

El código fuente de las fuentes

Freakend 2017





Jaime Chapinal

Electronic Arts



Carto



Simfor



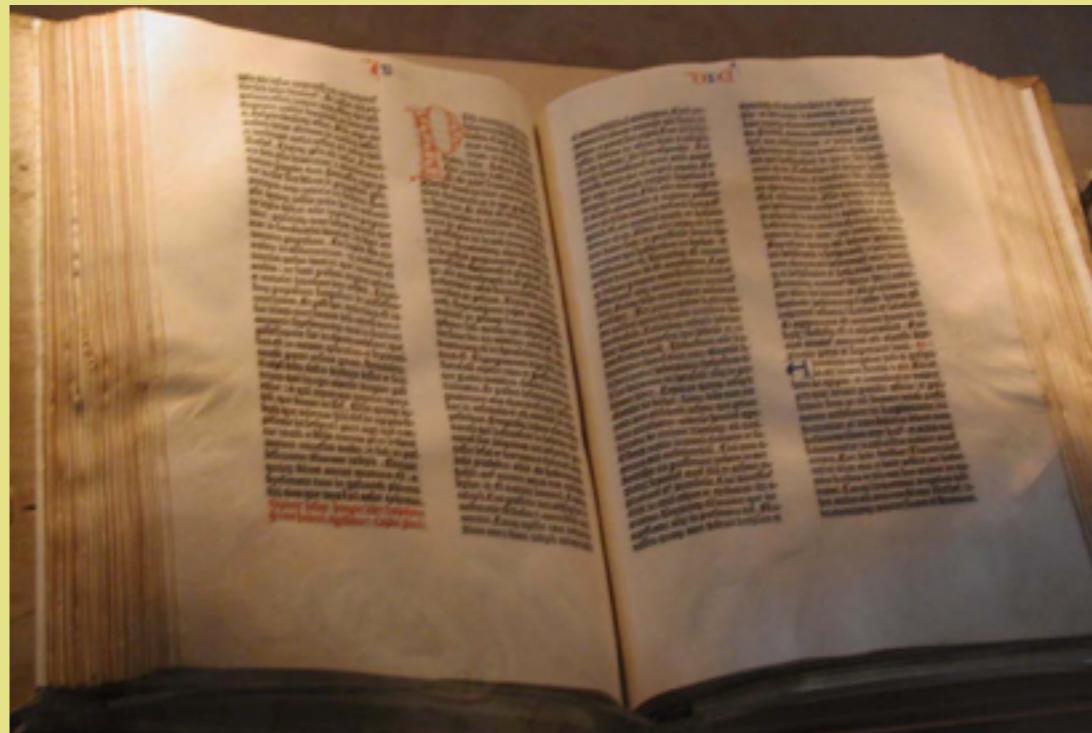
@chapi13

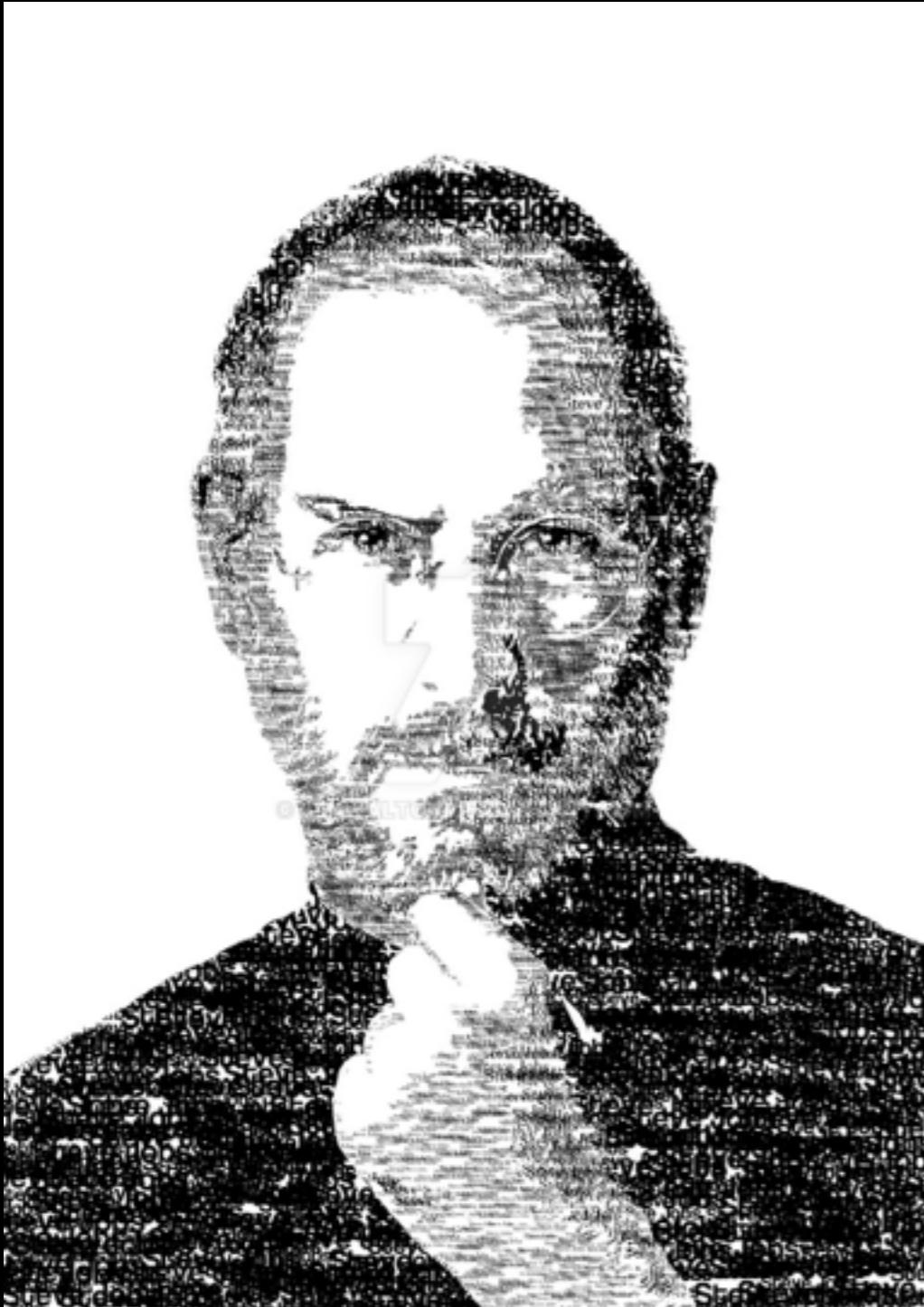
jaime.chapinal@gmail.com

www.jaimechapinal.com

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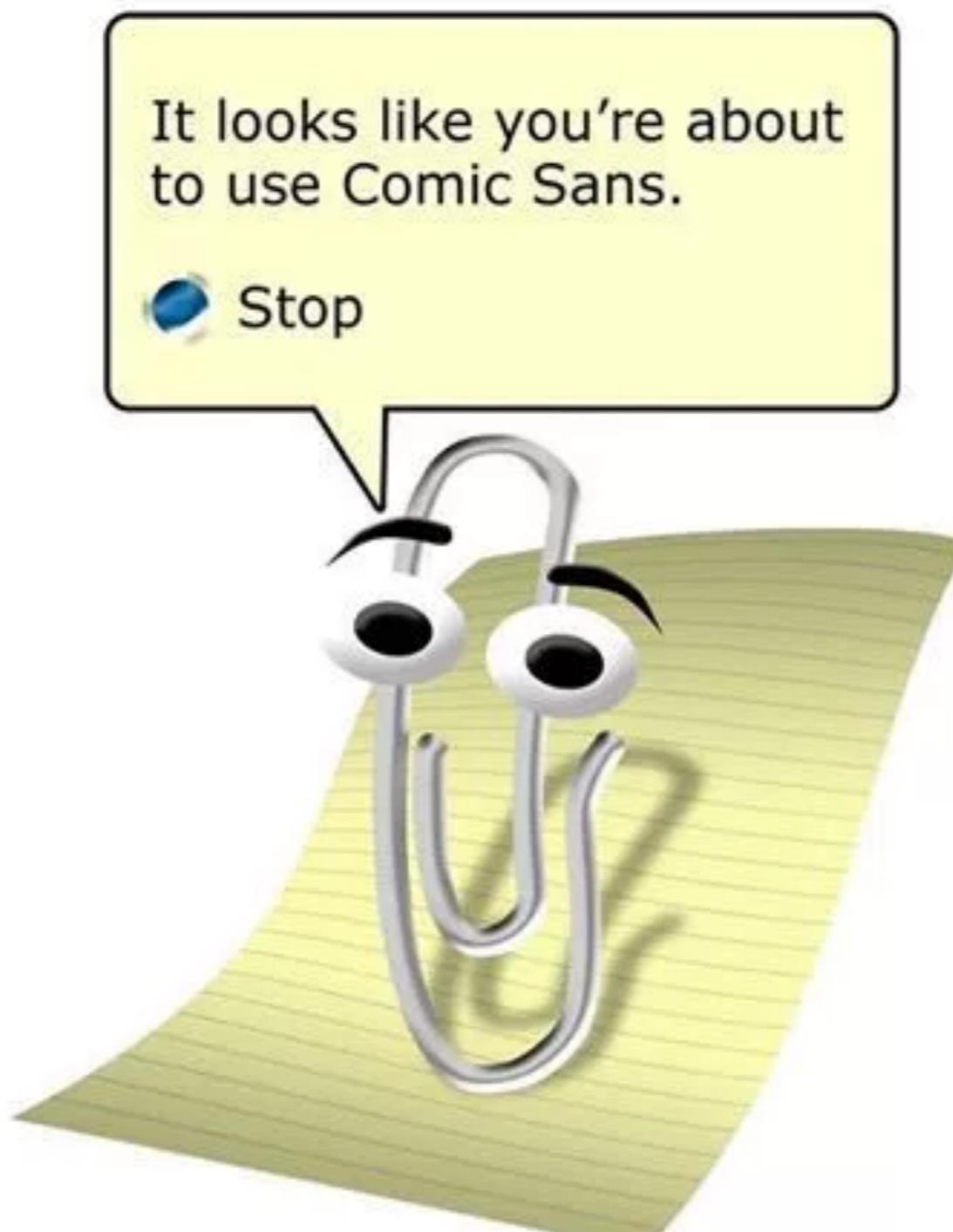






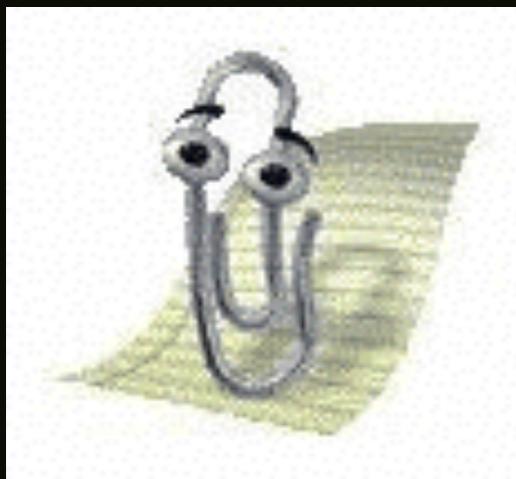
- “I decided to take a calligraphy class to learn how to. [...] I found it fascinating. None of this had any hope of any practical application in my life. But 10 years later, when we were designing the first Macintosh computer, it all came back to me. And we designed it all into the Mac. It was the first computer with beautiful typography.”

Steve Jobs (biography)



It looks like you're about
to use Comic Sans.

 Stop





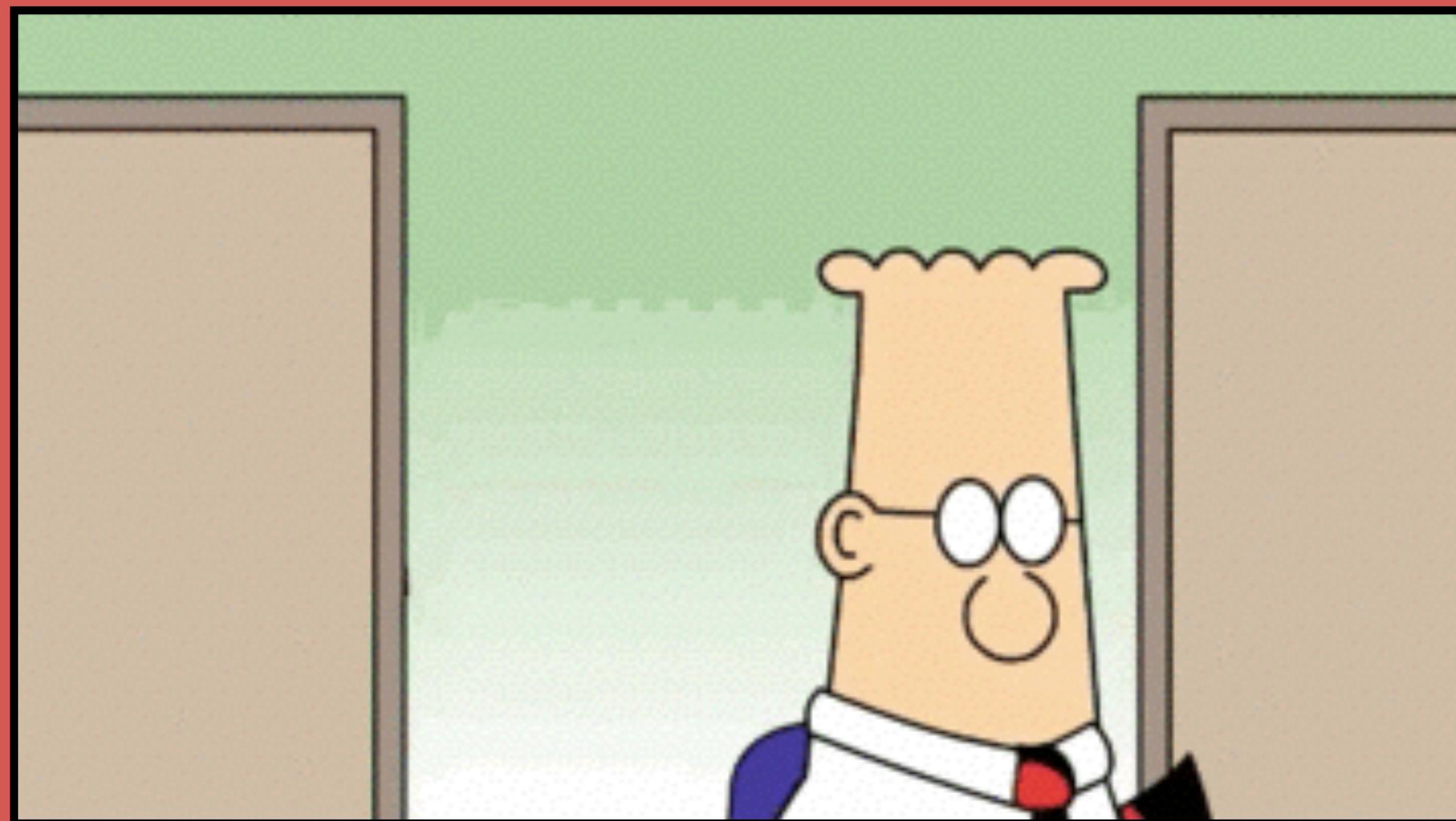
Evolution of fonts



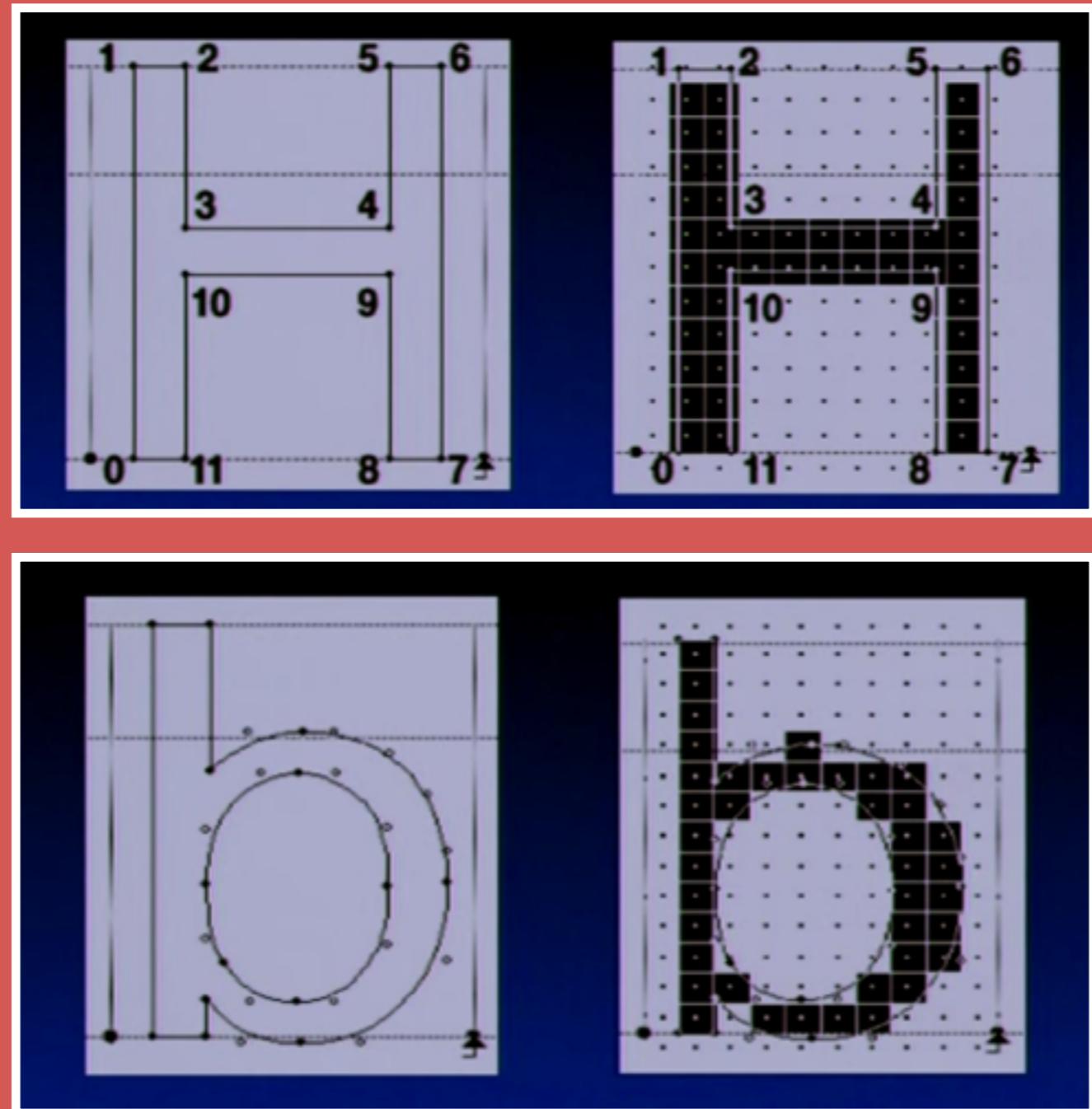
Bitmap fonts



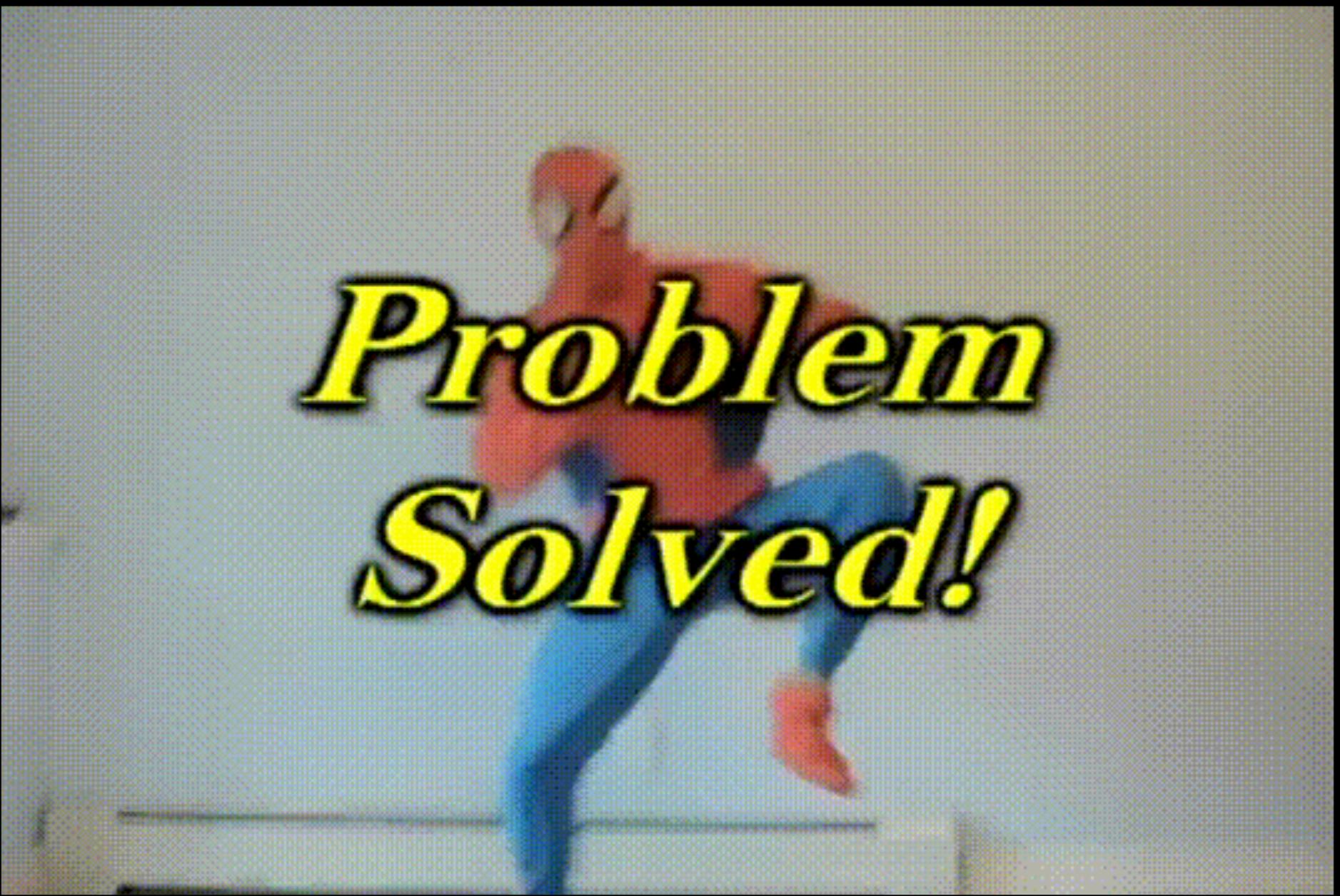
- Stores each glyph as an array of pixels (bitmap).
 - Examples: .FON, .BMF, .BDF, .FZX



Scaling

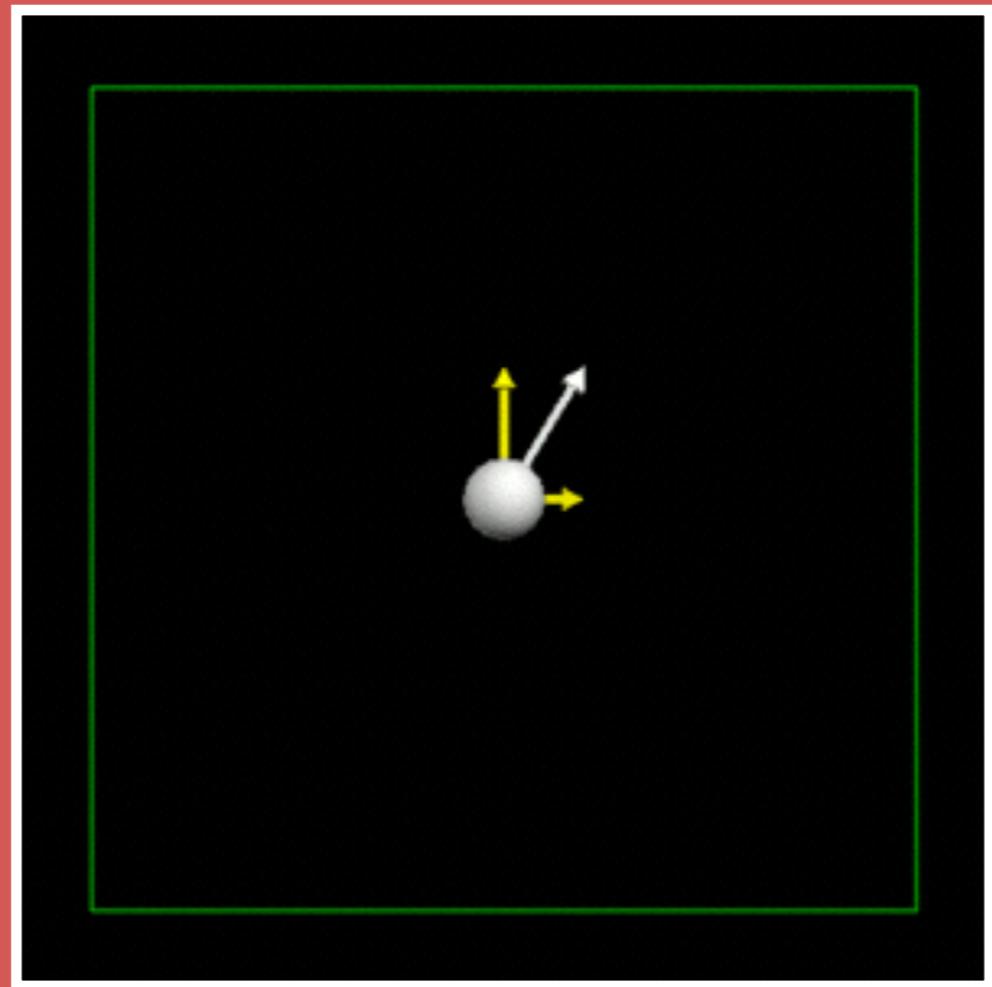


<https://youtu.be/nWs65Uejd4M?t=8m35s>



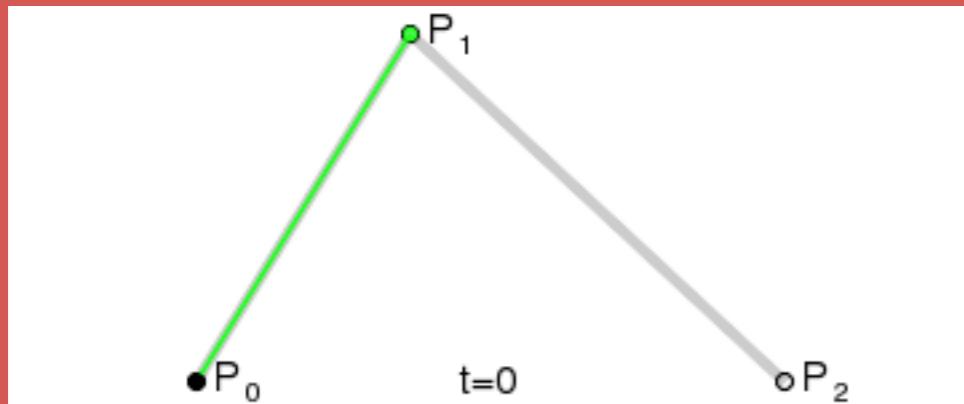
*Problem
Solved!*

Outline fonts



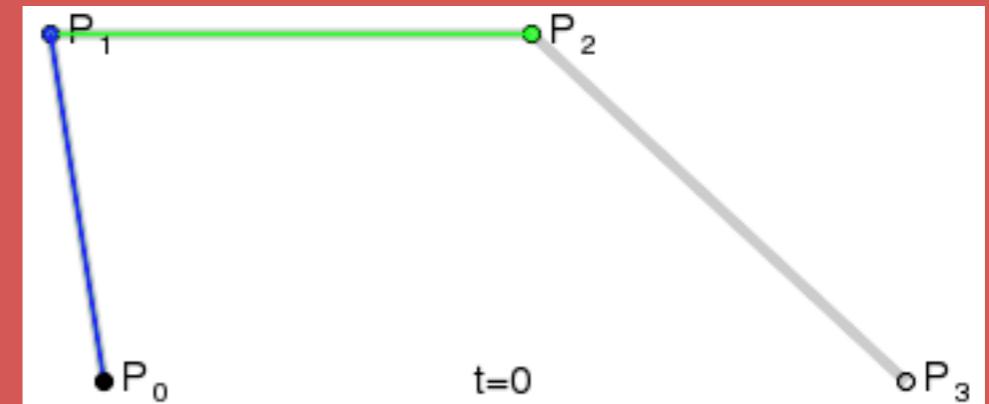
Collections of vector images, consisting of lines and curves defining the boundary of glyphs.

Bézier curves



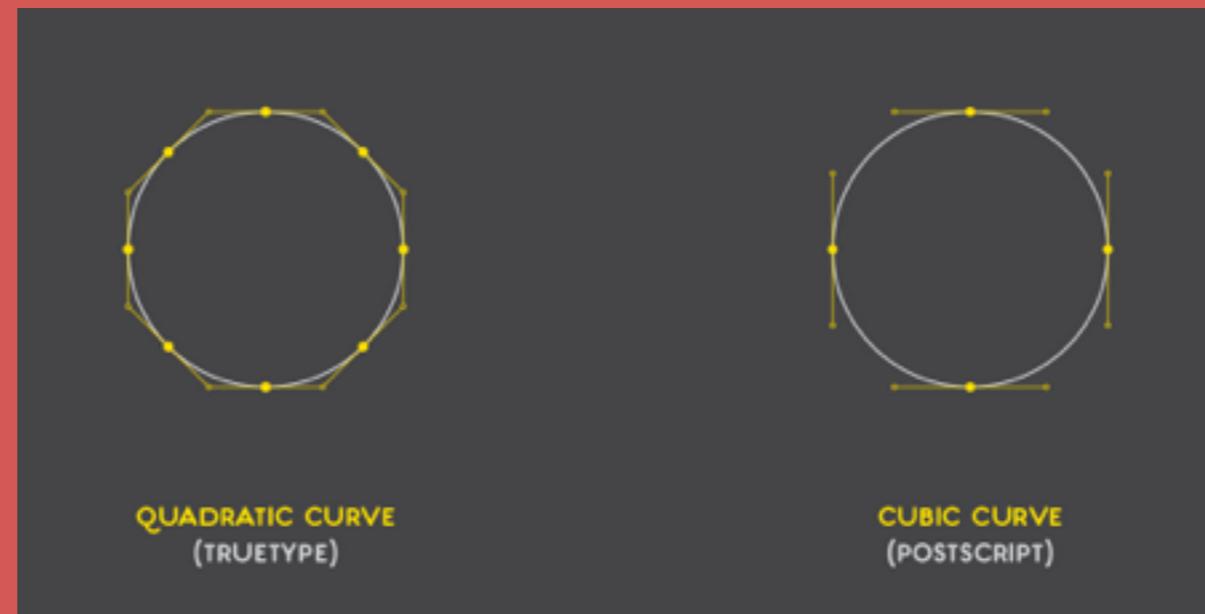
Quadratic

https://en.wikipedia.org/wiki/B%C3%A9zier_curve



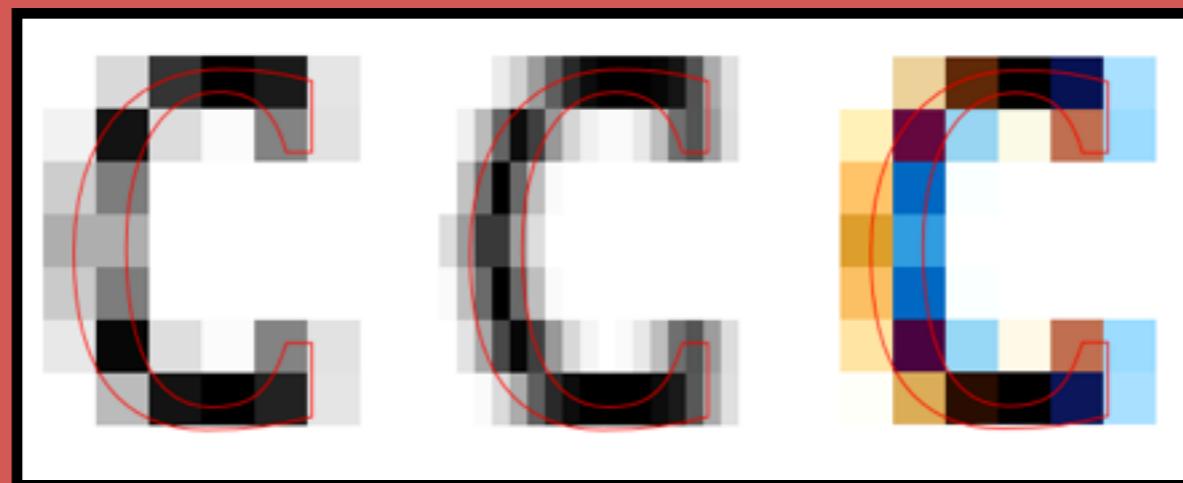
Cubic

Quadratic:
8 anchor points + 8
control points = **16**
points



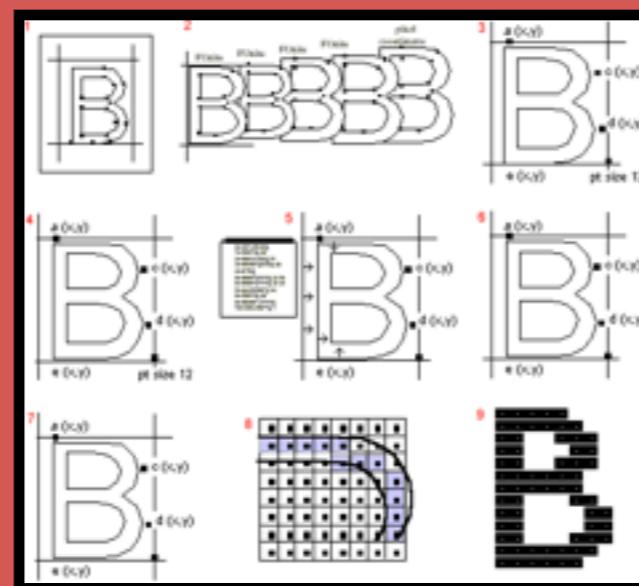
Cubic:
4 anchor points +
8 control points =
12 points.

Antialiasing



<https://blog.mozilla.org/nattokirai/2011/08/11/directwrite-text-rendering-in-firefox-6/>

Hinting

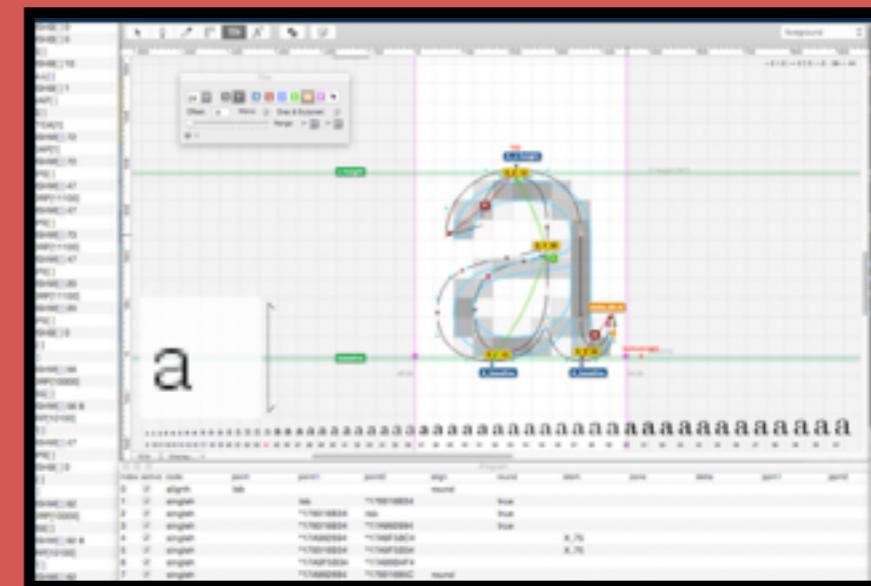


TrueType Instructions

```
TrueType Instructions for 'fpqn'

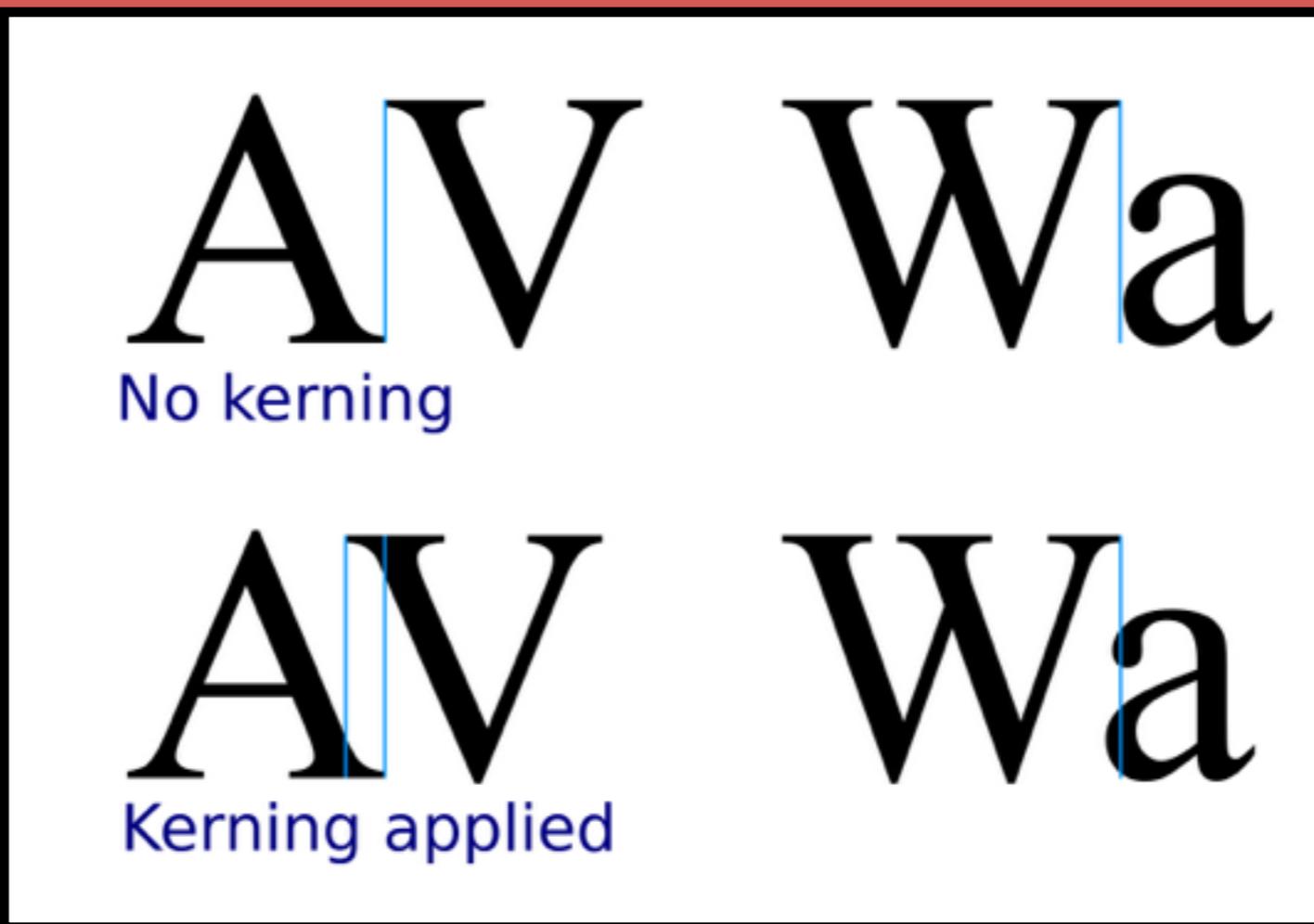
322 2c FDEF
323 20 DUP
324 45 RCVT
325 b0 PUSHB_1
326 03 3
327 25 CINDEX
328 45 RCVT
329 61 SUB
330 64 ABS
331 b0 PUSHB_1
332 50 80
333 51 LTEQ
334 58 IF
335 45 RCVT

OK Edit Cancel
```

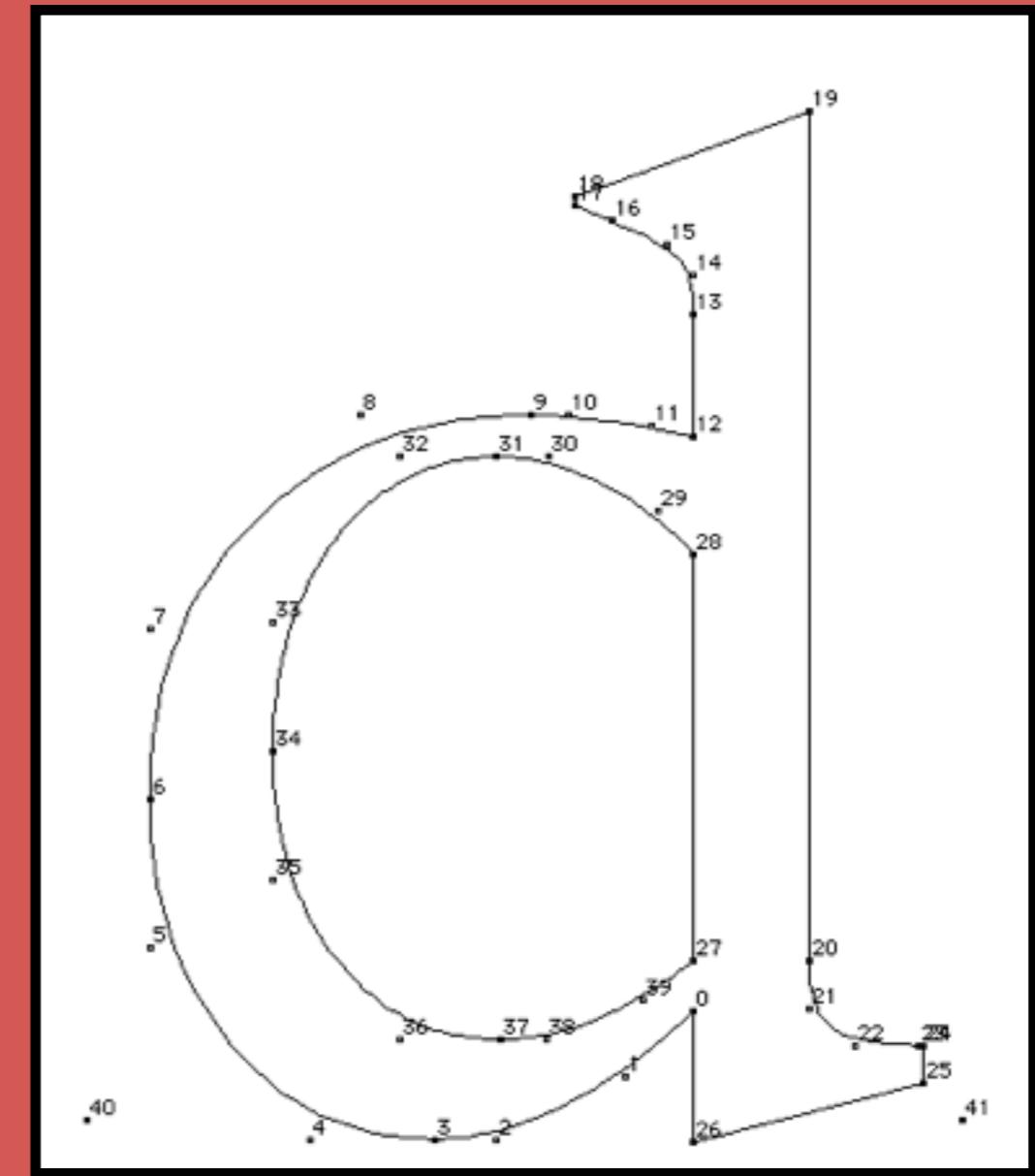


<https://www.microsoft.com/typography/otspec/TTCH01.htm>

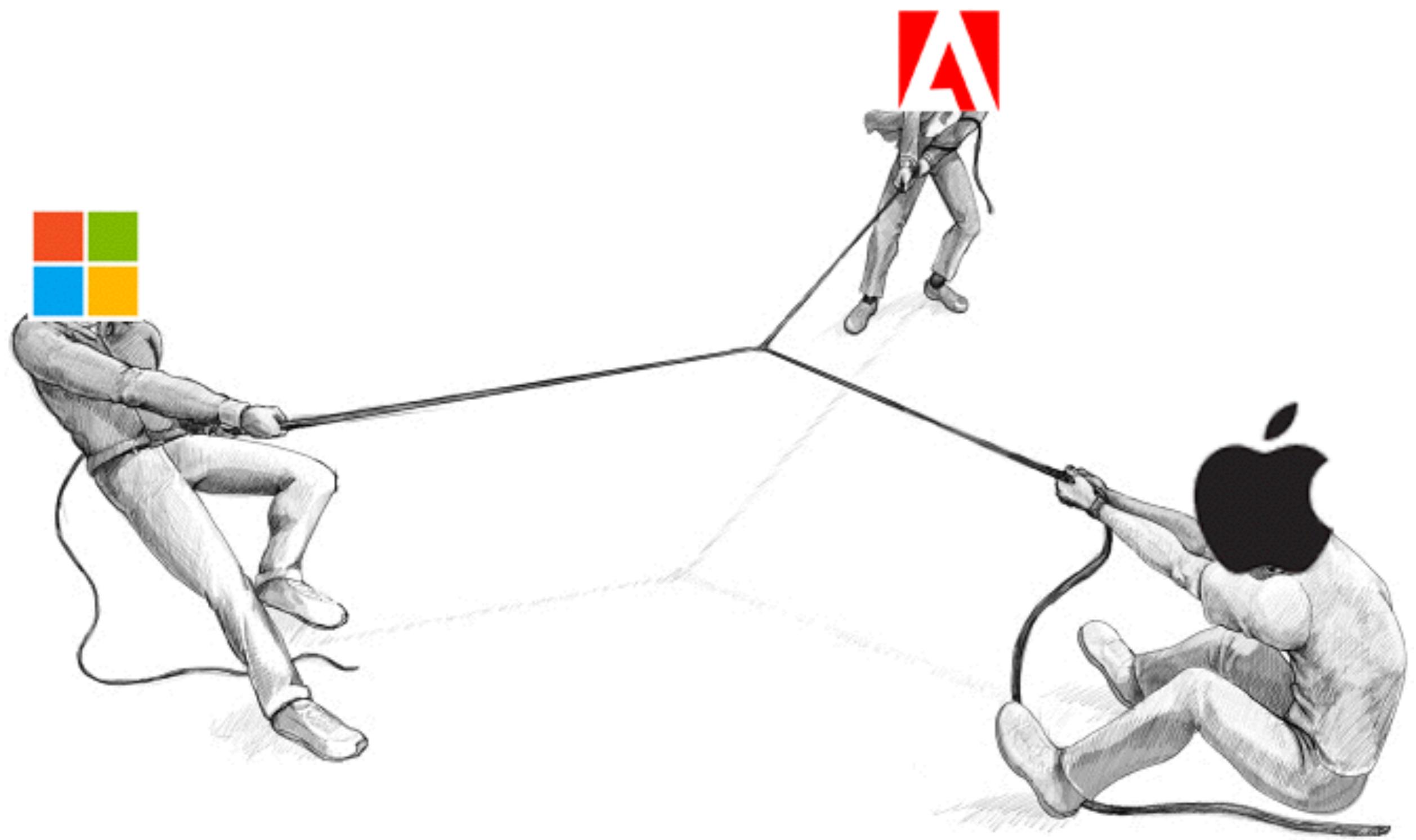
Kerning



Holes



**FONNS
WARS**



Original image: <http://www.momahler.com/ProArtistMarket>

PostScript



Adobe

- Computer language for creating vector graphics.
- Cubic Bézier.
- Printing and publishing.



True Type



Apple + Microsoft

- Hintings. TrueType instructions
- Quadratic Bézier.
- .ttf



OpenType



Adobe + Microsoft

- Based on TrueType
- Advanced techniques –
Example: Extended support for ligatures
- .otf

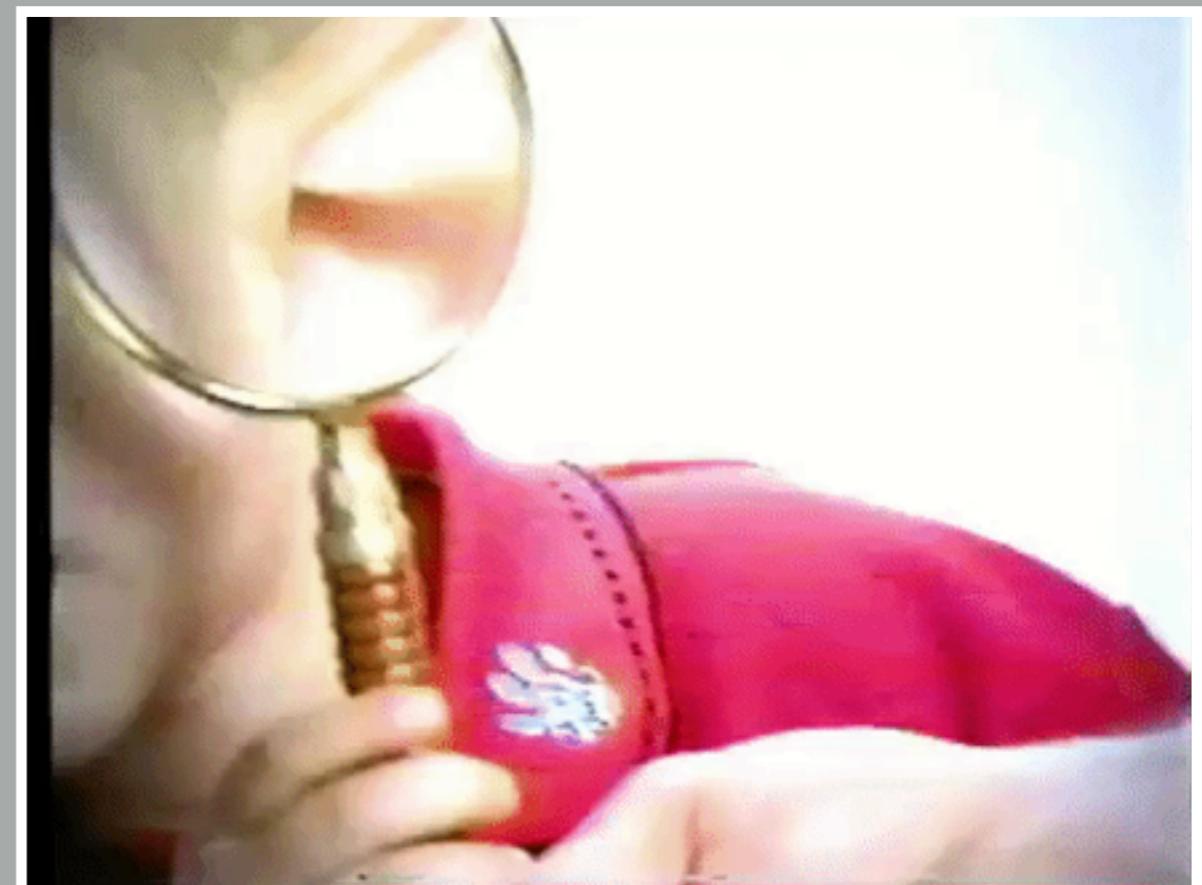


Web fonts

- WOFF (Web Open Font Format)
- SVG (Scalable Vector Graphics)



<https://glyphter.com/>

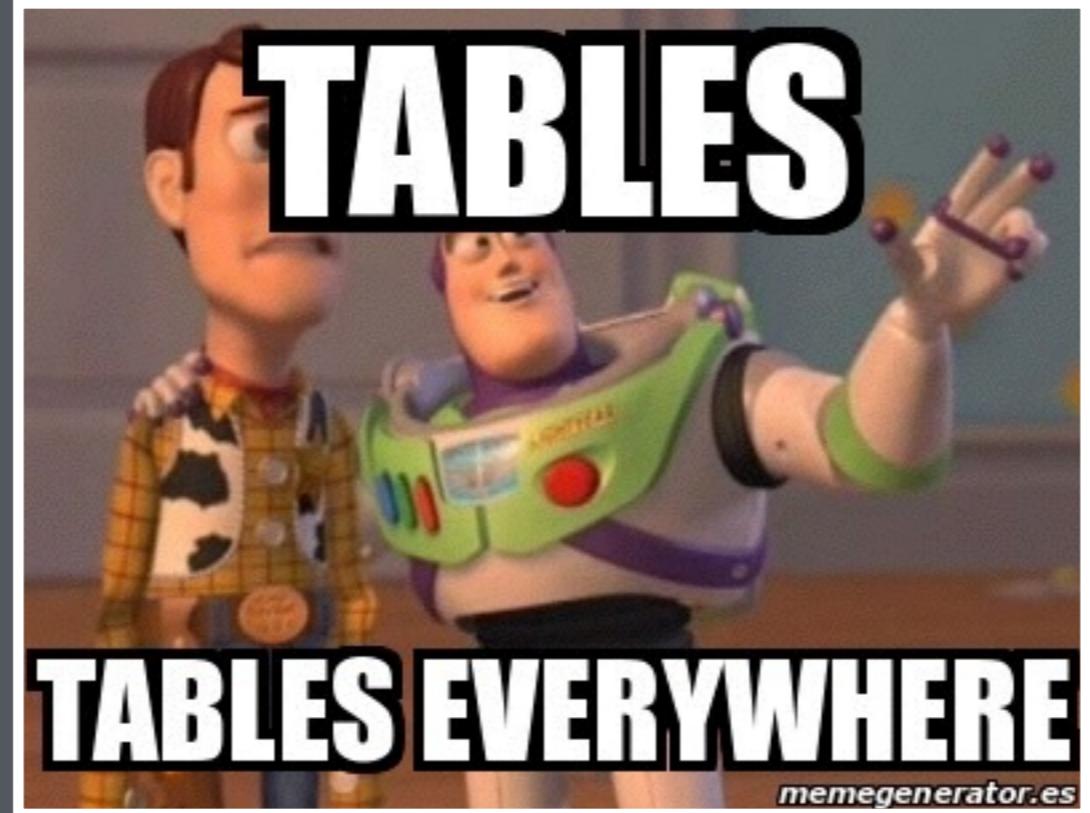


Font classification

PANOSE

Times New Roman		2 2 6 3 5 4 5 2 3 4
ATTRIBUTE	SETTING	
Family Kind	Latin Text	—
Serif Style	Cove	—
Weight	Medium	—
Proportion	Modern	—
Contrast	Medium Low	—
Stroke Variation	Transitional	—
Arm Style	Straight Arms	—
Letterform	Round	—
Midline	Standard	—
X-height	Large	—

<https://www.w3.org/Printing/stevahn.html>



True Type

'acnt' (accent attachment) table
'ankr' (anchor point) table
'avar' (axis variation) table
'bdat' (bitmap data) table
'bhed' (bitmap font header) table
'bloc' (bitmap location) table
'bsln' (baseline) table
'cmap' (character code mapping) table
'cvar' (CVT variation) table
'cvt' (control value) table
'EBSC' (embedded bitmap scaling control) table
'fdsc' (font descriptor) table
'feat' (layout feature) table
'fmtx' (font metrics) table
'fond' (font family compatibility) table
'fpgm' (font program) table
'fvar' (font variation) table
'gasp' (grid-fitting and scan-conversion procedure) table
'glyf' (glyph outline) table
'gvar' (glyph variation) table
'hdmx' (horizontal device metrics) table
'head' (font header) table
'hhea' (horizontal header) table
'hmtx' (horizontal metrics) table
'just' (justification) table
'kern' (kerning) table
'kerx' (extended kerning) table
'lcar' (ligature caret) table
'loca' (glyph location) table
'ltag' (language tag) table
'maxp' (maximum profile) table
'meta' (metadata) table
'mort' (metamorphosis) table (deprecated)
'morx' (extended metamorphosis) table
'name' (name) table
'opbd' (optical bounds) table
'OS/2' (compatibility) table
'post' (glyph name and PostScript compatibility) table
'prep' (control value program) table
'prop' (properties) table
'sbix' (extended bitmaps) table
'trak' (tracking) table
'vhea' (vertical header) table
'vmtx' (vertical metrics) table
'xref' (cross-reference) table
'zapf' (glyph reference) table

Open Type

Required Tables

Tag	
cmap	Character to glyph mapping
head	Font header
hhea	Horizontal header
hmtx	Horizontal metrics
maxp	Maximum profile
name	Naming table
OS/2	OS/2 and Windows specific metrics
post	PostScript information

Tables Related to TrueType Outlines

Tag	
cvt	Control Value Table (optional table)
fpgm	Font program (optional table)
glyf	Glyph data
loca	Index to location
prep	CVT Program (optional table)
gasp	Grid-fitting/Scan-conversion (optional table)

Table related to SVG outlines

Tag	
SVG	The SVG (Scalable Vector Graphics) table

Tables Related to Bitmap Glyphs

Tag	
EBDT	Embedded bitmap data
EBLC	Embedded bitmap location data
EBSC	Embedded bitmap scaling data
CBDT	Color bitmap data
CBLC	Color bitmap location data
sbix	Standard bitmap graphics

Advanced Typographic Tables

Tag	
BASE	Baseline data
GDEF	Glyph definition data
GPOS	Glyph positioning data
GSUB	Glyph substitution data
JSTF	Justification data
MATH	Math layout data

Tables Related to Color Fonts

Tag	
COLR	Color table
CPAL	Color palette table
CBOT	Color bitmap data
CBLC	Color bitmap location data
sbix	Standard bitmap graphics
SVG	The SVG (Scalable Vector Graphics) table

Other OpenType Tables

Tag	
DSIG	Digital signature
hdmx	Horizontal device metrics
kern	Kerning
LTSH	Linear threshold data
MERG	Merge
meta	Metadata
STAT	Style attributes
PCLT	PCL 5 data
VDMX	Vertical device metrics
vhea	Vertical Metrics header
vmtx	Vertical Metrics

Kernel tables

- **cmap** : Mapping glyphs <-> characters
- **name** : Naming info
- **head** : General font info
- **hhea** / **hmtx**: Horizontal metrics
- **maxp** – Helpful for allocation of memory
- **post** – PostScript legacy. Glyphs names



Style tables

- **glyf** : Desc. of the contours of the glyphs
- **loca** : Pointers to glyph descriptions
- **fpgm** / **prep** : Global TrueType instructions
- **cvt** : Global variables for instructions

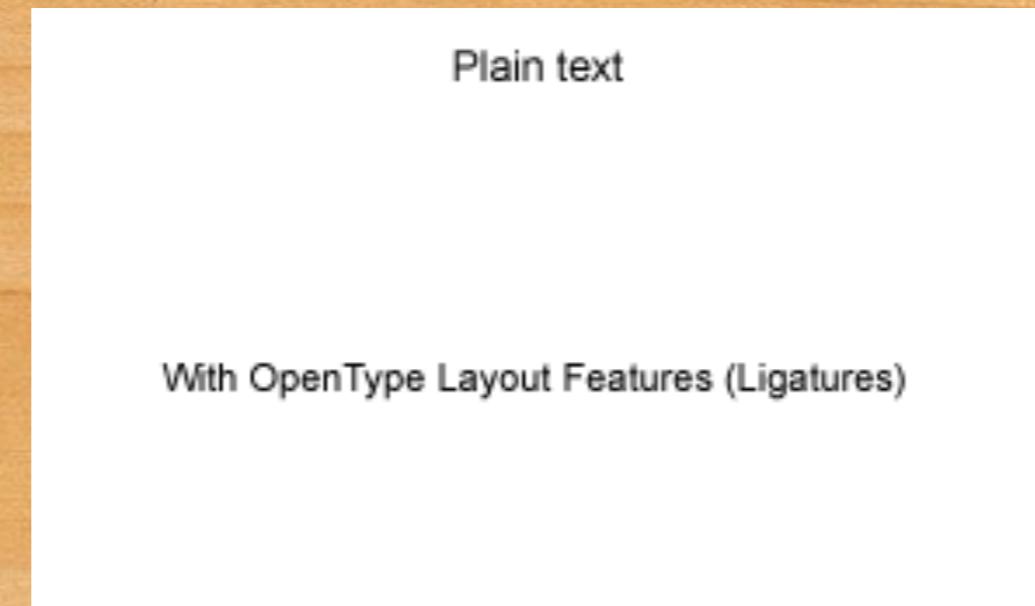
Others

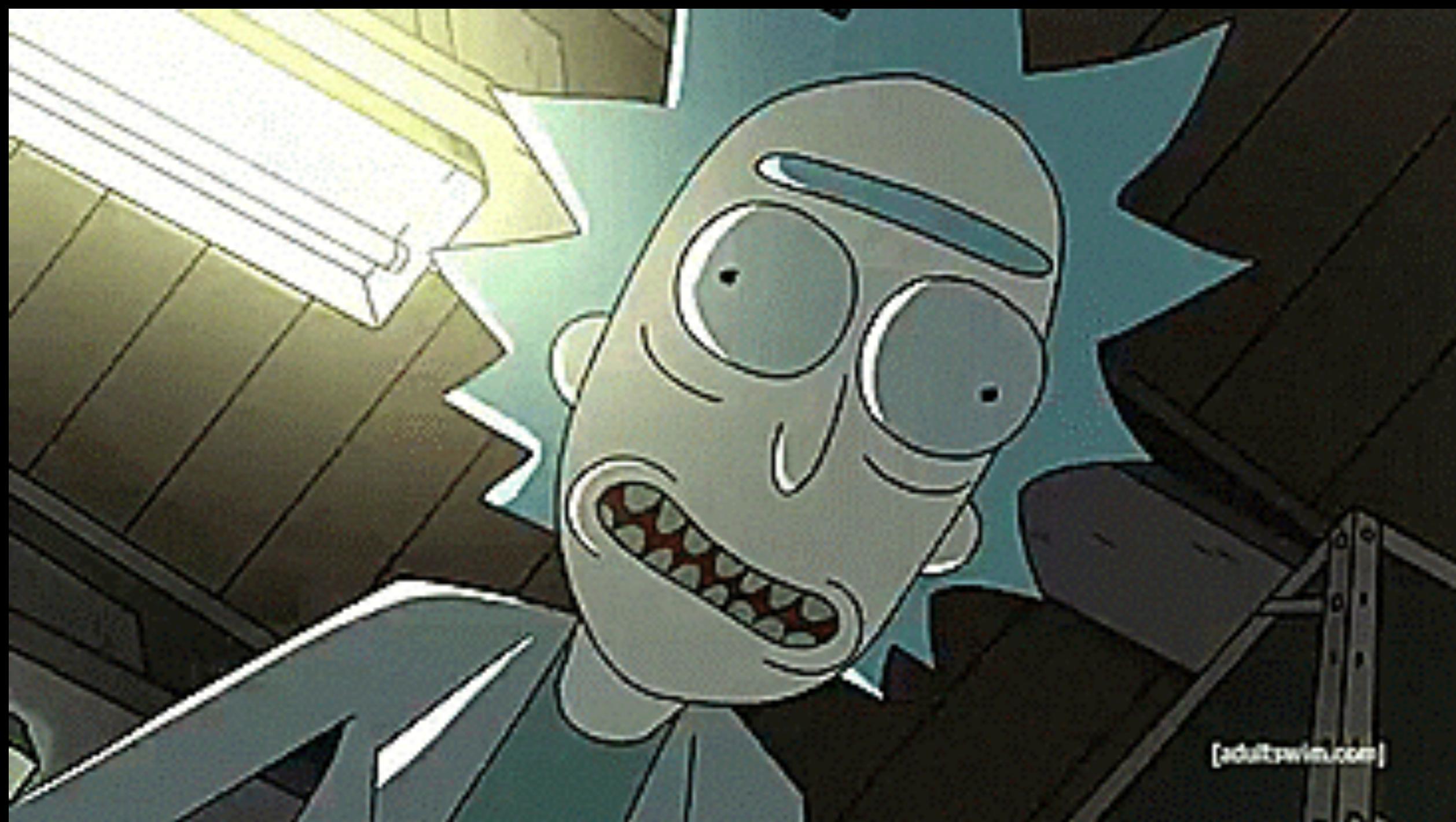
- **kern** : Kerning information
- **vhea** / **vmtx** : Vertical info
- **PCLT** : Hewlett–Packed printers



Advanced OpenType

- **BASE** : Baseline data
- **GDEF** : Glyphs definition.
- **GPOS** : Glyph positioning.
- **GSUB** : Glyph substitution.
- **DSLG** : Digital signature.





[adultswim.com]

Tools

- Font Forge (Open Source)



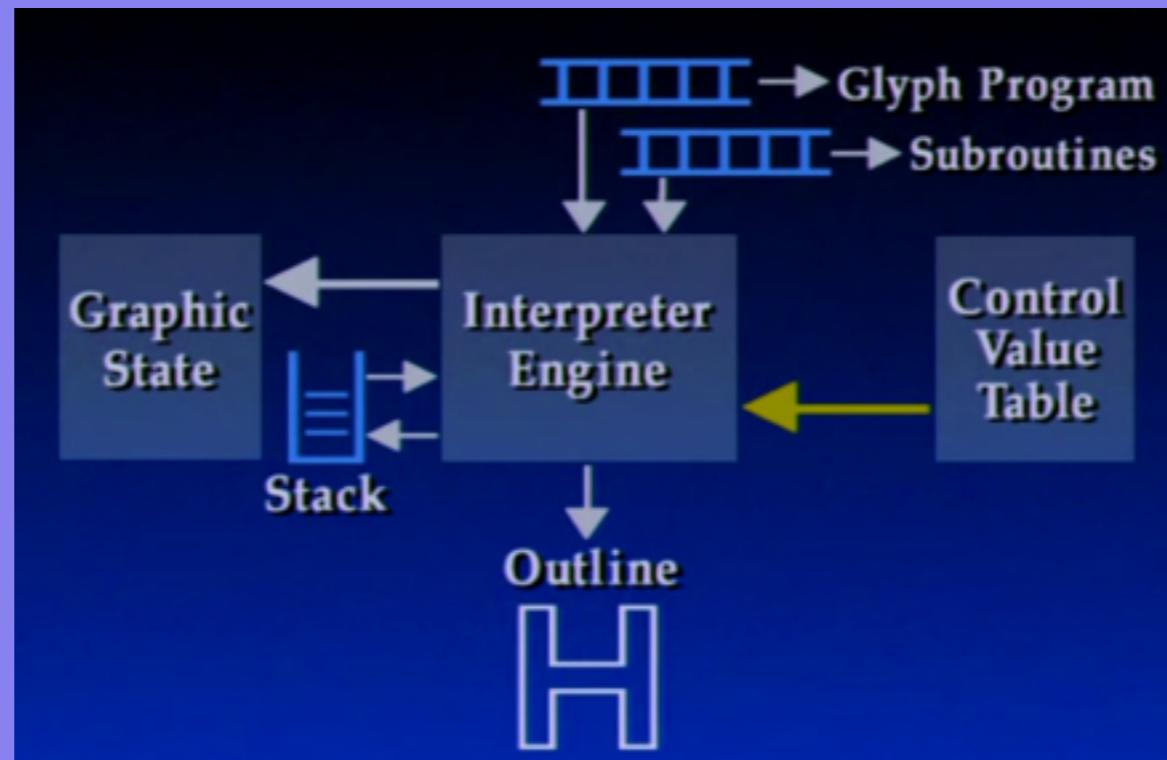
- Font Lab (Fontlab Ltd, Inc)



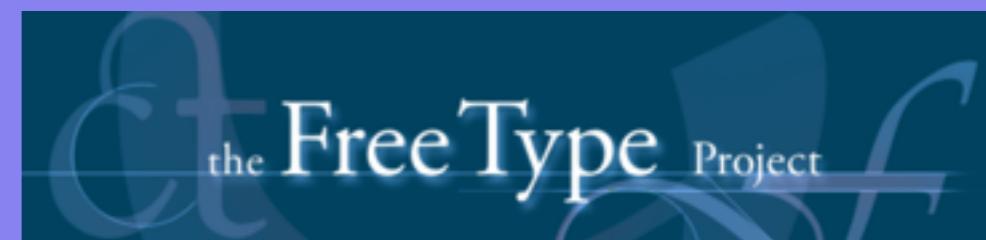
- Font Creator (High-Logic)



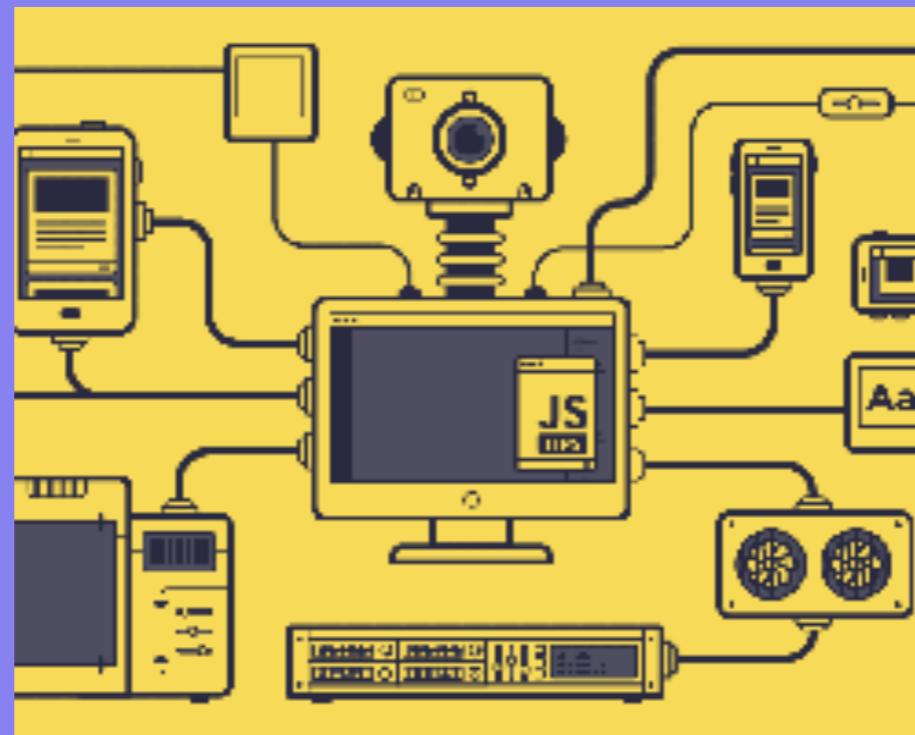
State of Text Rendering



<http://behdad.org/text/>



Reading Truetype font file from scratch (Javascript)



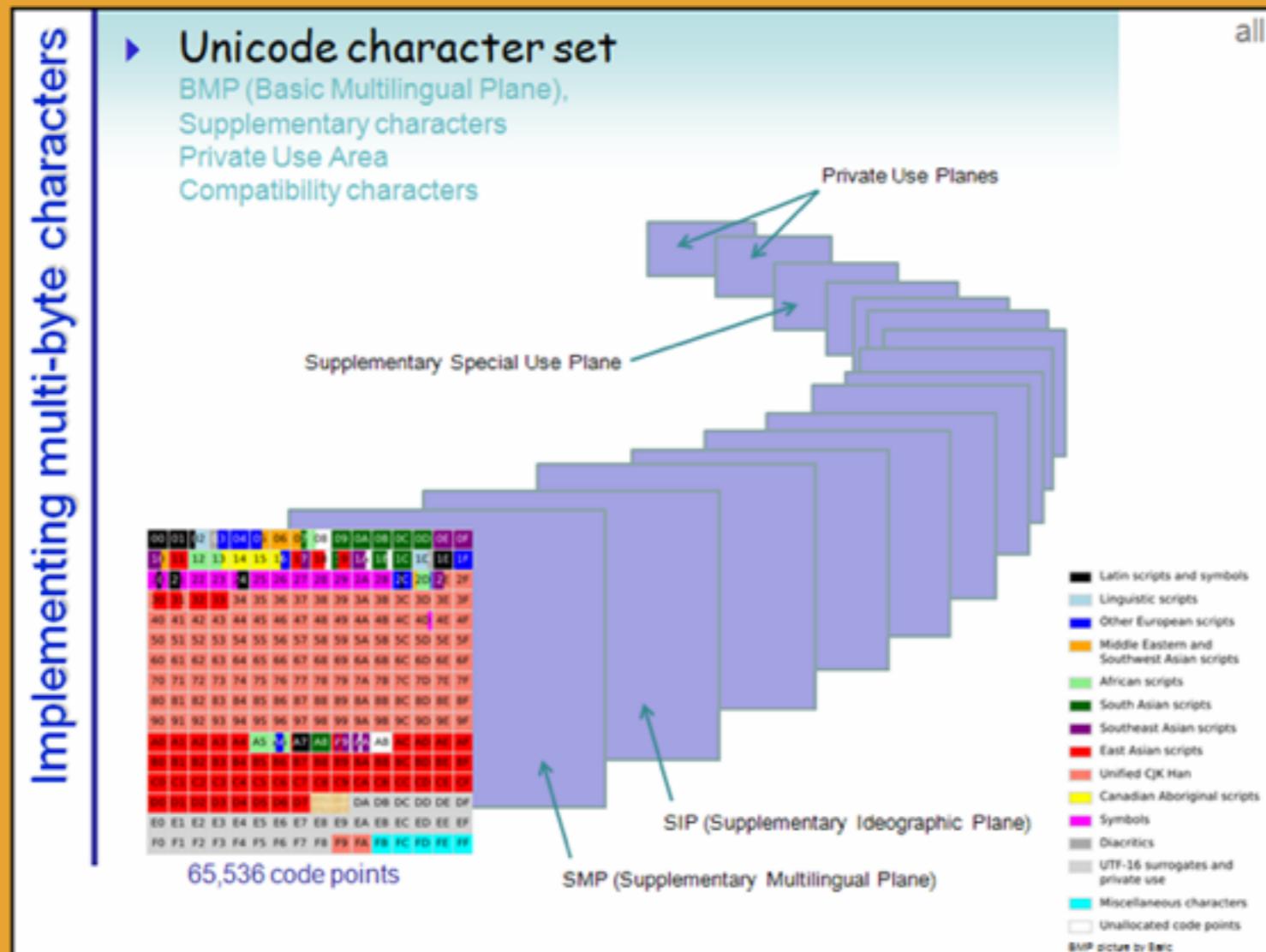
<http://stevehanov.ca/blog/index.php?id=143>

THE STATE OF UNICODE

Unicode was a brave effort to create a single character set that included every reasonable writing system

Unicode

Unicode is a standard for encoding of characters, representation, and handling of text.



PUA



Private User Area:
Planes 15 and 16 (U+F0000–U+FFFFD,
U+100000–U+10FFFF)

ICU



Unicode based globalization library.

Support for:

- ★ Locale-sensitive string comparison,
- ★ Date/time/number/currency/message formatting.
- ★ Text boundary detection, character set conversion.
- ★ ...

<http://site.icu-project.org/>

**WHY SO
CURIOUS?**

ZERO WIDTH JOINER

Unicode Character 'ZERO WIDTH JOINER' (U+200D)

[Browser Test Page](#)
[Outline \(as SVG file\)](#)
[Fonts that support U+200D](#)

ZWJ : Character that prevents the formation of a link or a ligature between the glyphs of the two surrounding characters.

Length?

```
> var str = "a"
< undefined
> str.length
< 1
> str = "😂"
< "😂"
> str.length
< 2
> str = "👨‍👩‍👧‍👦"
< "👨‍👩‍👧‍👦"
> str.length
< 11
```

emojipedia.org/family-man-woman-girl-boy/

Codepoints

- 👨 U+1F468
- U+200D
- 👩 U+1F469
- U+200D
- 😂 U+1F467
- U+200D
- 愐 U+1F466

Browse

👨‍👩‍👧‍👦 on Emoji Wiki



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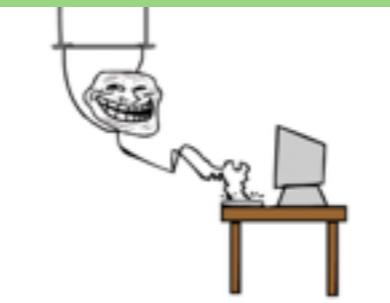
THAI CHAR...R TO PATAK
Unicode U+0E0F
UTF-8 E0 B8 8F

ឃ

THAI CHAR...YAMAKKAN
Unicode U+0E4E
UTF-8 E0 B9 8E

ឃ

THAI CHAR...R NIKHAHIT
Unicode U+0E4D
UTF-8 E0 B9 8D



Gmail - Google Accounts
<https://accounts.google.com/ServiceLogin?hl=es&service=mail> ▾
Gmail es un correo electrónico intuitivo, eficaz y útil. 15 GB de almacenamiento, menos spam y acceso desde dispositivos móviles.

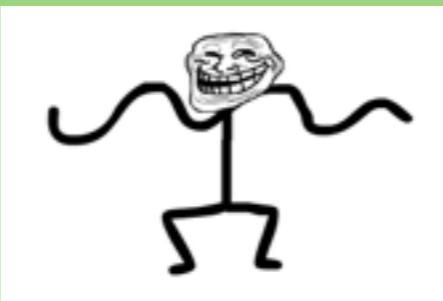
Gmail - Google Accounts
<https://accounts.google.com/ServiceLogin?hl=es-419&service=mail> ▾
Gmail es un correo electrónico intuitivo, eficaz y útil. Cuenta con 15 GB de almacenamiento, mucho menos spam y acceso móvil.

Inicio de sesión - Cuentas de Google
<https://accounts.google.com/Login?hl=ES> ▾
Iniciar sesión con otra cuenta Crear cuenta. Una sola cuenta de Google para todos los servicios de Google. Acerca de Google · Privacidad · Condiciones ...

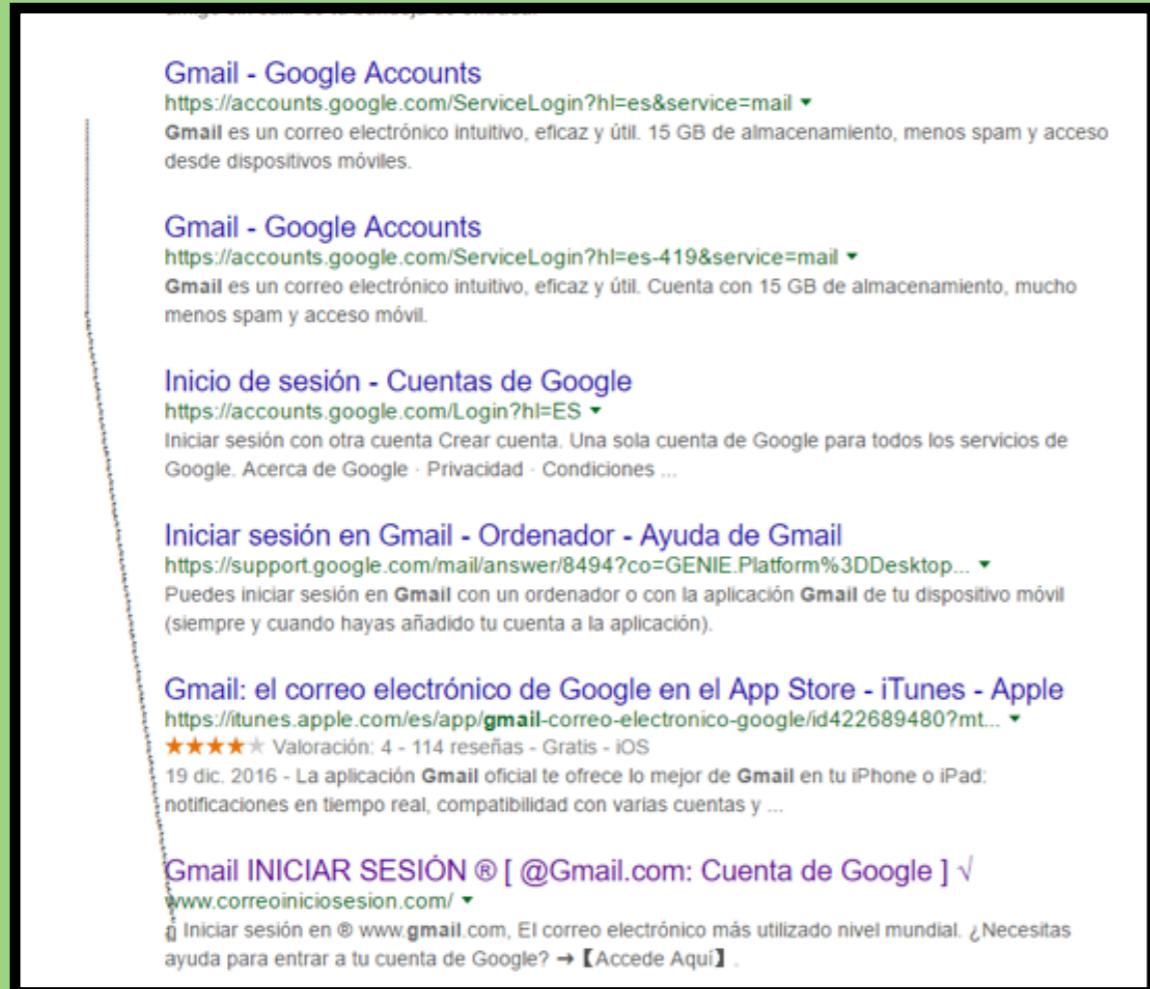
Iniciar sesión en Gmail - Ordenador - Ayuda de Gmail
<https://support.google.com/mail/answer/8494?co=GENIE.Platform%3DDesktop...> ▾
Puedes iniciar sesión en Gmail con un ordenador o con la aplicación Gmail de tu dispositivo móvil (siempre y cuando hayas añadido tu cuenta a la aplicación).

Gmail: el correo electrónico de Google en el App Store - iTunes - Apple
<https://itunes.apple.com/es/app/gmail-correo-electrónico-google/id422689480?mt...> ▾
★★★★★ Valoración: 4 - 114 reseñas - Gratis - iOS
19 dic. 2016 - La aplicación Gmail oficial te ofrece lo mejor de Gmail en tu iPhone o iPad: notificaciones en tiempo real, compatibilidad con varias cuentas y ...

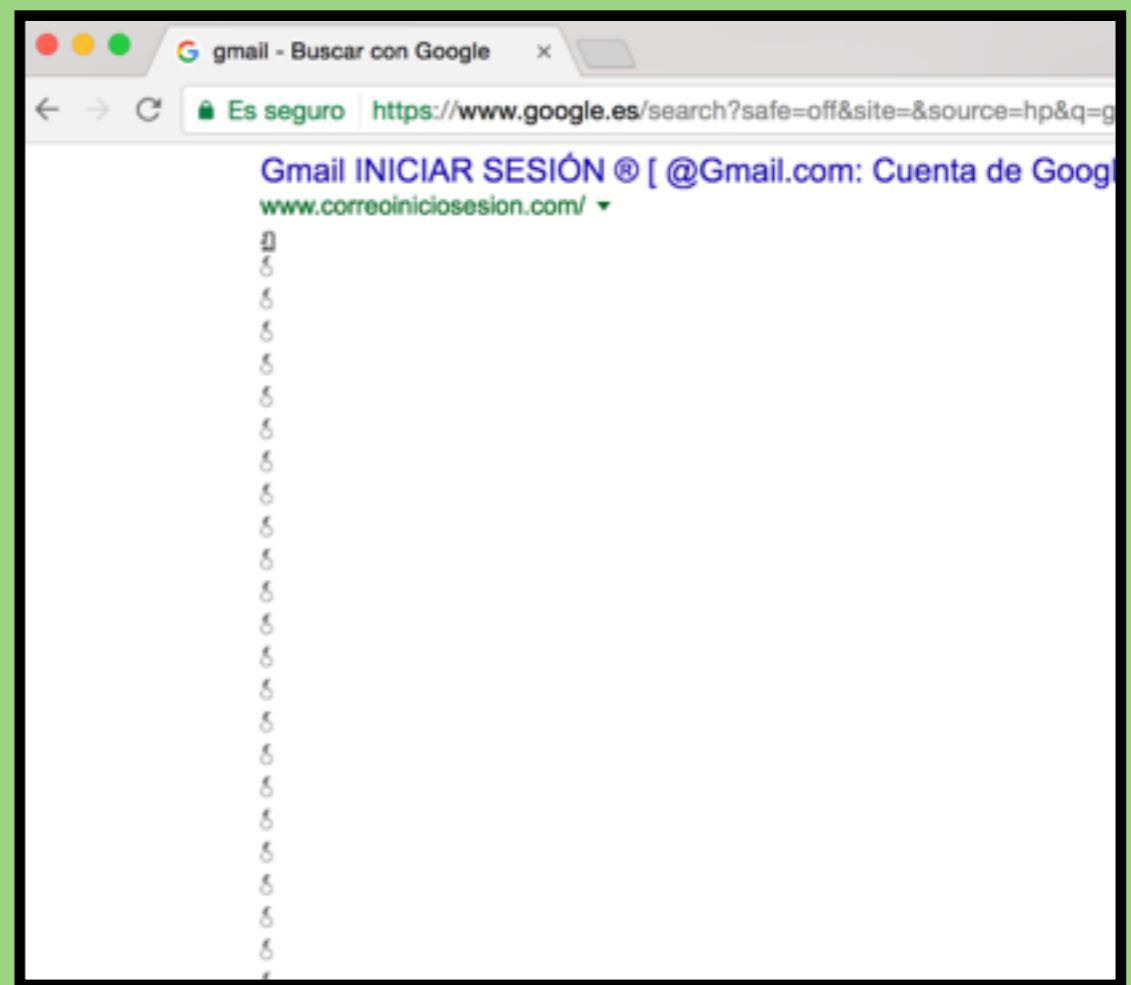
Gmail INICIAR SESIÓN ® [@Gmail.com: Cuenta de Google] ✓
www.correoiniciosesion.com/ ▾
Iniciar sesión en @ www.gmail.com. El correo electrónico más utilizado nivel mundial. ¿Necesitas ayuda para entrar a tu cuenta de Google? → 【Accede Aquí】 .



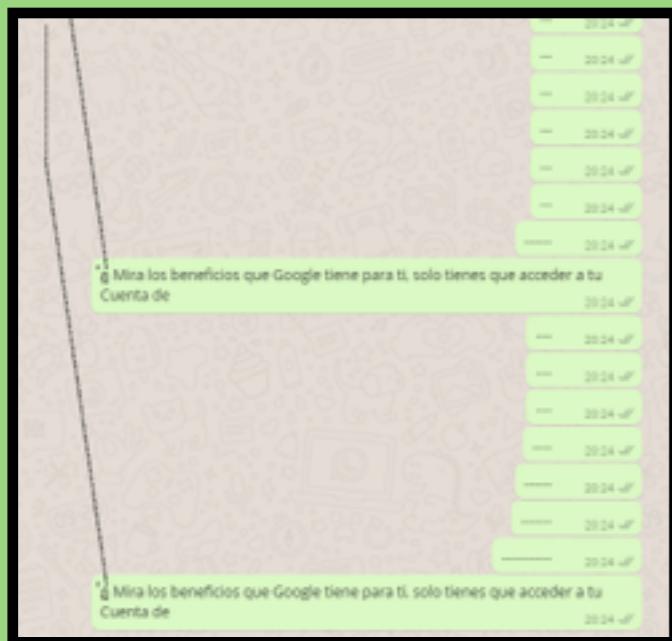
Chrome 55.0.2883 – Windows 7/10



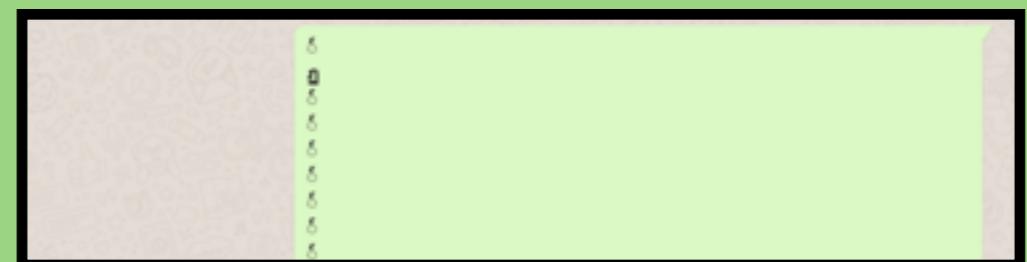
Chrome 55.0.2883 – Mac OS X 10.10.5



WhatsApp Web – Chrome – Windows 7/10

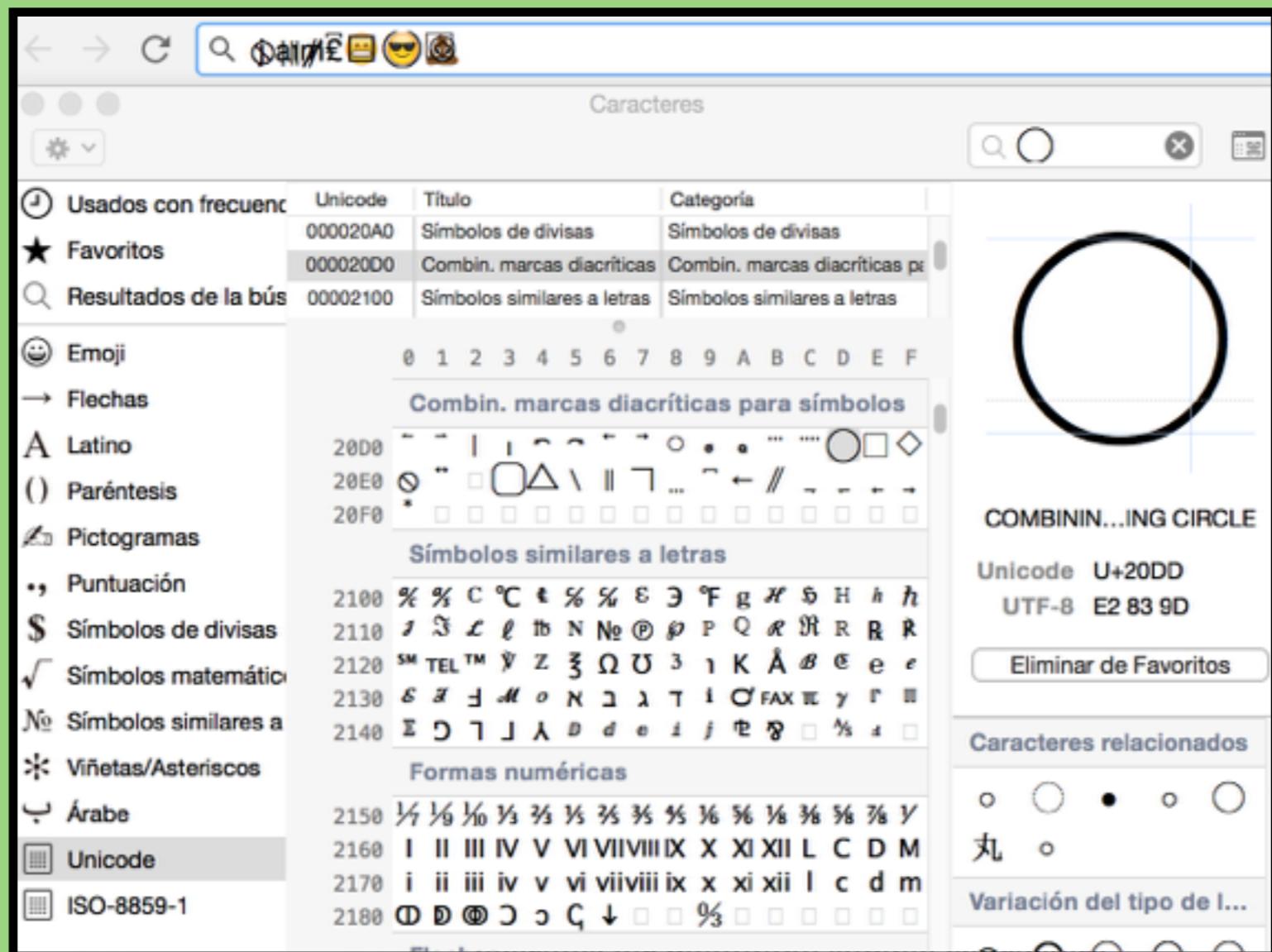


WhatsApp 2.17.24 – Android 6.0.1



Combining marks

0x20DC +



Freakend

Fréakend

Eidekeneb

end

Freakenf

FREEAKEND

<https://github.com/combatwombat/Lunicode.js>

References

- **[Books]**
 - [Fonts & Encodings](#) (Yannis Haralambous, P Scott Horne)
- **[Videos]**
 - [TrueType: The Digital Font Technology](#), lecture by Eliyezer Kohen
 - [Hinting around: Android text demystified](#) by Sebastiano Poggi/Eugenio Marletti
 - [!!Con 2016 - My favorite Unicode character: the zero-width joiner!](#) By Anne Decusatis
- **[Articles]**
 - [An Introduction to TrueType Fonts: A look inside the TTF format](#)
 - [Let's read a TrueType font file from scratch](#)
 - [Word Processing and typography : the computer - the graphical computer](#)
 - [Bezier Curves and Type Design: A Tutorial](#)
 - [Pango vs HarfBuzz](#)
 - [The Absolute Minimum Every Software Developer Absolutely, Positively Must Know About Unicode and Character Sets \(No Excuses!\)](#)
- **[Doc]**
 - [TrueType™ Reference Manual](#)
 - [OpenType specification](#)
 - [PostScript Language Reference](#)

THanks





 @chapi13