Topics

Types of fonts
Font properties
Font metrics
Box and glue model for layout
Unicode
References

References
Types of Type

(From R. Williams, Non-Designers Design Book)
Oldstyle (Renaissance)

- Diagonal stress
- Serifs on lowercase letters are slanted
- Moderate thick/thin transition in the strokes

Goudy, Palatino, Times, Baskerville, Garamond

Modern

- Vertical stress
- Serifs on lowercase letters are thin and horizontal
- Radical thick/thin transition in the strokes

Bodoni, Times Bold, Onyx, Fenice, Ultra, Walbaum
Childhood

I was born of very humble heritage. My mother and father had no degrees. Strange as it may seem, they only followed good common sense in rearing their family. My mother’s maiden name carried a Von before it and I believe this was a sign of some royal ancestor.

My grandfather Klinger had a grocery store and saloon, quite an enterprise in the 1800’s. My mother, with the rest of her family, arose early each morning to count and bag potatoes and from that I probably inherited the ability to count and bag coins at the dairy.
Sans Serif

No serifs anywhere
No thick/thin transition in the strokes
No stress because there's no thick/thin

Antique Olive  Formata
Folio  Franklin Gothic
Futura, Condensed  Syntax
Other Languages

Calligraphy          Font

Properties
Typographical Size

Units

Points (pt)
- Traditional: 72 pt = 0.996 in
- Adobe: 72 pt = 1 in

Picas (pc)
- 12 pt = 1 pc

Em (ps x ps)

En (M/2)

Standard sizes and names
http://www.sizes.com/tools/type.htm

Font Sizes

Units: Pixels (px)

Problem: the actual size of the character depends on the size and resolution of the display
- Early displays: 72 ppi
- Newer displays: 96 ppi

Operating systems (and browsers) assume different ppi
- Mac: 72 ppi -> 1 px ~ 1pt
- Windows: 96 ppi
Styles

Roman

Italic

Oblique

Weights

Light

Regular

Semibold

Bold
Stretch

Condensed

Regular

Expanded

Adobe Multiple Master Fonts

Myriad MM

Weight

Width
Font Metrics

| ascent | ascender height |
| cap height |
| mean line | median |
| baseline |
| descent | descender height |

Font size ~ ascender + descender

Different x-heights

Times Caslon

The bigger the x-height the larger the font seems

Small fonts designed for the screen (like Tahoma & Verdana) have large x-heights. They are also stretched and have fairly uniform letter spacing.
Leading

The distance from the baseline of one line of type to another is called leading, in reference to the lead used in typesetting. The default setting in most layout and image editing software is slightly greater than the cap height of the letter “x.” Expanding this distance creates a text block with a lighter, more open color. As line spacing increases further, the lines of type become less independent; lower elements rather than parts of an overall texture.

This is called “not solid.” When lines are set too closely together, the ascenders and descenders begin to touch, an uncomfortable effect.

Kerning

In most page layout programs, the default line spacing (leading) is 12 pt, or slightly greater than the cap height.

As the spacing became more severe, the block of text begins to read as separate lines rather than a shade of gray.

No kerning

Kerning applied
Ligatures

ff fi fl ffi ffl

ff fi fl ffi ffl

Combining Marks

\[ \acute{\text{a}} \quad \grave{\text{a}} \quad \tilde{\text{a}} \quad \text{macron} \quad \breve{\text{a}} \quad \check{\text{a}} \quad \ddot{\text{a}} \quad \text{overdot} \quad \text{diaeresis} \quad \text{umlaut} \quad \text{ring} \quad \text{double acute} \quad \text{caron} \quad \text{cedilla} \quad \text{ogonek} \]
Glyph Variants

Freetype Glyph Metrics
Box and Glue Model (Knuth)

width 5  width 6  width 3  width 8

space 9  space 9  space 12  stretch 0
stretch 3  stretch 6  shrink 0
shrink 1  shrink 2

9+2  9+4  12+0

Box and Glue Example

5 Results

In this section, we start by demonstrating the efficiency of the scattering equation for solving rendering problems. We then demonstrate the use of the 3D scattering and adding equations to render complex surfaces and show applications of the 3D scattering equation in accurate rendering of surfaces, accounting for light that enters the surface some distance from where it exits.

5.1 Accuracy and efficiency

We tested our implementation’s accuracy against a model that corresponded to the standard problem in astrophysics. This model is specified by the atmosphere’s vertical thickness, depths, and phase function. The resulting scattering functions have been computed and used by many authors. We compared our results to tables from Bokan et al. [BGK91], which have results computed by using Gaussian quadratures to generate a system of differential equations which were then solved via the Runge-Kutta method.

For a set of roughly forty randomly-sampled albedo, thicknesses, and sizes of models, we found excellent agreement with the
Unicode [unicode.org]

“Unicode provides a unique number for every character, no matter what the platform, no matter what the program, not matter what the language”

- Organized as 256 code pages
  - [http://unicode.org/charts]
- Initial version encodes 65K (16-bit) characters
- Characters distinguished by charcodes
- Encodings represent charcodes as numbers
  - ASCII, UTF-8, UTF-16, ISO-8859-1, ..
  - <?xml version=“1.0” encoding=“utf-8” ?>

OpenType [Adobe, Apple, Microsoft]

Encoding
Character map: encoding -> glyph
Glyphs
Glyph metrics

May contain multiple character maps
May contain multiple fonts
May contain bitmap and outline fonts
FreeType.org is an open source implementation
Anatomy of a Glyph
Rasterization

Scaled Outline

Raster Image

(from Apple TrueType Reference Manual)

Anti-Aliasing & ClearType

Anti-Aliased Rendering

Microsoft ClearType
Representing Bitmaps

\[ \text{Glubyte rasters}[24] = \{ \]
\[ 0xc0, 0x00, \]
\[ 0xc0, 0x00, \]
\[ 0xc0, 0x00, \]
\[ 0xc0, 0x00, \]
\[ 0xc0, 0x00, \]
\[ 0xff, 0x00, \]
\[ 0xff, 0x00, \]
\[ 0xff, 0x00, \]
\[ 0xff, 0x00, \]
\[ 0xff, 0x00, \]
\[ 0xff, 0x00, \]
\[ 0xff, 0x00, \]
\[ 0xff, 0x00, \]
\[ 0xff, 0x00, \]
\[ 0xff, 0x00, \]
\[ \} ; \]

\text{glPixelStorei(GL_UNPACK_ALIGNMENT, 1); }

Drawing Bitmaps

Syntax

\[ \text{glBitmap}( w, h, xoff, yoff, xinc, yinc, data ); \]

Example:

\[ \text{glRasterPos2i( 20, 20 );} \]
\[ \text{glBitmap( 10, 12, 0.0, 0.0, 11.0, 0.0, rasters );} \]
Things to Remember

Typography
- Types of type
- Style, weight, stretch
- Character encoding is different than glyph index
- Font metrics
- Layout, box and glue model
- Glyph outlines are modeled using splines