Creating TrueType Fonts For Use As Symbols in ArcGIS™

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Introduction

Most organizations need to use iconic symbols of some sort in their documents and maps. These icons may be a widely used standard like the Visa or MasterCard symbols or something custom like an organization's logo. Using these symbols in documents and presentations has often been a problem because the only way to do so was to scan the symbol and use it as a bitmap. Bitmap images offer a trade-off, quality at the expense of performance. For presentations bitmap images are particularly bad because they are often displayed at large sizes and are usually perceived to be of low quality. It is also difficult to publish documents that contain bitmaps due to large file sizes or incompatibilities in the bitmap formats.

In late 1995 ESRI began supporting TrueType fonts as an option for the source for artwork in symbols. By 1997 ESRI had replaced all its bitmap images with TrueType font based symbols in its ArcView product line and had added full support for TrueType fonts in the ArcInfo product line. This was a popular idea as MapInfo Corporation, Caliper Corporation, and Intergraph Corporation also added support for TrueType fonts at or around that same time. The main reason for this migration was to afford mapmakers a higher quality option that was considerably more efficient to work with.

Today ESRI has a large library of standard symbols that are based on TrueType fonts. However, despite this plentitude of symbols, cartographers always seem to want more or slightly different symbols. This article will introduce many of the concepts that pertain to TrueType fonts and the necessary knowledge to create or edit TrueType fonts so they will work with ESRI's ArcGIS products. While that is obviously a product specific direction, the concepts and many of the specific settings will apply to any software that uses TrueType fonts.

Advantages of Symbols that use TrueType Fonts

TrueType fonts as the basis for symbols on a map offer some distinct advantages to cartographers. However, it would be good to note that these advantages really apply to all vector based fonts, for example, OpenType and PostScript fonts. The following are the main advantages to using TrueType fonts as symbols on maps:

1. TrueType fonts are easy to use. Once installed, a TrueType font is accessible to all software applications.
2. Using TrueType fonts generally results in smaller document sizes. Using a TrueType symbol will increase the file size of your document by just a small number of bytes. This is because nothing that is already in the font is redundantly stored in the document. Conversely symbols that are based on bitmap images often require at least one copy of the bitmap to be stored in the document. Some GIS or map making software packages permit symbols to reference external files, but distributing the document file that references these other files can be a frustrating experience.
3. TrueType fonts can be embedded in digitally published documents. As mentioned above, typically GIS and mapping software packages merely reference which characters to use. While efficient, this is not always an effective way to distribute a document because others may not have the same TrueType font available on their computer. Rather than having the software on somebody else's computer substituting another font, a font can be embedded in the document with only a small file size penalty (usually about 100Kb). Embedding can take several forms. ESRI's ArcMap™ application supports embedding in the form of the creation of a PostScript Type 3 font within its EPS (Encapsulated PostScript) and PDF (Portable Document Format) export formats. Only the characters that are actually used get embedded.
4. The graphical quality of a glyph in a TrueType font can be of very high quality. TrueType fonts typically store vector outlines, including parametric definitions for curves that can be scaled to any size with no loss of quality. TrueType fonts also afford the ability to be displayed at any device resolution, i.e., a computer screen or a high-resolution printer with optimal quality. Symbols based on bitmap images cannot scale or adapt to multiple resolutions.
5. Using TrueType fonts often results in work getting done faster. TrueType fonts are handled more efficiently by the operating system for display and output purposes.

A Brief Anatomy of a Font

The definitions of terms and

properties that follow apply to all formats of fonts, not just TrueType.

- Font Family: A font family is a group of fonts that resemble one another, and are visually compatible. One member of the family may be italic, another other bold, another bold and italic, etc. Examples of font family names include Helvetica, New Century Schoolbook, and Times New Roman. Font family names are not restricted to Latin characters. Font families may be grouped into different categories: those with or without serifs, those whose characters are or are not proportionally spaced, those that resemble handwriting, those that are fantasy fonts, etc.
- Typeface or Font: A visually consistent set of characters or glyphs. A font or typeface includes characteristics of style. Typically a font's name includes the family name and the style, for example, Helvetica Bold.
- Font Style: The font style specifies whether the font is normal, bold, italic, etc.
- Font Variant: The font variant indicates whether the font contains normal upper and lower case characters or whether it contains small-caps characters.
- Font Weight: The font weight refers to the boldness or lightness of a font's glyphs.
- Font Size: The font size refers to the size of the font in point units. 72 points equals one standard inch.
- Font Menu Name: This is the name used to access a font in a software application. In the case of Souvenir ™, the Menu Name is the same for all weights of the Font.
- Glyph: A glyph is an individual character within a font.
- Type Spacing: Type is defined by the space around it, whether between letters, words, or lines. Commercially printed text and all the modern digital type used on computers are designed to be spaced proportionally. With proportional spacing, each letter is given just the amount of space it needs to look right and be most legible. Using a proportional font, you can fit much more text on a page than using a fixed-pitch font and improve readability.
- Leading: Leading is the distance between lines of type and is measured in points. During the days of metal type, printers inserted extra strips of lead between long lines of text to make them easier to read. That procedure gave rise to the term "leading."
- Resolution: Characters in TrueType fonts are defined as resolution independent outlines. However, resolution becomes relevant when the image is output to either the screen or a printer at which time the operating system will create the image at the resolution level of the output device. Therefore if you are using a 600 dpi printer the resolution of your character will be 600 dpi.

Creating TrueType Fonts for use with ESRI's ArcGIS Software

TrueType fonts are primarily created using special software packages specifically created for building typefaces. There are several good font editing software packages commercially available. Of these, ESRI uses FontLab by Pyrus North America Ltd. to create its TrueType fonts. FontLab has a relatively easy learning curve while remaining a powerful typography tool.

To create TrueType fonts for use with ESRI's ArcGIS software use these recommended internal font settings:

1. Internal font settings when saving a TrueType font:
   a. Family Name does not begin with the letter "A".
   b. Family Name must match the Menu name.
   c. Family Name cannot conflict with existing installed font names.
   d. Font UPM setting is 1000
   e. Alignment is set to local zones
   f. Set PANOSE Family Kind to Latin Text
   g. IBM identification is set to "No Classification"
   h. Supported Code pages is set to 1252 Latin 1, Character Set to ANSI
   i. All Embedding allowed (for exportability)
2. It is important to use the following ASCII ranges with ESRI's ArcGIS software products: ASCII 33-125, 161-172, 174, 176-180, 182, 184-255.
3. Most TrueType fonts created for use as marker symbols in ESRI's ArcGIS products follow a "symbol" font design. This means the individual characters are not intended to be used in a text document as text, dingbats, or bullets.

Creating glyphs that are intended to overlay in specific ways

The following example will be specific to ESRI's ArcMap software. Unfortunately this example
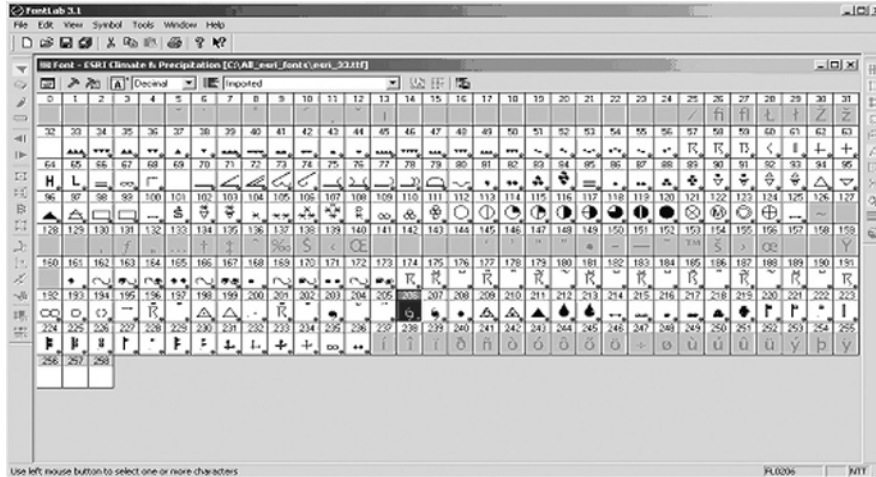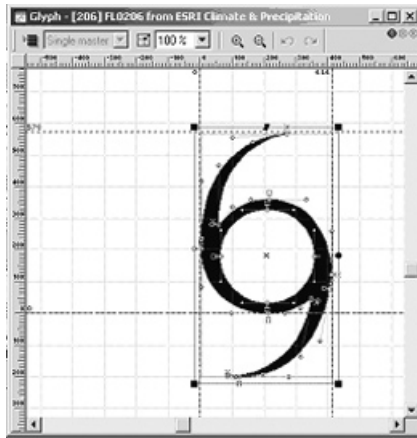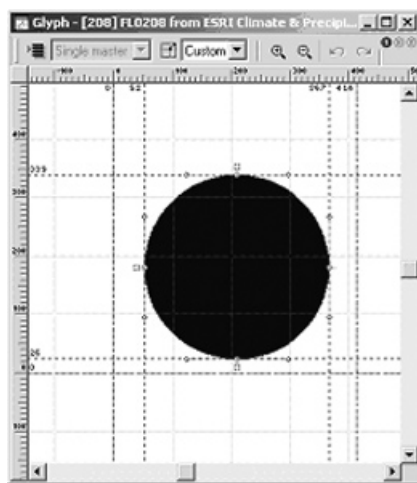

Figure 1

Figure 2

Figure 3

Figure 4

cannot be guaranteed to apply to other software packages, including ArcView GIS and workstation ArcInfo because the settings or metrics that control the positioning of font glyphs can be interpreted and used in several ways.

This example will show how to create two glyphs that will overlay to form a symbol is that used to represent a typhoon or tropical storm (Figure 1). In this case the glyphs are already included in the ESRI font called ESRI Climate & Precipitation (esri_155.ttf). Figure 2 shows what the FontLab application looks like with the ESRI Climate & Precipitation font loaded. The entire contents, all the glyphs, are shown here. The two glyphs that will be used in this example are numbers 206 and 208 (Figures 3 and 4).

Each glyph can be shown in a window that shows the size of the glyph in font units. Notice the baseline extent (distance from lower-left to lower-right) for both glyphs is 414. This is an important dimension for glyphs that are intended to align when overlaid because by keeping each glyph's extent the same you can create artwork in the font creation software that is relative to the centroid (denoted by the "x") allowing it to align when used in ArcMap. If the baseline extent is different, the centroids will not overlap, causing

the glyphs to have different centers of rotation.

In order to compare the actual glyph alignment, it is often helpful to select, copy and paste one glyph into another glyph's pattern cell and align the glyphs to check their relative size and fit.

Summary

Hopefully this article has shown that TrueType fonts are a good means for storing artwork for symbols, while affording excellent document publishing and management options. Also, creating and editing TrueType fonts is a task that any cartographer with a modest background in graphics software can readily learn to do. Finally, for more in-depth information, www.truetype.demon. co.uk provides an excellent set of resources for TrueType fonts.

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