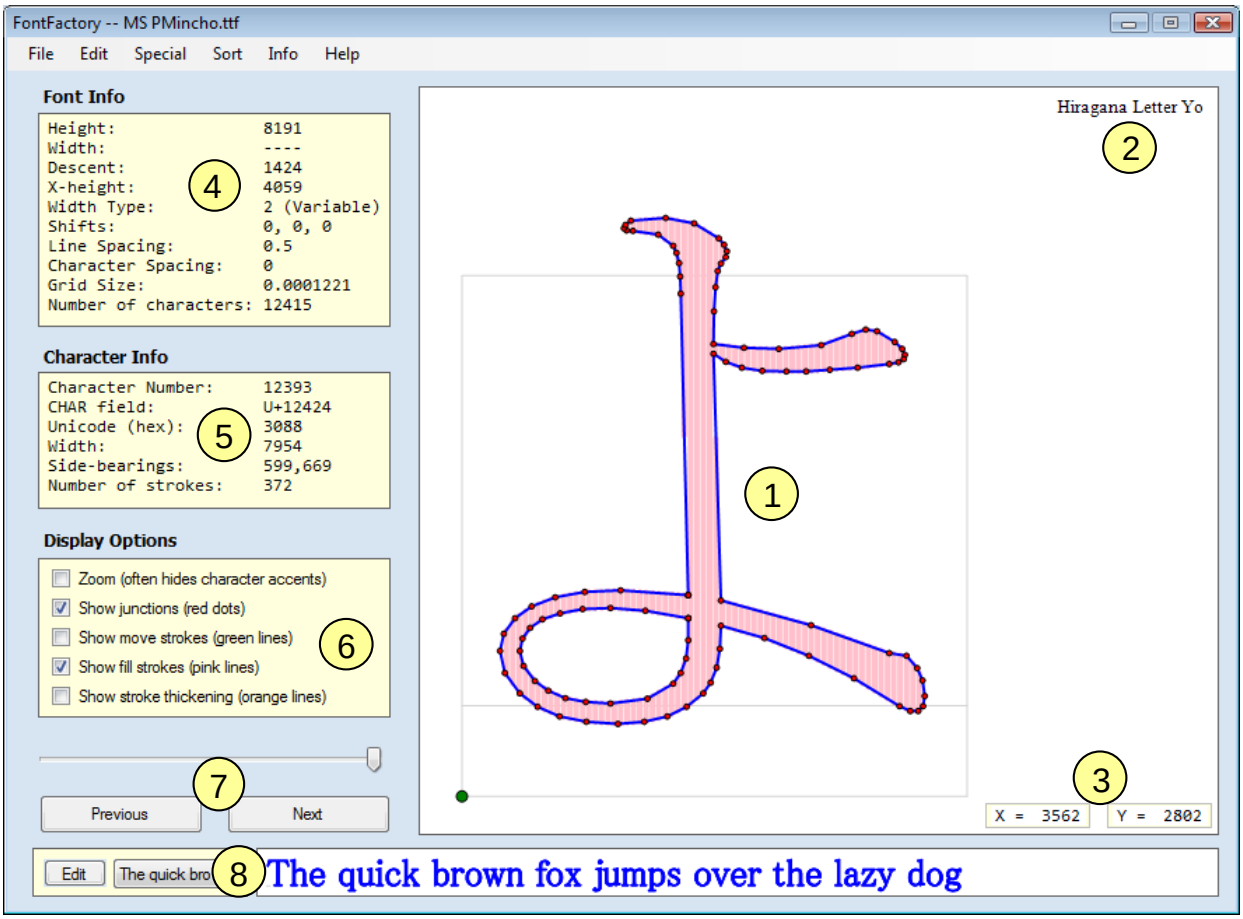
FontFactory



Introduction

FontFactory is an application for working with NX fonts. Among other things, you can look at them, modify them, and convert them to and from other formats. These notes provide a brief outline of its capabilities. The following sections describe the individual functions, and then, at the end, there are some step-by-step instructions for performing a few common tasks.

Installation

Copy the file FontFactory.executable to someplace on your hard disk, and change its extension from “executable” to “exe”. For added convenience, make a shortcut and place it on your Desktop or on your Programs menu, if you want to.

The FontFactory Window

The FontFactory window is shown above. It provides:

(1) A display of the current character in the current font
(2) The Unicode name of the current character
(3) The cursor location, in the font coordinate system
(4) Some information about the current font
(5) Some information about the current character
(6) Some options to control the character display
(7) Controls to move from one character to another
(8) Some functions for controlling a sample of text

The File Menu

Open

FontFactory allows you to open NX font files that are in either .FNT or .FNX format.

Save

Saves your font file in the current format with the current name. You can save fonts in either .FNT or .FNX format. Files in the .FNX format are usually more useful, since these can immediately be used within NX. Save in .FNT format if you want to modify your file with a text editor.

Save As

Allows you to choose a new name or format for the file .

In addition to the FNT and FNX formats, you can also save fonts in the SFD format. This is the file format used by a free-ware font editor named FontForge. You can then use FontForge to thicken strokes, edit in other ways, and save the font in TrueType format. This gives you a way to convert NX fonts to TrueType form.

You can also save fonts in PostScript Type 3 (PT3) format. This is a not likely to be useful, though.

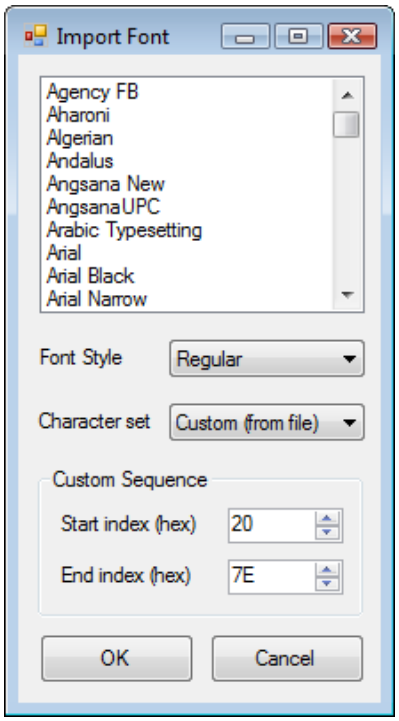
Finally, you can save a Character Table text file. This is a tabular summary of the characters in your font, and their properties, in a form that is suitable for import into MS Word or MS Excel. This is essentially the same information you get in Info → Character Table.

Close

Closes the file you are working on.

Import TrueType

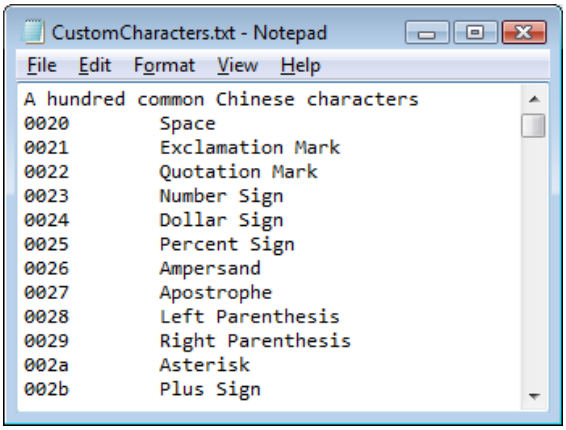
Allows you to import a specified range of characters from a Windows TrueType font. You can then save the font in NX form. You can find out which characters are available by using the Windows Character Map accessory or the MS Office Insert Symbol function. These two tools both use hexadecimal (base 16) numbers to describe character positions, so FontFactory does the same, for consistency.



Since dealing with hexadecimal codes is somewhat painful, some common ranges of characters can be selected from a menu on the dialog.

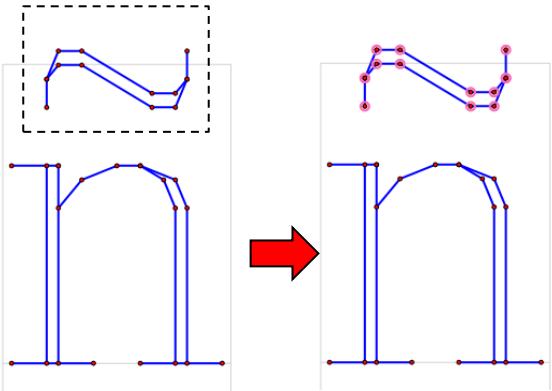
Only a few fonts include broad ranges of characters covering many different languages. Arial Unicode and Lucida Sans Unicode are two of the richest.

The most flexible way to specify a character set to be imported is to choose the Custom (from file) option. FontFactory will look for a text file called CustomCharacters.txt, and will use this to guide the import process. In this file, the first four characters of each line give the Unicode integer for a character you want to import, in hex format. If the first four characters can not be interpreted as a hex integer, the line is skipped. Any text beyond the first four characters is also ignored.



The Edit Menu

The Clipboard-related functions on the Edit menu operate either on selected strokes, or on the entire current character (if no strokes are selected). To select strokes, drag a rectangle around them in the main character area. The selected strokes will be highlighted with orange circles at their end-points, as shown in the picture. To deselect all strokes, click in some vacant area.



When a character is placed on the Clipboard, it is represented as text, as it would appear in a FNT file.

Collections of strokes are also represented as text (wrapped in a “fake” character). So, you can freely cut and paste stroke and character data between Fontfactory and text editors like Notepad or MS Word, in either direction.

Cut

Moves the current character (or selected strokes) to the Windows Clipboard.

Copy

Copies the current character (or selected strokes) to the Windows Clipboard.

Paste

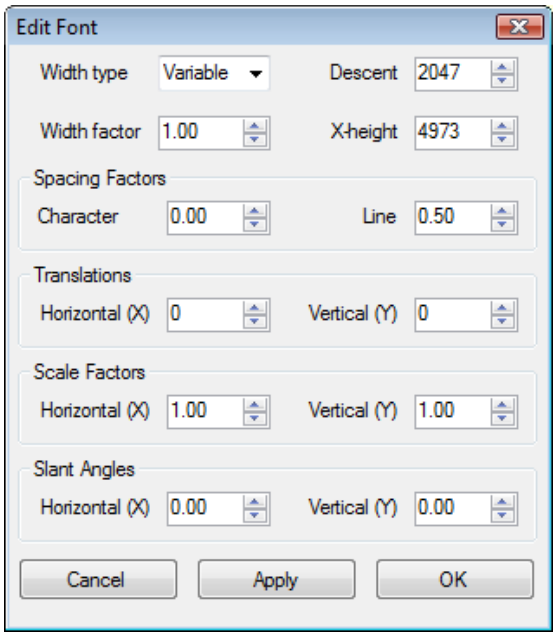
If the Clipboard contains strokes, these are inserted into the current character. If it contains an entire character, this is inserted into the font.

Clear

Deletes the current character (or selected strokes). Note that nothing is placed on the Clipboard, and FontFactory does not have an Undo function, so things that you delete are gone forever.

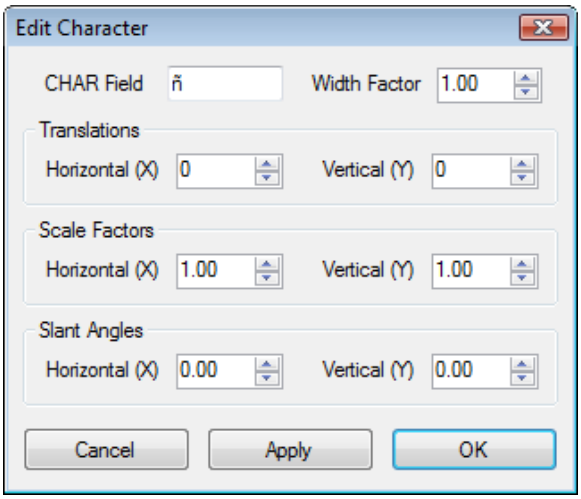
Edit Font

Allows you to edit the overall characteristics of the font as a whole, such as its x-height and character spacing. Also allows you to apply a common transformation to every character in the font. So, for example, you could slant every character or shrink them all horizontally.



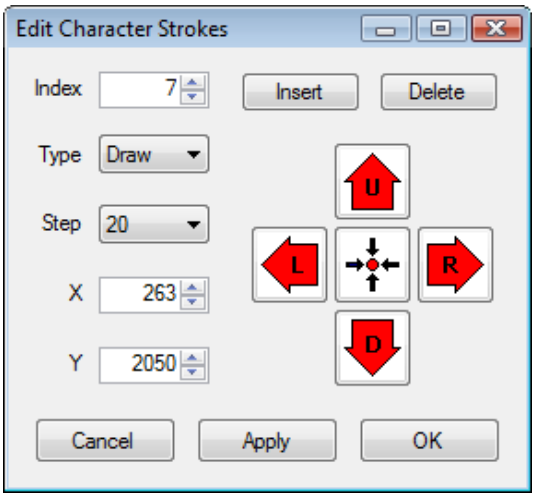
Edit Character

Allows you to edit the characteristics of the current character, such as its width or the keystroke(s) assigned to it via its “CHAR” field. Also allows you to apply a transformation to the character, to move it or stretch it.



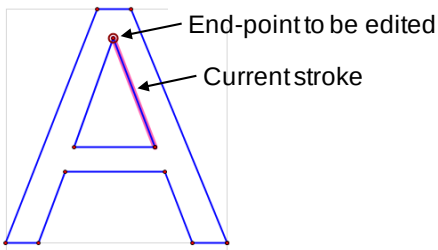
Edit Character Strokes

Allows you to edit the individual strokes in the current character. You can select the strokes to edit either by dragging a rectangle around them or by using the Index field in the dialog.



The behavior of the function depends on whether you have selected one stroke or several.

If one stroke is selected, it is drawn in pink, and its end-point is marked with an orange circle. You can use the red arrows to move the selected point around, or you can position it precisely by entering X and Y values. The Insert button allows you to insert a new stroke (by dividing the current stroke into two).

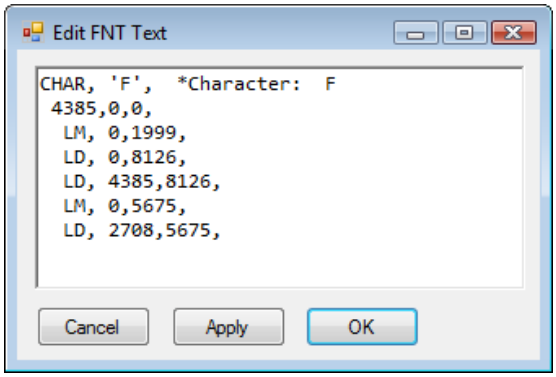


If several strokes are selected, then the X and Y fields disappear from the dialog, so you can only move strokes incrementally. Also, the Insert button becomes inactive.

In either state, the center button with four arrows will return the selected strokes to their original positions, and the Delete button will delete them.

Edit FNT Text

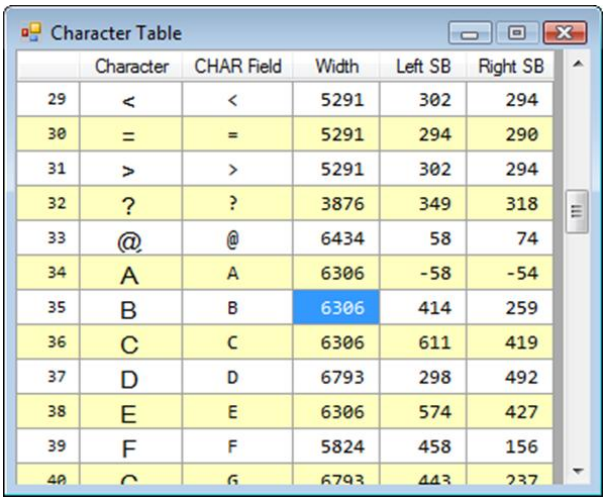
Allows you to edit the textual representation of a character, as it would appear in a FNT file. This is a very low level and tedious form of editing, but it is useful sometimes:



The NX documentation has a good description of the FNT file format, which you should read before you begin.

Edit Character Table

This function displays an editable table representing all the characters in your font



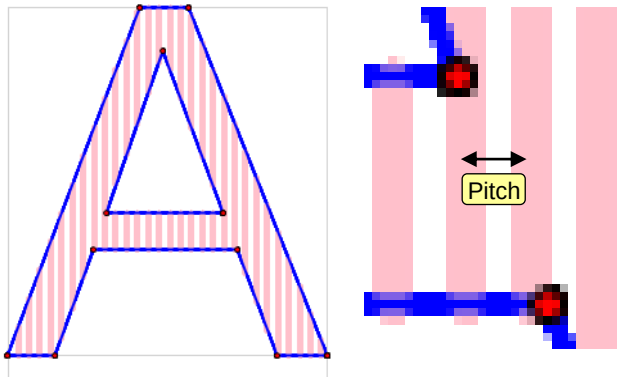
	Character	CHAR Field	Width	Left SB	Right SB
29	<	<	5291	302	294
30	=	=	5291	294	290
31	>	>	5291	302	294
32	?	?	3876	349	318
33	@	@	6434	58	74
34	A	A	6306	-58	-54
35	B	B	6306	414	259
36	C	C	6306	611	419
37	D	D	6793	298	492
38	E	E	6306	574	427
39	F	F	5824	458	156
40	G	G	6793	443	237

You can not edit the first two columns, but you can edit the four on the right. This table is especially useful for editing the "side-bearings" of large numbers of characters. The side-bearings are the spaces between the "ink" of the character and the edges of its bounding box. Getting these values correct is important if you want your text to look nicely spaced. The description of the Set Side-Bearings function has some more details.

The Special Menu

Fill Characters

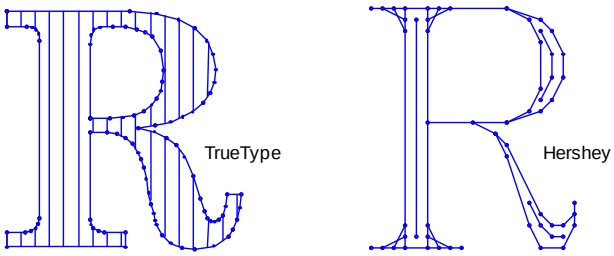
Allows you to fill the interior of the character outlines with vertical strokes (see below). Typically you would do this after importing a TrueType font, to make it more legible within NX. The Line Pitch parameter controls the spacing of these vertical lines. The best spacing will depend on the size of characters you will use and the resolution of your printer/plotter. A high-resolution device will draw thinner fill lines, so they will have to be spaced more closely.



The filling is somewhat intelligent – it will not insert fill strokes that are too short to be visible. Some TrueType fonts don't need to be filled at all; for example, at typical sizes, the Courier font generally looks fine without any filling:

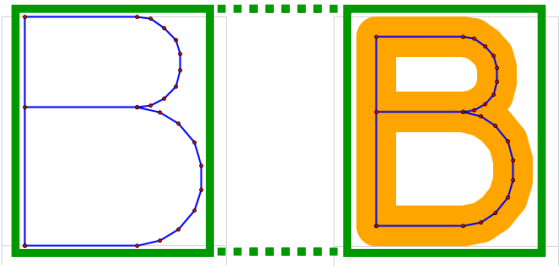
The quick brown fox

It's best to avoid filling, if you can, because it places a very heavy burden on NX display. Or, you might try using the Hershey fonts, which give you lightweight filling achieved through craftsmanship, rather than mathematical brute force.



Thicken Strokes

Simulates thickening the strokes of characters. This thickening is one of the steps in converting a traditional NX font into a useful TrueType font. The thickening itself must be done in a font editor such as FontForge or FontLab, but this function allows you to see what the final results will look like. More importantly, it offsets the strokes so the subsequent thickening produces a character with the same overall size as the original one.



Upgrade Resolution

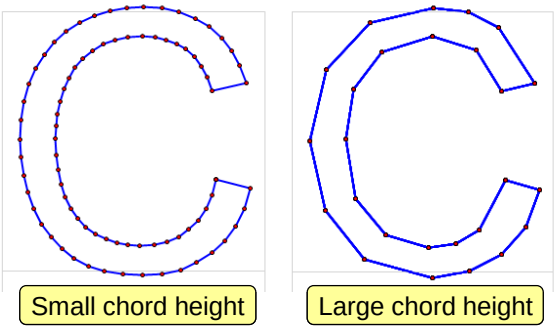
Changes the resolution of the font to 8192. This does not change the size of the characters, it just changes the precision with which they are represented internally. You should always use Upgrade Resolution before you Slant a font -- the slanting operation will ruin the shape of low-precision fonts. In many cases, FontFactory upgrades resolution automatically, so you don't have to.

Reduce Strokes

Eliminates some types of redundant strokes in the font. For example, two strokes that are almost collinear will be replaced by one. Also, strokes of zero length are removed and consecutive "Move" strokes are compressed.

Change Chord Height

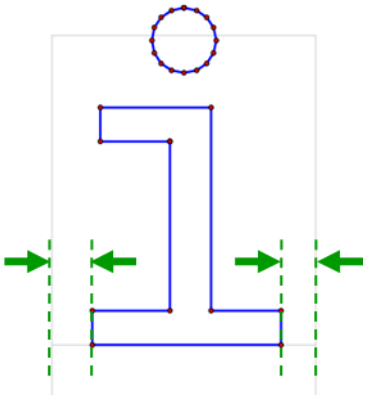
The characters in a TrueType font are made from Bezier curves. When the font is imported into FontFactory, these Bezier curves have to be approximated by straight lines. The chord height parameter controls how many lines (strokes) are used. A small chord height will produce a smooth character shape with a large number of strokes. A larger chord height will produce a rough shape with fewer strokes.



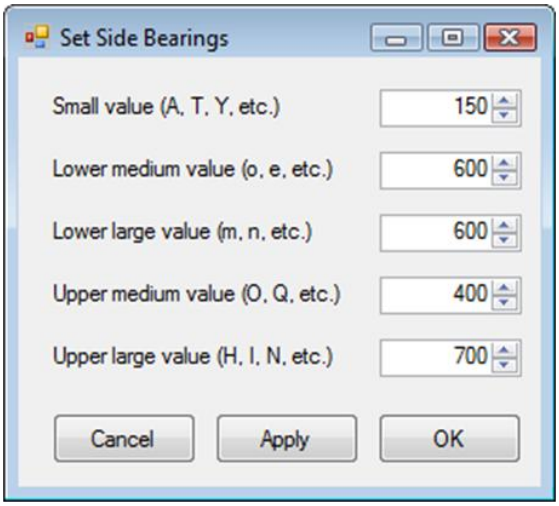
Set Side-Bearings

As mentioned earlier, side-bearing values are important because they determine the spacing of characters. This function gives you a way to set side-bearings consistently in your font, based on knowledge of character shapes. Some fine-tuning will almost certainly be necessary, but this function can reduce the tedious work.

Left and right side-bearings are shown in the following picture:



As the dialog suggests, you should generally use smaller side-bearings for sharply pointed characters, medium-sized ones for rounded characters, and large ones for flat-sided characters, but this is just a guideline to get started – the appearance of text is the final criterion.



The Sort Menu

By Stroke Count

Sorts characters according to how many strokes they have, from smallest to largest. The characters with the largest numbers of strokes will end up at the far end of your font, so you can easily check to see if any of them exceed the 512-stroke limit.

By Unicode

Sorts characters according to their Unicode values, if known. Characters whose Unicode values are unknown to FontFactory will end up at the far end of the font, so you can easily find them and decide what to do with them.

By Width

Sorts characters according to their width. This can be useful if you are trying to ensure that all the characters in some collection have the same widths. Like numerals, for example.

The Info Menu

Large Characters

Provides a list of characters that have a large number of strokes. This is important since NX has a limit of 512 strokes per character. If your font contains characters that are too large, you can increase the chord height parameter (if it's a TrueType font), reduce the number of fill strokes, or delete individual strokes. The @ and % characters are two that are often the worst culprits.

Empty Characters

Finds characters that have no strokes.

Duplicate Characters

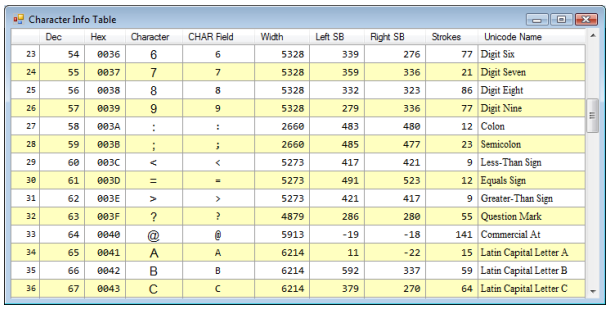
Finds duplicate characters. This function actually looks for duplicate Unicode values, which are, in turn, inferred from the contents of the CHAR fields. So, if you have two characters in your font, one having "B" in its CHAR field, and the other having U+0066, these will be reported as duplicates, since "B" and "U+0066" are the same Unicode character.

Missing Characters

Finds cases where some of the first 256 "common" characters are missing from your font. When you import a TrueType font, you should choose the "European" character set if you want to get all these characters. Using the "English" character set will result in a large number of gaps.

Character Table

Displays a large table giving you lots of information about the characters in your font.



Character Info Table

	Dec	Hex	Character	CHAR Field	Width	Left SB	Right SB	Strokes	Unicode Name
23	54	0036	6	6	5328	339	276	77	Digit Six
24	55	0037	7	7	5328	359	336	21	Digit Seven
25	56	0038	8	8	5328	332	323	86	Digit Eight
26	57	0039	9	9	5328	279	336	77	Digit Nine
27	58	003A	:	:	2660	483	480	12	Colon
28	59	003B	;	;	2660	485	477	23	Semicolon
29	60	003C	<	<	5273	417	421	9	Less-Than Sign
30	61	003D	=	=	5273	491	523	12	Equals Sign
31	62	003E	>	>	5273	421	417	9	Greater-Than Sign
32	63	003F	?	?	4879	286	280	55	Question Mark
33	64	0040	@	@	5913	-19	-18	141	Commercial At
34	65	0041	A	A	6214	11	-22	15	Latin Capital Letter A
35	66	0042	B	B	6214	592	337	59	Latin Capital Letter B
36	67	0043	C	C	6214	379	270	64	Latin Capital Letter C

You can sort the table by clicking in the column headings.

Right-clicking in the table gives you access to Select All and Copy functions, which you can use to copy the table into Excel or other applications.

The characters in the fourth column are from the Arial Unicode font, so they may not look exactly like the characters in your font.

The Help Menu

Help

Displays an abbreviated form of this document.

About

Tells you about FontFactory and its author.

Copying Graphics

If you right-click in either the main character area or the sample text area, you can copy graphical data to the Windows Clipboard (and then paste it into Powerpoint, for example). The graphics are copied in vector format (not as bitmaps), so you scale them without impairing quality.

Sample Text

The display along the bottom of the Fontfactory window shows you how some sample text will look when using your font. The display in NX won't be exactly the same, but it will be very similar. You can choose a sample text string from the drop-down menu, or you can add your own sample string by clicking on the Edit button.

Keyboard Shortcuts

A few useful shortcuts are secretly hidden.

You can use the arrow keys instead of clicking on the "Previous" and "Next" buttons. Also, you can often move to a specific character by pressing the corresponding keys on your keyboard. So, pressing Shift+B will take you immediately to the B character.

The arrow keys can also be used to move around strokes in the Edit Strokes function.

Double-Clicking

Several editing functions can be launched by double-clicking in some area of the FontFactory window:

Double-clicking here	Launches this function
Character area	Edit Strokes
Font Info area	Edit Font
Character Info area	Edit Character
Sample text area	Edit sample text

Task 1: Compiling/Decompiling

The simplest application of FontFactory is in compiling and decompiling NX fonts via the ugfontc program. Previously, you had to run ugfontc from a command prompt in order to convert NX fonts from .FNT to .FNX format or vice-versa. If, like many people, you have forgotten what a "command prompt" is, then you can use FontFactory instead. Simply open a file in one format, and save it in another.

Task 2: Rearranging Characters

Within a single NX font, the positions (order) of characters doesn't matter, so there is not much point re-arranging them. To transfer characters between fonts, run two copies of FontFactory, and copy/paste characters between them. After pasting a character into a font, you will probably have to adjust its size and position using the Edit Character function.

Task 3: TrueType to NX

To create an NX font from a TrueType font, proceed as follows:

(1) Import the font into FontFactory using the File → Import TrueType command.

(2) Assign keystrokes to the characters using the Edit Character command.

(3) Use the Special → Change Chord Height command to get the right number of strokes. Be aware that using a very small chord height value will generate a large number of strokes, and you may exceed NX's 512 stroke limit.

(4) Fill the characters using the Special → Fill Characters command. Again, be careful you don't exceed the limit of 512 strokes.

(5) Save the file in FNX format

Task 4: NX to TrueType

This is a much less frequent process, but there are times when it is useful. Proceed as follows:

(1) Open the NX font file (usually a FNX file) in FontFactory.

(2) Offset the character strokes using the Special → Thicken Strokes command. Typically, a thickness value of somewhere between 10 and 30 is suitable.

(3) Save the file in SFD format.

(4) Get a copy of the FontForge font editor, install it, and get it running. This is not as easy as it sounds on a Windows computer, since X-Windows is required. A Macintosh or other Unix machine is easier.

(5) Open the SFD file in FontForge.

(6) Use the Element → Expand Stroke command in FontForge to create an outline for each character in the font. The offset distance you use will not be the same as the one you used in FontFactory. I found that an offset of 20 in FontFactory is equivalent to a stroke width of 56 in FontForge, but this may depend on screen resolutions.

(7) Using the Element → FontInfo dialog, in the "General" section, uncheck the "Stroked Font" button.

(8) Generally clean up the font using FontForge. The Remove Overlap command is useful for this.

(9) Add hints using the AutoHint function.

(10) Use View → Fill to check your results.

(11) Save the font in TrueType format.

Task 5: Creating New Characters

Creating new characters is hard work. Now that you can move around selected groups of strokes in FontFactory, character design is starting to become feasible, but it still requires a lot of effort. The best approach is usually to copy/paste pieces of existing characters. For example, it is easy to copy an accent from one character and paste it onto another one.

Possible Problems

Finding ugfontc

FontFactory uses ugfontc to convert fonts from .FNT form to .FNX form and back again, and ugfontc in turn uses libsyss.dll. If neither of these two can be found, then operations involving .FNX files won't work. This probably means that the environment variable UGII_ROOT_DIR is not set properly.

If all else fails, place FontFactory.exe and a copy of libsyss.dll in your NX fonts folder, and run from there.

Access to Your TEMP folder

As part of the conversion process mentioned above, FontFactory creates temporary files in your TEMP folder. If you don't have write access to this folder, then, again, operations on .FNX files won't work.

Consolas Font Missing

There are several places where FontFactory uses a font called Consolas to display things. Consolas is a standard font in Windows Vista, and is fairly easy to find if you don't have it. Without it, the Font Info area and the Character Info area within FontFactory will look messy, for example.

Bugs and Enhancements

FontFactory started out as an exercise in Windows programming. I wanted to understand the standard .NET techniques that are used to handle menus, dialogs, events, drawing, and so on in a native Windows application. But then, as with many hobby projects, it got a bit out of hand.

As far as I am concerned, it has served its purpose, and I'm not really interested in improving it any further. But, if you find a problem, please publicize it in the usual NX community places, and maybe I'll take a look at it. Maybe.

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