Lecture Notes: Writing Tools

In this set of notes I cover two important types of tools for creating high quality written documents: typesetting systems and vector graphics tools. Neither type of tool is commonly available or used in MS Windows, particularly in MS Office. This is because MS Office is not concerned with producing high quality documents. It is generally used to produce common home and office documents, such as reports, spreadsheets, memos, letters, etc. By "high quality documents", I am referring to books, articles, published papers, theses, and other documents where the appearance is more important than for unpublished materials. There are certainly appropriate times to use office-like tools, but when an author desires to achieve the highest quality document, the tools discussed in this lecture provide a much higher quality.

The goal of a typesetting system is to separate content generation from document layout. This is in direct contract to a WYSIWYG system (what you see is what you get), where document appearance is created simultaneously with content. One advantage to a typesetting system is that the author can focus on content generation independent of worrying about appearance. This is especially useful when the document is changing, for example going through multiple revisions. In this case it can be a waste of time to work on appearance when future additional content may cause large changes in appearance. Another advantage is that the typesetting system generally has thousands of rules that it uses to generate the layout, which collectively are superior to an ad-hoc approach. For example, the rules will include how to handle hanging lines, how to vertically and horizontally space text for optimal appearance, relative font sizes for headings and captions, and many many others.

TeX is the dominant typesetting system although there are others such as SGML/XML. This lecture will focus on TeX. TeX is platform independent, free, and very stable. Common releases are MikTeX for MS Windows, and TeX Live for linux/unix. TeX has great support for typesetting mathematical equations and non-Latin alphabets. Because it is so stable, one can expect that a document written today will produce the exact same document output years from now. TeX files are also plain text, so that they are small and easily edited. TeX can take some time to learn to use, and it can feel a little strange if your only previous experience writing documents is with WYSIWYG tools. During the lecture, I will demonstrate the creation of a TeX document, along with some common TeX features. However, there are several good guides online that can be used as manuals and references, such as "A Gentle Introduction to TeX" and "TeX for the Impatient", both of which are free on-line books. A wiki is available at `http://en.wikibooks.org/wiki/TeX`. There are many quick guides that can be found using simple google searches such as "guide to tex" or "tex math symbols".

For graphics, it is important to understand the difference between raster and vector graphics, and use the appropriate tools for each. Raster graphics are images. They are large

files because they provide a color for every pixel across a raster. They can resize smaller, but do not resize larger very well because colors for in-between pixels have to be interpolated. This leads to jagged (pixelated) effects. Raster graphics are also bad for text or straight lines, because interpolated pixels will look blurred. Vector graphics are sets of primitives. Example primitives include points, lines, and text. A vector graphic file is small because it stores only the primitives; for example, storing a line takes only 2 points, instead of the pixel colors along the entire line. Vector graphics are well suited for resizing, because the primitives can be resized before drawing.

The image file formats, such as png, tiff, gif, jpeg, and ppm, are all used for raster graphics. Vector file formats include eps, ps, and pdf. As a general rule, if you are making a figure with only image content, then raster file formats are okay. If you are making a figure that includes text, hand-drawn shapes, a table or a flowchart, then the figure should use a vector file format.

Tools like MS Paint and MS Office use raster graphics formats by default. There are several tools that can be used to draw and manipulate vector graphics, such as inkscape. Some tools like Adobe Photoshop work with both formats. It can take a little time to become proficient with a vector graphic drawing tool, but the improved quality in figures is well worth it. I will demonstrate the tool tgif in class. I will also demonstrate how to include a vector graphic file into a TeX document.