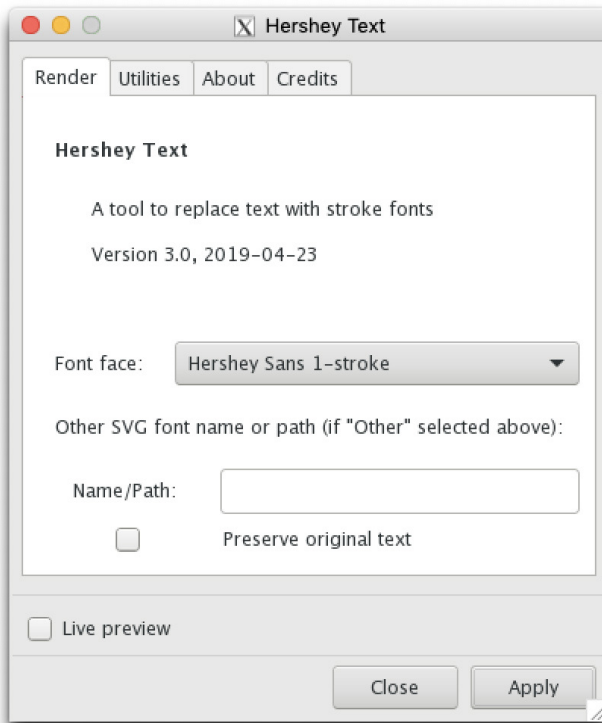


# Hershey Text

*Stroke font software for Inkscape*



## User Guide

# 0. Preliminaries

## 0.1 This is open source software

Hershey Text is open source software, that we are making available without warranty, in the hopes that it will be useful. Hershey Text is licensed under the GPL v2.

Feedback is sincerely appreciated. You may come across things that don't work as expected. Sometimes, this may be due to a known bug in the software — perhaps one fixed in a more recent version — or, it may be that you've come across something new, or a problem in the documentation. Please don't hesitate to let us know about it!

## 0.2 Links

Current links to software and the latest version of this user guide can be found at:  
<https://wiki.evilmadscientist.com/hershey>

The preferred method of feedback is to post an issue at our repository:  
<https://gitlab.com/oskay/hershey-text>

General documentation for products from Evil Mad Scientist can be found at:  
<https://wiki.evilmadscientist.com/>

Please refer to the front cover of the guide to find the date and applicable software version of this document.

## 0.3 Copyright notice:

Software and manual: © 2019 Windell H. Oskay, Evil Mad Science LLC

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# 1. Introduction to Hershey Text

**Hershey Text** is an Inkscape extension designed to replace text in your document with stroke fonts rendered into paths. This tool can assist with text creation for use with pen plotters, lasers, engraving tools, routers, CNC mills, and other similar digital fabrication tools.

Hershey Text v 3.0 performs font substitution on your document, taking your page of mixed text — in paragraphs or however laid out — and replacing those text elements with single-stroke text, using specially designed purpose-built fonts.

In this documentation we will primarily refer to the use case of using Hershey Text to prepare text for use with a pen plotter, but it is equally applicable to creating text for use with other types of digital fabrication tools.

## 1.1 Credits and acknowledgments

This software is written and maintained by [Evil Mad Scientist](https://wiki.evilmadscientist.com/hershey), designer and manufacturer of pen plotters and writing machines such as the AxiDraw, EggBot, and WaterColorBot, to provide a useful tool to assist with certain workflows.

Fonts included with this distribution include original Hershey fonts and fonts licensed under the SIL open font license. Sheldon B. Michaels and Marty McGuire contributed to the creation of these font files from the original source materials. For additional credits and links, please see the individual font files and/or visit <https://wiki.evilmadscientist.com/hershey>

## 2. Outline Fonts and Stroke Fonts

Before delving into the specifics of Hershey Text, we will first cover some important background material about the structure of fonts, and important considerations when working with text on plotter-like tools.

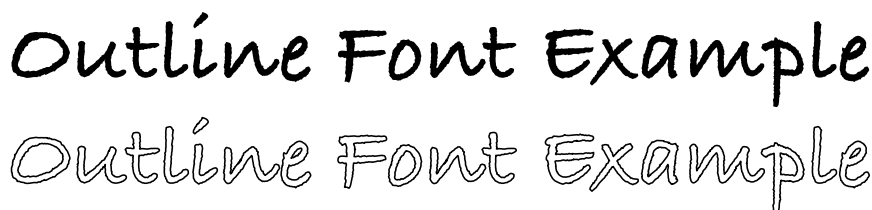
## 2.1 Outline Fonts

All standard computer fonts — those found in formats including TrueType, PostScript, and OpenType — are **outline fonts**. In outline fonts, each character in the font file describes a vector outline shape, which will be filled in by tiny pixels when displayed on your screen or rendered by an inkjet or laser printer.

Things are different when you wish to use a pen plotter or any other machine that moves a tool along a path, since it follows paths rather than drawing pixels.

Suppose that you start with some text in Inkscape, and then convert it into paths using the **Path > Object to Path** menu command. When you do so, the machine will be able to follow the vector shapes generated from the data in the font file.

Below is a sample of text written in a common handwriting-like font:



Outline Font Example

Outline Font Example

The upper part of the sample shows the text filled in, as it will typically appear on your screen, or when printed on a laser printer. The lower part shows the outline: The actual vector shapes contained within the font file, and how the output will look when printed with a pen plotter.

If you had picked that handwriting-like font with the intent of creating handwriting-like output on a plotter, this is *probably not what you had intended*.

The cause of this perhaps unexpected behavior is that one could easily, though mistakenly, assume that a handwriting-like font contains handwriting-like strokes. For example, the letters “t” and “x” both look like they *could* be made up of two strokes that overlap, and the “O” looks like it could consist of a single loop. However, in order for outline fonts to render correctly on your screen, the “t” and “x” are instead composed of a single complex shape, while the “O” consists of two concentric loops.

To be quite explicit: there is absolutely no data contained within an outline font that represents or corresponds to the visual centerline of the characters. This fact is consistent with all standard computer fonts, and will present no unexpected behavior, so long as you are aware of it.

While it is straightforward to understand where font outlines come from, they can still potentially present several disadvantages:

**(A) Visible outlined appearance**

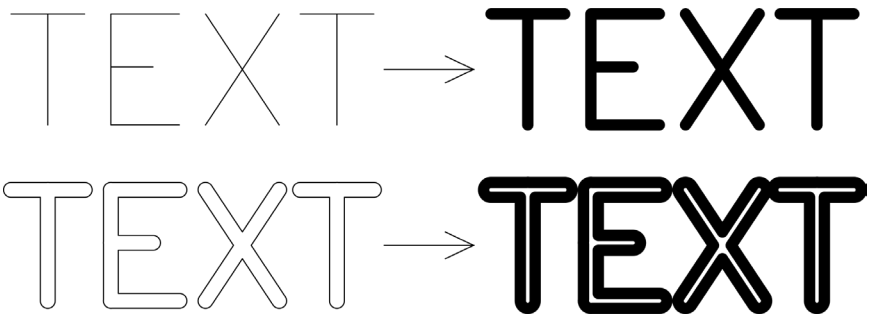
As we have already noted, if you plan to use fonts for handwriting-like applications, outlines can be problematic. Fonts tend to look more like computer fonts and less like handwriting when you can see the outlines.



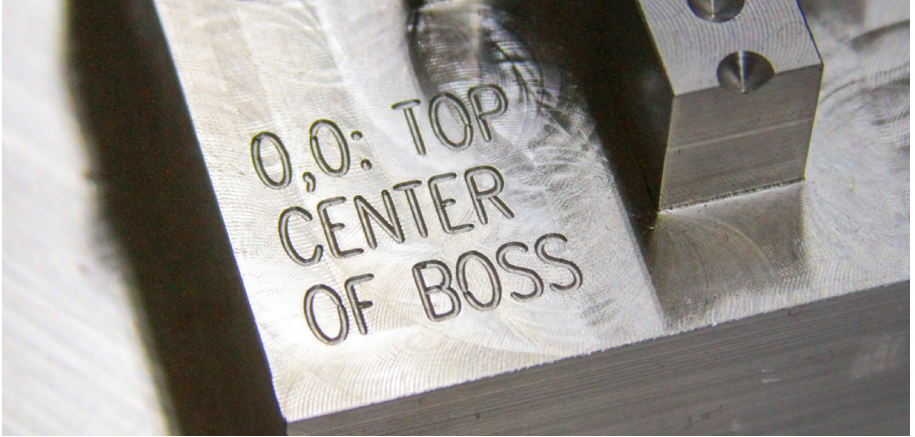
**(B) Excess apparent width of text**

When working with fabrication tools that have a nonzero width — whether that is a pen tip, laser beam, or a milling cutter — tracing that tool around the outline of text rather than through its center can increase the apparent width of the text.

Here is what it looks like when you apply the same (nonzero) stroke width to text made up of center lines versus made up of outlines:

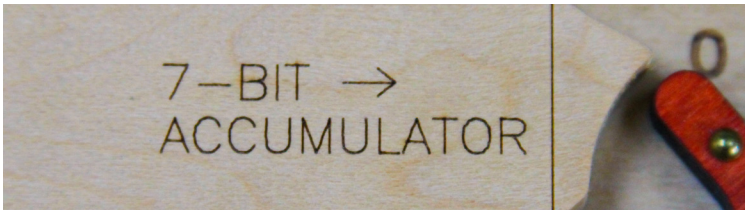


When cutting with a CNC mill, the width of your milling cutter provides a real limitation — using outline fonts, you would need to use a smaller cutting tool (typically requiring a lower cutting speed) to fit legible text in the same area. However, cutting along the center line can be smaller and



more efficient:

In some other applications, such as when engraving with a laser or cutting



with a waterjet, the cutting width is relatively thin, which can allow you to use very small text, so long as it isn't outlined:

### **(C) Excess path length and time**

Finally, the perimeter around the outline of text is much longer — at least twice the total length of the center lines drawn through text. For example, every “O” is two loops, not one.

This means that your pen plotter or CNC tool will take typically twice as long to write out the text. That represents not just time, but also more ink usage (with a pen) or wear on your cutting tool or laser.

## 2.2 Stroke fonts

The ideal type of font to use with a plotter or cutting tool is a **stroke font**, also known as an **engraving font**. That's a font where each visible character is *defined by strokes of non-zero width*, rather than by the area enclosed by a path.

The following sample of text is rendered with a stroke font. In the lower line, we have colored the individual paths within each character so that you can tell them apart:

Stroke Text Example  
Stroke Text Example

As you can see, characters like the “t” and “x” are here composed of two intersecting strokes. Similarly, a letter “o” in this font consists of a single loop. This particular stroke font is a *single-stroke* font, since each visible line is made up of only a single path. (Some other stroke fonts instead use multiple strokes to construct wider characters, e.g., bold fonts.)

Stroke fonts like these have “efficient” paths without redundant loops, which makes them ideal for use with computer-controlled tools. They are also well-suited for handwriting-like applications, because the characteristics of the fonts more closely mimic how humans write. However, since they are not regular computer fonts, it is generally not possible to use them as one would other fonts — for example within word processors or graphics applications.



## 3. Hershey Text version 3.0

**Hershey Text** is a helper application, built as an Inkscape extension, that performs single-stroke font substitution. It takes your document that contains text elements — in paragraphs or however laid out — and replaces those text elements with stroke-based text, using specially designed fonts.

While this works quite well, there are several important process limitations that you should be aware of from the start:

(I): This typesetting process takes editable text (that is, text that you type) and **renders** a set of vector paths (lines and curves) that the pen can follow. Once you have rendered that text into paths, it can no longer be edited as though it were text. Once the text is rendered into a set of paths, those paths can be edited like other paths with Inkscape's path editing tools.

(II): Relatively few stroke based fonts are available. A number of handwriting-like styles are included with this software; you can see them listed in the appendix to this guide. While you can add your own stroke-based fonts, they do need to be in the proper format.

(III): Since Hershey Text works by a process of font substitution, you should expect that your text layouts will change slightly in terms of spacing and how lines of text wrap, just like you would any other time that you change fonts.

### 3.1 Name and history

This software is named after Dr. Allen Vincent Hershey, who designed a set of stroke fonts for plotters in the late 1960s. The “Hershey” fonts included with this software are derivatives of his original designs.

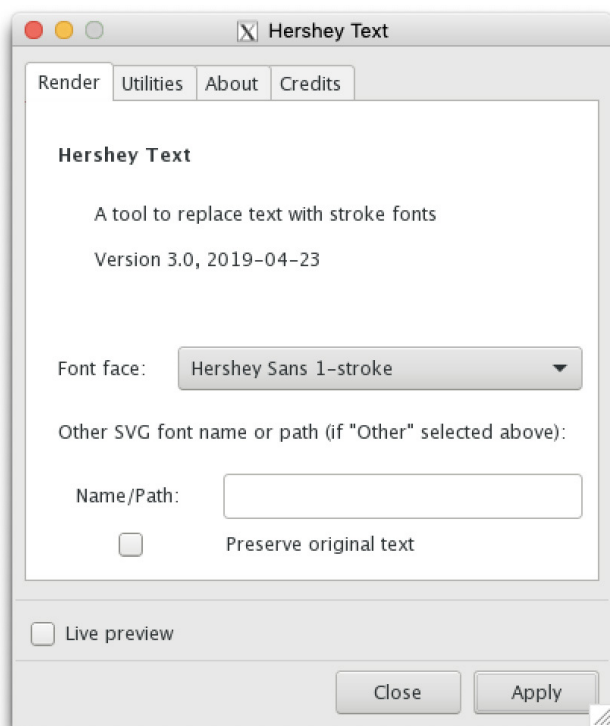
Hershey Text v 3.0 is a successor, written from scratch, to the original version of Hershey Text, which we introduced in 2011:

<https://evilmadscientist.com/go/hershey>

## 3.2 Getting Started

You can find Hershey Text in your Inkscape menu at:

**Extensions > Text > Hershey Text**



To use Hershey Text, start with a document that contains text objects. Select the **Render** tab, and choose a font face from the drop-down list.

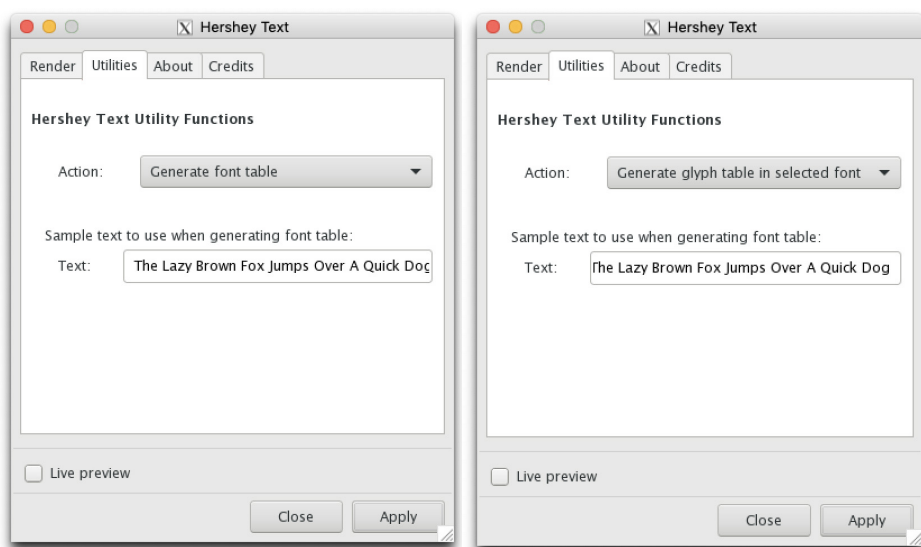
When you click **Apply**, it will render all text elements on your page with the selected stroke-based typeface. If you would like to convert only certain text elements, click **Apply** with just those elements selected.

In addition to the drop-down list and text box for selecting the font face, there is also a check box, **Preserve original text**. If that option is checked, then the original (editable) text will be left in place when the stroke-based is rendered.

You can use the **Live preview** option to preview how your text will be rendered, before you click **Apply** to actually perform the rendering.

### 3.3 Utility modes: Font table and glyph table

Under the **Utilities** tab of Hershey Text are two utility modes, that you can select between with a drop-down list:



If you click Apply with the **Utilities** tab selected, then one of these two actions, to generate a table of available fonts or a table of all glyphs within a given font, will be executed.

The first option, **Generate font table** will generate and render a list of all available SVG fonts, previewed with sample text that you enter in the **Text** entry box. All available fonts will be listed. You can add custom fonts following the methods described in §3.5 Adding custom fonts on page 12.

The second option, **Generate glyph table in selected font** will create a list of all characters (glyphs) in the selected font. The selected font, for this purpose, is the currently active default font, as selected on the **Render** tab. This may be one of the included SVG fonts or the name of a custom font, if “Other” is selected from the drop-down list.

## 3.4 About SVG fonts

Hershey Text uses fonts in the **SVG font format**. While this is a rather uncommon font format, it is perhaps the only modern font format that does support stroke-based characters.

It is important to note that while the SVG font format does support stroke-based characters, not every SVG font is a stroke-based font. (Indeed, most SVG fonts are outline fonts.) Hershey Text does not convert outline fonts into stroke fonts, nor does it convert other fonts into SVG format. Its function is to replace the text in your document with paths from the selected SVG font.

Several stroke-based SVG fonts are included with this distribution, including both single-stroke and multi-stroke fonts. These SVG fonts are included within the “svg\_fonts” directory within your Inkscape extensions directory.

## 3.5 Adding custom fonts

SVG fonts may be added to the “svg\_fonts” directory, which is located within your Inkscape extensions directory. If you add an SVG font to this directory, it will automatically be available when generating a table of available fonts. However, please note that it will *not* show up in the drop-down list of font choices.

To use a font that you have added to the svg\_fonts directory, select the last item from the drop-down list, “Other (given below)”. Then, enter the name of the font in the “Name/Path” text box. The font name that you enter needs to exactly match the name of the font file (with or without the “.svg” extension).

**Example:** If you have a font file named “robin\_handwriting.svg”, you can add it to the svg\_fonts directory, select “Other” from the drop-down list, and enter either “robin\_handwriting” or “robin\_handwriting.svg” in the “Name/Path” text box.

Custom SVG fonts may also be located elsewhere on your computer. To use one or more fonts in a different directory, enter either the full path to your SVG font or to a directory (folder) containing one or more SVG fonts. If you give the path to a directory, all SVG font files within that directory will be available to Hershey Text. If the path is to a file, that file *and all other SVG font files within the same directory* will be available within Hershey Text.

### Example (Mac):

A full path to a font folder or font file might look like:

```
/Users/Robin/Documents/AxiDraw/fonts/           or  
/Users/Robin/Documents/AxiDraw/fonts/robin_handwriting.svg
```

### Example (Windows):

A full path to a font directory or font file might look like:

```
C:\Users\Robin\Documents\AxiDraw\fonts\           or  
C:\Users\Robin\Documents\AxiDraw\fonts\robin_handwriting.svg
```

## 3.6 Advanced methods for font selection

We have already discussed two methods of selecting the font to be used. For built-in fonts, you can select the font that you would like to use from the drop-down list on the **Render** tab of Hershey Text. And, for fonts that you have added yourself, either in the `svg_fonts` directory or with a path, you can select “Other” in the drop-down list and type the name of the font.

Beyond these, you can use automatic font-name substitution to pick fonts and even use multiple SVG fonts within the same document.

The order of preference for font selection is given by the following rules:

(1) **Font name substitution:** If there is an SVG font with a name that matches that of the font for a given piece of text, that font will be used. For example, if the original text is in the font “FancyScript” and there is an available font file with name `FancyScript.svg`, then `FancyScript.svg` will be used to render the text. The font file may be in the `svg_fonts` directory, or given by an external path.

(2) **Default font substitution:** If there is no SVG font available matching the name of the font for a given block of text, the face selected from the “Font face” drop-down list will be used as the default font when rendering text with Hershey Text. This may be one of the included SVG fonts or the name of a custom font, if “Other” is selected from the drop-down list. An internal default font selection will be used if “Other” is selected but no alternate font is named.

(3) **External files take priority.** If there are multiple font-name matches, external fonts given by a path take precedence over those in the `svg_fonts` directory.

These methods can be used to render different text elements with different SVG font faces, even within the same document. You can even rename a font — either your own font or one of the bundled ones -- to match the name of a font that you’re using. For example, if you rename a handwriting-like font to “Helvetica.svg”, then all text in Helvetica will be replaced with that font.

### **3.7 Limitations due to font substitution**

Since Hershey Text works by a process of font substitution, the same types of changes that happen when changing fonts in other contexts may occur here as well. Text spanning a single line will generally stay that way, whereas text flowed in a box (that may span multiple lines) will be re-flowed from scratch. Style information such as text size and line spacing can be lost in some cases.

## 3.8 About custom SVG fonts

While creating new fonts is outside the scope of this software, Hershey Text is designed to accept and make use of custom SVG fonts. You can create your own, convert fonts from other formats, or commission a custom font to be created for you.

### 3.8.1 SVG Font Repository

A repository for SVG fonts compatible with Hershey Text can be found at:

<https://gitlab.com/oskay/svg-fonts>

### 3.8.2 Custom handwriting fonts

If you would like to commission a custom single-stroke font based on your handwriting, we recommend the services of a third party, Quantum Enterprises:

<https://www.quantumenterprises.co.uk/slf>

Their stroke fonts are available in matched TrueType and SVG font pairs, making it easy to use the fonts by the font name substitution method. They also produce high quality ready-made handwriting-like stroke fonts.

### 3.8.3 More about the SVG font format

Formal documentation about the SVG font format can be found at:

<https://www.w3.org/TR/SVG11/fonts.html>

Stand-alone SVG fonts are relatively uncommon, but SVG fonts following this specification are used as part of the OpenType “OTF+SVG” font format, sometimes referred to as “color fonts.” A number of commercial font editing packages support SVG stroke fonts and/or OTF+SVG. Inkscape also offers limited support for SVG font creation.

### 3.8.4 Tips on font conversion

As we have noted, just because a font is in the SVG format does not mean that it is a stroke font. Converting an outline font to the SVG format will result in an outline font in the SVG format, not a stroke font.

One other issue to watch out for is that some font creation and/or conversion software may “helpfully” close open contours in your fonts when saving or exporting. That is to say, if the software is expecting to only work with outline fonts, it may regard (for example) your letter “C” consisting of a single arc to be defective since it has an open contour. You can check for the resulting stray lines by using the glyph table feature.

When possible, it is ideal to have two fonts to use: A regular TrueType (TTF) or OpenType (OTF) font –which can be installed on your computer, plus a matching stroke-based SVG equivalent, so that when you perform font substitution, the path-based text ends up in the same places and with the same appearance.

## 4. Appendix: Stroke font samples

The samples on this and the following page show the “EMS” and “Hershey” stroke font faces included with Hershey Text. The EMS series fonts are all single-stroke fonts. HersheySans1 and HersheyScript1 are single-stroke fonts; the other Hershey fonts are multiple-stroke fonts.

EMSAI lure:

*The five boxing wizards jump quickly.*

EMSEI fin:

*The five boxing wizards jump quickly.*

EMSFelix:

*The five boxing wizards jump quickly.*

EMSNixish:

*The five boxing wizards jump quickly.*

EMSNixishItalic:

*The five boxing wizards jump quickly.*

EMSOsmotron:

*The five boxing wizards jump quickly.*

EMSReadability:

*The five boxing wizards jump quickly.*

EMSReadabilityItalic:

*The five boxing wizards jump quickly.*

EMSTech:

*The five boxing wizards jump quickly.*



HersheyGothEnglish:

**The five boxing wizards jump quickly.**

HersheySans1:

The five boxing wizards jump quickly.

HersheySansMed:

**The five boxing wizards jump quickly.**

HersheyScript1:

*The five boxing wizards jump quickly.*

HersheyScriptMed:

*The five boxing wizards jump quickly.*

HersheySerifBold:

**The five boxing wizards jump quickly.**

HersheySerifBoldItalic:

***The five boxing wizards jump quickly.***

HersheySerifMed:

**The five boxing wizards jump quickly.**

HersheySerifMedItalic:

***The five boxing wizards jump quickly.***

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Hershey Text documentation home:  
<https://wiki.evilmadscientist.com/hershey>

Hershey Text is open source software.  
Source code and issue tracker available at:  
<https://gitlab.com/oskay/hershey-text>

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