSP** by clicking and dragging **DIRECTIONALS HANDLES**, and

STRAIGHT and **CURVE** points by clicking or clicking and dragging the **ANCHOR POINT**.

10. **USE KEYBOARD SHORTCUTS!!!** Many actions take far less time this way, leaving you free to be creative. If “the typist syndrome” is your problem, think of it like playing the piano. One important key to remember is the Command (Apple) key. In most programs, it is always somehow connected with selection tools. For example when you hold down this key in *Illustrator* it changes any tool in use to the last used tool — great for editing paths as you go. In *Photoshop* the Command key gets you back to the Mover tool, and in *QuarkXPress* it lets you toggle between Mover (Item) tool and Contents tool.

Use both hands, support your elbow, and don't worry if your drawing doesn't look great on the first try. After all, the digital environment has one advantage over an analog one: you can always go back and edit it again.

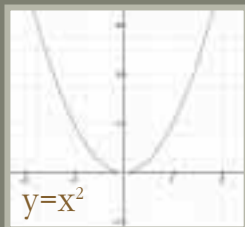
IF YOU HAVE A COMPUTER QUESTION, OR IF YOU NEED PROFESSIONAL TRAINING IN DIGITAL GRAPHICS, E-MAIL LIDKA AT STUDIO_L@ISTAR.CA, OR VISIT STUDIO L'S WEBSITE AT [HTTP://HOME.ISTAR.CA/~STUDIO_L](http://HOME.ISTAR.CA/~STUDIO_L).

GLOSSARY

BÉZIER PEN: a digital drawing tool which allows us to draw curves and straight lines in segments

BITMAPPED IMAGE: an image composed of pixels laid out on a grid.

FUNCTION: a mathematical equation that can be represented graphically with the use of x and y axis. For example: $y=x^2$
3-D objects are represented using x, y, and z axis



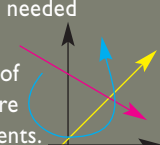
PIXEL: basic, smallest, square picture element

RASTER IMAGE: always used to describe an image composed of basic building blocks. Printed images are halftoned (broken) into series of dots. Therefore, in prepress terminology before computers, raster image

was a synonym for a printed image. Since bitmap images are also broken into basic building blocks (pixels), the word raster slipped into computer terminology as a description of a bitmap image.

Also, the process of converting image data into a pattern of printable laser dots (or breaking it into building blocks needed for printing) is called rasterizing.

VECTOR: a graphic representation of magnitude and direction. Vectors are represented by directed line segments.



VECTOR ART: also called object-oriented art. Images composed of objects with outlines and fills and numerically represented by positions of anchor points on x and y axis and vector functions describing the direction and length of segments between these points.



PIERRE BÉZIER

French mathematician and engineer, the father of modern PostScript vector-based page description language. (photograph courtesy of Bézier Fan Club at www.bezier.com)

PAGE 27

FUJI PHOTO AD — RPT JULY P. 1

FPO

About as small as a pack of cigarettes.



About as addictive.

The Fuji MX-700. No other digital camera offers the shirt-pocket sized brilliance of 1.5 million pixels. It also lets you easily merge images of brilliant quality into documents, presentations, webpages, or the Internet. Once you pick it up (for under \$1000), you can't put it down. Call Fuji at 1-800-461-7380 for more information.

