Computational Science:
Computational Methods in Engineering

Graphical Design Concepts

Outline

• Typefaces & Fonts
• Pictures
• Labels
• Color
• Layouts
• Graphics Software
Typefaces & Fonts

**Fonts** – A complete set of characters that share a common weight, width, and style.

**Typeface** – A collection of fonts sharing an overall appearance that are designed to be used together.

<table>
<thead>
<tr>
<th>Font 1a</th>
<th>Font 1b</th>
<th>Font 1c</th>
</tr>
</thead>
<tbody>
<tr>
<td>Font 1d</td>
<td>Font 1e</td>
<td>Font 1f</td>
</tr>
<tr>
<td>Typeface 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Font 2a</th>
<th>Font 2b</th>
<th>Font 2c</th>
</tr>
</thead>
<tbody>
<tr>
<td>Font 2d</td>
<td>Font 2e</td>
<td>Font 2f</td>
</tr>
<tr>
<td>Typeface 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Typefaces

• Serif – Strokes help guide eyes along sentences.
• Sans Serif – No strokes. More pleasing to eye.
• DISPLAY – Large titles. Decorative.
• Script – Implies handwritten and personal.
• Dingbat – Special symbols.

Serifs

Serifs are tails or decorative structures at the ends of the strokes of letters.

Serif Fonts

• Serifs guide the eyes making text easier to read.
• Used mostly for body text where many lines must be read.
• Draws attention. More decorative.
• May be overwhelming as a title or label font.

Sans Serif Fonts

• Simpler and more legible.
• Better looking when scaled large.
• Should be your go-to style, except for body text.
General Rules

• Do not use too many typefaces.
• Use well contrasting colors.
• **LIMIT USE OF DISPLAY FONTS.**
• Make your text easily read and scannable. Use bold headings and focus points to organize.
• Don’t distort typefaces. This means not using the bold and italics styles!

Equations

In math equations, only variables should ever be italicized. Variables that are upper case Greek letters are not capitalized.

<table>
<thead>
<tr>
<th>Incorrect Formatting</th>
<th>Correct Formatting</th>
<th>Why?</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \cos(\theta) )</td>
<td>( \cos (\theta) )</td>
<td>Variable ( \theta ) should be italicized.</td>
</tr>
<tr>
<td>( \cos(\theta) )</td>
<td>( \cos (\theta) )</td>
<td>The function should not be italicized.</td>
</tr>
<tr>
<td>( \cos(\theta) )</td>
<td>( \cos (\theta) )</td>
<td>Parentheses are not correct.</td>
</tr>
<tr>
<td>( \nabla \vec{A} )</td>
<td>( \nabla \cdot \vec{A} )</td>
<td>Dot products should have a large dot.</td>
</tr>
<tr>
<td>( P_{\text{avg}} )</td>
<td>( P_{\text{avg}} )</td>
<td>avg is text and should not be italicized.</td>
</tr>
</tbody>
</table>

Use the correct symbol for the operation!

\[ ab \quad a \cdot b \quad a \times b \quad \vec{a} \cdot \vec{b} \quad a \otimes b \]
Always ensure your graphics have sufficient resolution to avoid pixelization.
Engineer the Contrast (1 of 2)

Your eyes are drawn to contrast.

Engineer the Contrast (2 of 2)

Design the contrast in your pictures to keep attention on what is important.

There are other techniques for drawing attention to the object(s) of interest. This is just one and probably not the best.
Parabolic dish antenna

Neither dark or light lines work well as labels in this picture.
A Solution

Dark lines with a light outline are good way to label high-contrast diagrams.

Parabolic dish antenna

Color
Theory

Colors have an extraordinary ability to influence mood, emotions, and perceptions. They can attract attention and even convey cultural and personal meaning.

Color Wheels

- **ADDITIVE**
  - All about mixing light.
  - Used for graphics on a computer screen.

- **SUBTRACTIVE**
  - All about mixing pigments.
  - Used for printed graphics.
Choosing Colors

Monochromatic -- various shades, tones, or tints of one color. This type of scheme is more subtle and conservative.

Analogous -- hues that are side by side on the color wheel. Easy and versatile to use.

Complementary -- opposites on the color wheel. Complementary colors are high-contrast and high-intensity, but can be difficult to apply in a balanced, harmonious way.

Split-Complementary -- any color on the color wheel plus the two that flank its complement. This scheme still has strong visual contrast, but is less jarring than a complementary color combination.

Triadic -- any three colors that are evenly spaced on the color wheel.

Tetradic/Double-Complementary -- two complementary pairs. This scheme is very eye-catching, but may be even harder to apply than one pair of complementary colors, since more colors are more difficult to balance.

Layouts
Layout Must Convey Meaning

Even though the text is not readable (bad), the layout immediately conveys there is a step-by-step process being conveyed.

Rule of Thirds

- Divides a layout into three rows and three columns.
- Creates visual interest without overcrowding.
- Either place elements in the boxes or at the locations of the stars.
Graphics Software

Manipulating Photos & Images

Commercial King

Adobe Photoshop

Open Source King

GIMP
Vector Graphics

Commercial King

Open Source King

Consider using a vector graphics package to create, edit, or annotate diagrams.

3D Modeling & Animation

Commercial King

Open Source King

Artistic -- Maya

Artistic -- Blender
Posters, Pamphlets, Etc.

Commercial King
- Adobe InDesign
- Microsoft Publisher

Open Source King
- Scribus

DO NOT EVER USE POWERPOINT FOR POSTERS!!!!!!

Text Documents

Commercial King
- Microsoft Word

Open Source King
- LibreOffice
Scientific Data Visualization

Commercial King

MATLAB*

Open Source King

Octave**

* MATLAB does not produce the best quality graphics, but is arguably the best for the ease and number of ways to visualize data.

** Octave is not the best open-source scientific visualization package, but it wins here due to being the closest clone of MATLAB.