Preparing print-ready graphics that look great using JMP

Daniel Valente | DECEMBER 15, 2011

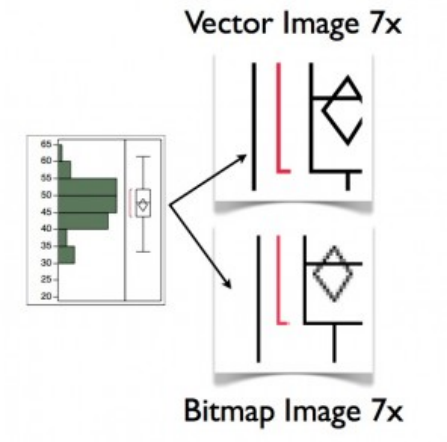
Graphics that are tailored for print in an article you are preparing have different requirements than those that are optimized for viewing on your computer screen. To understand why, we have to think about how graphics are images are displayed on the computer.

Computer screens are composed of many small rectangular cells called pixels. Pixels can be measured in dots per inch (DPI), which represents the number of individual elements that can be placed in a line spanning one inch on your screen. Different devices have different DPIs. For example, an average 15” laptop may have a DPI of 110 pixels. An iPhone 4, with its high resolution "Retina" display has a DPI of 326 pixels.

A higher DPI means that, when looking at the screen from a fixed distance, you will be less likely to make out individual dots. Unlike computer screens – which can display any color within a pixel by mixing varying amount of red, green and blue – printers require many more DPI to reproduce a color accurately and to ensure crisp text with graphics that have a high clarity.

Images that are displayed in the various platforms in JMP can be dynamically resized within the program. This means that as you make an image larger, there is no change in the clarity of the graphic; but when they are output as a bitmap image type (like a .png), they cannot be enlarged without a degradation in quality.

For example, see the image below. In this display, we are looking at a Distribution that I want to put into an article for print. I’ve selected just the graphic in JMP and not the summary statistics as they will be text in the body of the article. I’ve made this selection by using the Selection tool and then journaled the results. In the journal window, I have options to Save As a graphic file that I can then use in my article. If this image was destined for a Web page or a presentation only, I could save as a bitmap format such as .png. But since I want to be able to resize the image and print this at a higher resolution, I want to select .eps or Encapsulated PostScript.



This will now save my graphic as a vector image that can be resized or enlarged to any size without any loss of quality. I have taken small crops of a 7-times-enlarged version of the Distribution shown on the left with files saved in a scalable vector

image, versus a fixed-resolution bitmap image format. The difference is quite clear: The bitmap image degrades in quality when it is resized because the individual pixels that made up the image at 100% are now stretched to make the image larger. A dot that takes 1x1 pixel at 100% reproduction takes up 2x2 pixels when it is doubled in size through the enlarging process.

As a result, curves and angles don't look smooth anymore because we can see the individual pixels. Saving as a vector image results in smooth transitions at any size because the vector images can be scaled to any size without degrading quality. This is because the vector image uses a set of mathematical functions (the vectors) to draw the resultant image, whereas a bitmap image is simply a matrix of fixed pixel-based values. For more information on the difference between vector and bitmap images, the Wikipedia article on vector graphics is highly informative.

This concept becomes very important in preparing graphics created in JMP for print. Graphics for print have much different requirements. Often when you wish to submit articles to journals for publication, you will need to follow specific formatting rules to ensure that graphics will look good in print.

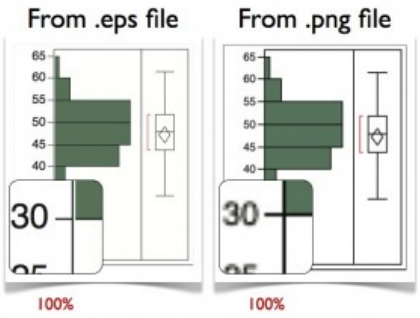
For example, the American Institute of Physics has a list of 12 points for preparing graphics files.

A key point for figures (like ones that are created in one of the platforms in JMP) is that you want to create images that are sized appropriately for the journal as they will appear in publication, such that that journal publication staff will not have to resize anything to make it fit in the article for print.

An additional concern is that you want to avoid submitting graphs that have excessively small or large labels. Everything should be in proper proportion. Finally, this particular journal wants images submitted as either .tiff or .eps file formats with a resolution of 300 DPI.

So let's go back to my Distribution from earlier. I've decided that I want this graphic to be 4 inches wide in print at a resolution of 300 DPI. In the program I use for graphic layout and preparation for print, Adobe Illustrator, I've created a new document that is 4" x 5" at 300 DPI (1200 x 1500 pixels).

In the figure below, you can see the resultant graphics file either from the scalable .eps format or from the fixed-resolution .png format. In both cases, I've had to resize the file that I have saved out of JMP so that in print it has the dimensions that I need (in this case 4" x 5"), at the resolution that is required by the journal (300 DPI).



You can see that when I resized the file saved from JMP as a .png, the image quality went down. This would be unsuitable for print as you can see the individual pixels because they are now larger. Everything has been scaled properly when using the .eps format, and at this point, I can either save the file as an .eps again (now that it is properly sized to be printed at 100%), or save it as a high-quality 300 DPI .tiff file as needed by this specific journal.

Another nice feature about importing .eps files into a program such as Adobe Illustrator is that I can modify each line within a graph, change text or adjust the graphics in order to make the best images of my analysis for print. Because everything shows up as an individual, editable object, I have the flexibility to modify my files after they have been saved, make decisions about the look of axis labels, or add text-based legends or labels.

Any of the outstanding graphical output in JMP can be made print-ready conforming to any style outlines of a print journal using this technique. If you are looking for a way of displaying .eps files and don't have access to Adobe Illustrator, you do have other options for either Mac OS X or Windows platforms. The way to do this is to resize the image in JMP and then use a free viewer to see your .eps files. The following viewers are available for Windows or Macintosh systems:

- Ghostview – a free viewer that can read .eps files is available for Windows users.
- Preview – which is included on all installations of Mac OS X and can read .eps files.

An editor such as Adobe Illustrator will make it easier to customize your graphics as well as fine-tune the exact sizing and final output, but you can still make this technique work with the above-mentioned, free tools.

In the next installment in this series, I will go through this process step by step in a video tutorial.

Editor's Note: The first part of this series was "Graphical output options in JMP."

tags: *bitmap image*, *eps*, *JMP for publication*, *JMP graphics*, *png*, *print-ready images*, *vector image*

One Comment

MS

Posted December 16, 2011 at 4:16 pm | *Permalink*

I also prefer to use Illustrator to give JMP graphics the final touches, such as changing fonts, deleting unnecessary elements or combining graphs. I can add to this excellent series of postings, that, at least on the Mac, one can skip the .eps export and just copy paste. The clipboard retains all vector graphics incl. fonts (as pdf).

One Trackback

1. By Print-ready graphics from JMP: Step-by-step video tutorial on December 20, 2011 at 9:09 am

that affect a global business

Value Alley
Your pathway from strategy to process to repeatable value creation

SAS Learning Post
Technical tips and tricks from SAS instructors, authors and other SAS experts.

Graphically Speaking
Data Visualization with a focus on SAS ODS Graphics

SAS Users
Providing technical tips and support information, written for and by SAS users.

A community of data management experts

COUNTRIES AND REGIONS

Hidden Insights
Experience the possibilities with Business Analytics

Klog på SAS
Tips og tricks til effektiv SAS-programmering

Mehr Wissen
Big Data Analytics in Deutschland, Österreich und der Schweiz

State and local governments using data to serve citizens and save money

The Analytic Hospitality Executive
Finding analytic solutions to your forecasting, pricing and operational challenges.

Pathfinders
Exploring SAS Curriculum Pathways & Instructional Technology

Made in… Analytics
Your guide for improving manufacturing outcomes with advanced analytics

---