The Non-Designer's Design Book

Typographic Principles for the Visual Novice

-- Robin Williams

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4 basic design principles

- Contrast
  - avoid having items on a page be similar
  - if they are not the *same* then make them **very different**
- Repetition
  - repeat visual elements of the design throughout the piece
  - i.e. shape, texture, spatial relationships, line thickness, sizes, etc.
- Alignment
  - nothing should be arbitrarily placed
  - every element should have some visual connection with another element on the page
- Proximity
  - items relating to each other should be grouped close together
  - helps organize information and reduces clutter

Proximity

Group related items together

- The basic purpose:
  - organize
  - if information is organized it is more likely to be read and more likely to be remembered
  - easier to use?
- How to get it:
  - Squint your eyes and count the number of visual elements on the page by counting the number of times your eye stops.
  - If there are more than 3- 5 then try to regroup some of the elements

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Proximity

- What to avoid:
  - too many separate elements on a page
  - don't stick things in the corners and in the middle
  - avoid leaving equal amounts of white space between elements unless each group is part of a subset
  - avoid even a split second of confusion between related material
  - don't create relationships with elements that don't belong together

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Alignment

Nothing should be placed on the page arbitrarily

- The basic purpose:
  - unify and organize the page
- How to get it:
  - Be conscious of where you place elements
  - always find something else on the page to align with, even if the two objects are physically far apart
- What to avoid:
  - Avoid using more than one text alignment (like I did above)
  - break away from centered alighnment unless you want a more formal (often dull) presentation

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Repetition

Repeat some aspect of the design throughout the entire piece

- The basic purpose:
  - unify and add visual interest
  - if a piece looks interesting it is more likely to be read
- How to get it:
  - Think of it as being consistent
  - possibly add elements just to create repetition
  - find existing repetition and strengthen it
  - start to create repetitions to enhance the design and clarity
- What to avoid:
  - Avoid repetition so much that it is annoying or overwhelming
  - be aware of contrast

Contrast

If two items are not the same then make them REALLY different

- The basic purpose:
  - create an interest on the page -- more likely to be read
  - organization of information
- How to get it:
  - add contrast though typeface choices, line thickness, colors, shapes, sizes, space, etc.
  - most important thing is to be strong
- What to avoid:
  - Don't be a wimp!
  - do it with strength
  - *make them different*

Don't be a Wimp!

- Don't be afraid to create the design of your life with LOTS of blank space
- Don't be afraid to be asymmetrical
  - often makes it stronger
  - it's ok to do the unexpected
- Don't be afraid to make words very large or very small
  - both can be effective in the right place
- Don't be afraid to make graphics very bold of very minimal as long as the result complements or reinforces your design or your attitude

How might the 4 basic design principles apply to software development?

- Proximity

- Alignment

- Repetition

- Contrast

Principles of User Interface Design

- Organize
  - provide the user with a clear and consistent conceptual structure

- Economize
  - maximize the effectiveness of a minimal set of cues

- Communicate
  - match the presentation to the capabilities of the user

Visual language

- Layout (formats, proportions and grids)
- Typography (typefaces and typesettings)
- Colour and texture
- Imagery (signs, icons, and symbols)
- Animation (a dynamic or kinetic display)
- Sequencing (overall approach to visual storytelling)
- Sound (abstract, vocal, concrete, or musical cues, earcons)
- Visual identity (rules that lend to overall consistency of a user interface)

Organize

- Consistency
  - internal consistency
  - external consistency
  - real world consistency
  - when not to be consistent
- Screen layout
  - use a grid structure
  - standardize the screen layout
  - group related elements
- Relationships
  - Establish clear relationships by linking related elements and disassociating unrelated elements
- Navigability
  - provide an initial focus for the viewer's attention, direct attention to important, secondary or peripheral items, and assist in navigation

Economize

"doing the most with the least"

- Simplicity
  - include only those elements that are essential for communication
  - be as unobtrusive as possible
- Clarity
  - design all components so their meaning is not ambiguous
- Distinctiveness
  - distinguish important properties of essential elements
- Emphasis
  - make the most important elements salient (easily perceived)
  - de-emphasize non-critical elements
  - minimize clutter

Communicate

- Legibility
  - design individual characters, symbols, and graphic elements to be easily noticeable and distinguishable
  - must select visualization techniques appropriate to the output display
- Readability
  - the display in comprehensible (easy to identify and interpret)
  - display is inviting and attractive
- Typography
  - characteristics of individual elements (typefaces and typestyles) and their groupings (typesetting techniques)
  - Typesetting
    - adjust point size, word spacing, paragraph indentation, and line spacing to enhance the readability and to emphasize critical information

Basic Typesetting Recommendations

- Maximum of three typefaces and three sizes
- lines of text should be max. 40-60 characters
- text should be set in appropriate formats
  - text flush left, numbers flush right, avoid centered text in lists, avoid short justified lines
- use variable width font
  - fixed width can slow reading by 12 percent
- use upper and lower case characters
  - all capitals can slow reading by 12 percent

Communicate (continued)

- Symbolism
  - icons, symbols, charts, maps, diagrams
  - must be carefully selected and refined to communicate the desired contents
- Multiple views
  - provide multiple perspectives on the display of complex structures and processes
    - multiple forms of representation
    - multiple levels of abstraction
    - simultaneous alternative views
    - links and cross references
- Color
  - very complex, powerful communication tool

Why use colour?

- Colour displays are attractive to users and can often improve task performance

- Benefits:
  - various colours are soothing or striking to the eye
  - can improve an uninteresting display
  - facilitates subtle discriminations in complex displays
  - can emphasize the logical organization of information
  - can draw attention to warnings
  - can evoke more emotional reactions of joy, excitement, fear, or anger

D NGER

⌘**Inappropriate** use of **colour** can be **disasterous** to the application

Red
Green
Yellow
Blue
Orange
Black

Red
Green
Yellow
Blue
Orange
Black
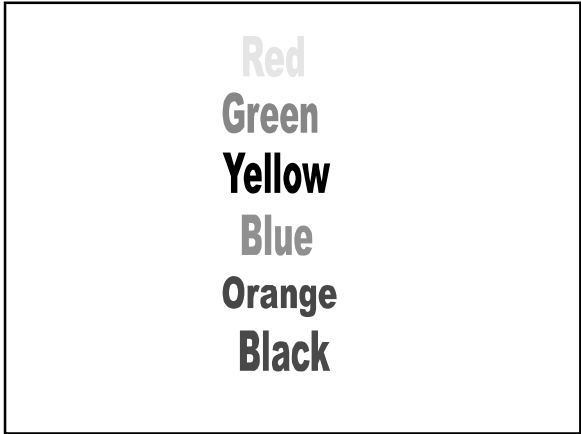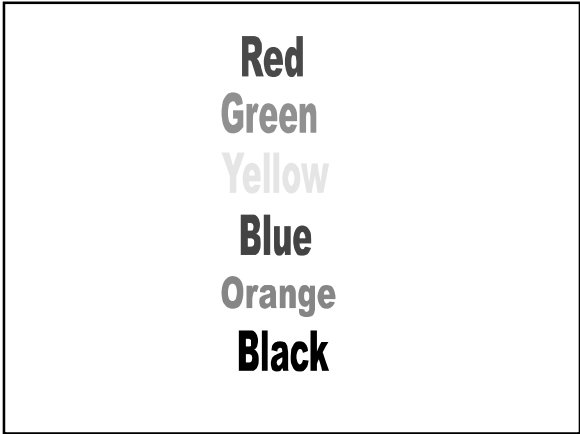
Colour Dimensions

- Hue, Intensity and Saturation
  - hue is the spectral wavelength composition of a colour that produces it's perception of being blue, orange, green, etc.
    - blue short, green medium, red long
    - average human can discriminate approx. 150 hues
  - intensity is the relative amount of lightness or darkness of the colour in a range from black to white (also known as value)
  - saturation is the purity of the colour in a scale from gray to the most vivid variant of the perceived colour (also known as chroma)

Hue, Shade and Tint

- *hue* is what we call colour in its purist form
- *shade* of a colour is what that colour would look like if the light were shaded from it, or black added to it,
- *tint* is what we get when a colour is diluted with white.


SHADES HUES TINTS

Colour Dimensions

- RGB (Red, Green, Blue)

- CIE (International Commission on Illumination)
  - responsible for maintaining color standards, based on the concept of a standard observer. This standard observer is in turn based on a model of the human rods and cones. However, the model does not take adaptation or simultaneous contrast into account which is why the CIE system has little to do with the appearance of colors.

Colour terminology

- Brightness
  - subjective reaction to levels of light
  - affected by luminance
- Luminance
  - luminance is the amount of light emitted by and object
  - dependent on the amount of light falling on the object's surface and its reflective properties
- Contrast
  - a function of the luminance of the object and the luminance of its background
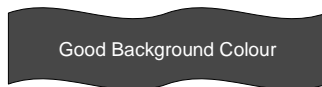
Colour Guidelines

- Color Graphics -- Blessing or Ballyhoo (Excerpt)
  - G. Murch
  - textbook 442-442
- Physiological guidelines:
  - #1 avoid simultaneous display of highly saturated, spectrally extreme colours
    - reds, oranges, yellows, and greens can be viewed together without refocusing
    - cyan and blues cannot easily be viewed simultaneously with red
    - avoid extreme colour pairs such as red and blue or yellow and purple
    - desaturating spectrally extreme colours will reduce the need for refocusing
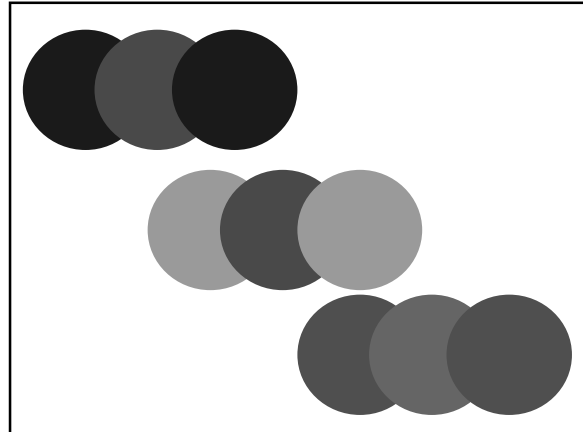
Physiological Guidelines

#2 avoid pure blue for text, thin lines and small shapes

❋ our visual system has trouble with detailed, sharp, short-wavelength stimuli

☞ however, makes a good background colour and is perceived easily in the periphery

> Good Background Colour

Physiological Guidelines

#3 avoid adjacent colours, differing only in the amount of blue

- edges will appear indistinct

Physiological Guidelines

#4 older viewers need higher brightness levels to distinguish colours

#5 colours change appearance as ambient light level changes

- displays change colour under different types of light (fluorescent, incandescent, or daylight)

- appearance also changes as light level is increased or decreased

- change occurs because of an increased or decreased contrast and due to the shift in the sensitivity of the eye

Physiological Guidelines

#6 magnitude of a detectable change in colour varies across the spectrum
- small changes in extreme reds and purple are more difficult the detect then small changes in other colours such as yellow and blue-green
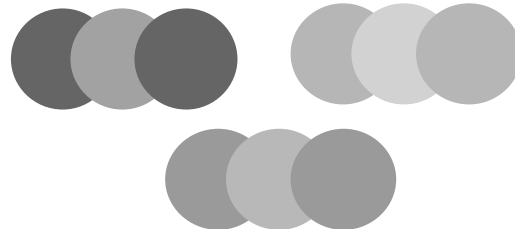
Physiological Guidelines

#7 difficulty in focusing results from edges created by colour alone
 – multi-coloured images should be differentiated on the basis of brightness as well as colour

Physiological Guidelines

#8 avoid red and green in the periphery of large-scale displays

  – due to the insensitivity of the retinal periphery to red and green, these colours in saturated form should be avoided, especially for small symbols and shapes
  – yellow and blue are good peripheral colours

Physiological Guidelines

#9 opponent colours go well together
  – good: red/green or yellow/blue
  – bad: red/yellow or green/blue
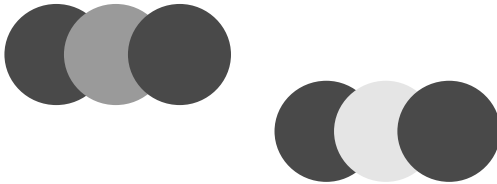
Physiological Guidelines

#10 for colour deficient observers, avoid single colour distinctions

  – colour blindness is a lack of perceptual sensitivity to certain colours
  – colour blindness comes as a result of a lack of one or more of the types of colour receptors
  – most colour perception defects are for red or green or both
  – about 10% of males have a colour perception defect, but this is rare in females
  – red-green colour blindness is a result of a lack of red receptors
  – yellow-blue is the second most common form, but it's extremely rare.
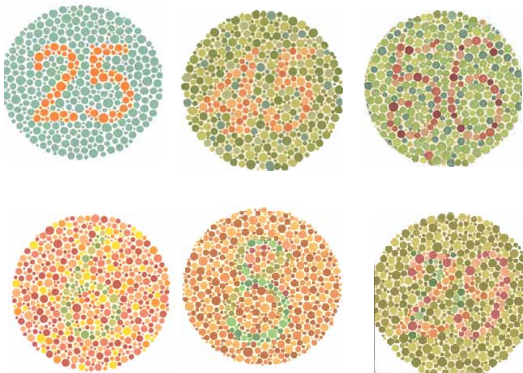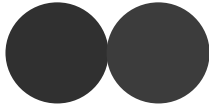

Perceptual Guidelines

#11 not all colours are equally discernible
  – perceptually we need a large change in wavelength to perceive colour difference in some portions of the spectrum and a small one in other portions

Perceptual Guidelines

#12 luminance does not equal brightness
- two equal-luminance but different hue colours will probably appear to have different brightness
- deviations are most extreme for colours towards the end of the spectrum (red, magenta, blue)

Perceptual Guidelines

#13 different hues have inherently different saturation levels
- for example, yellow always appears less saturated

Perceptual Guidelines

#14 lightness and brightness are distinguishable on a printed hard copy, but not on a colour display
- the nature of a colour display does not allow lightness and brightness to be varies independently

Perceptual Guidelines

#15 not all colours are equally readable or legible
- extreme care should be taken with text colour relative to background colours
- there is a loss in hue with reduced size
- there is inadequate contrast when the background and text colours are similar
- general rule:
  - darker, spectrally extreme colours such as red, blue, magenta, brown, etc. make good background colours
 - brighter, spectrally-centered, and desaturated hues produce more legible text

Perceptual Guidelines

#16 hues change with intensity and background colour
- when grouping elements by colour, make sure that backgrounds or nearby colours do not change the hue of an element
- limit the number of colours and make sure they are widely separated in the spectrum

Perceptual Guidelines

#17 avoid the need for colour discrimination in small areas
- hue information is lost in small areas
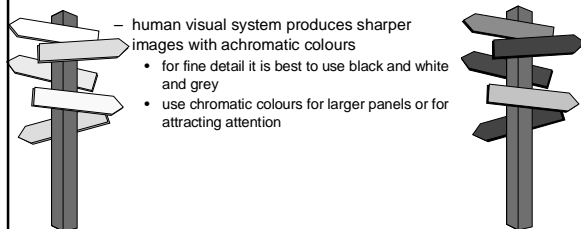
- human visual system produces sharper images with achromatic colours
  - for fine detail it is best to use black and white and grey
  - use chromatic colours for larger panels or for attracting attention

Cognitive Guidelines

#18 do not overuse colour
- benefits of colour as an attention getter, information grouper, and value assigner are lost if too many colours are used
- limit displays to about six clearly distinguishable colours

9 different colours   5 different colours

Cognitive Guidelines

#19 be aware of non-linear colour manipulation in video and hard-copy
- algorithms do not exist for translating the physical colours of an imaging device into a perceptually structured colour set
- video or hard copy systems cannot match human perception and expectations

Cognitive Guidelines

#19 group related elements by using a common background colour
- a successive set of images can be shown to be related by using the same background colour
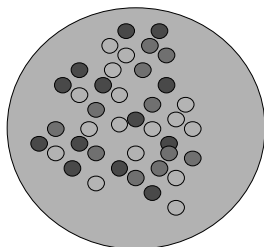
Cognitive Guidelines

#20 similar colours connate similar meanings
- can convey the message through the degree in similarity of hue

Cognitive Guidelines

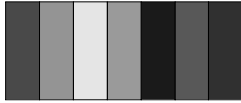#21 brightness and saturation draw attention

Cognitive Guidelines

#22 link the degree of colour change to event magnitude

Cognitive Guidelines

#23 order colours by their spectral position
  – red, orange, yellow, green, blue, indigo, violet

Cognitive Guidelines

#24 warm and cold colours should indicate action levels
  – warm (long wavelength) signify an action or the requirement of a response
  – cool signify status or background information

Colour is preattentive

8568972698468976268976435892265986598655489768926989 8
0246299687402655762798638904567923276928546098677209 8
9083457980279075904709827908579084772908759082790875 4
9870985674906897578625984569024379047219079070981145 0
8568972698468976268976445892265986598655489768926989 8

8568972698468976268976435892265986598655489768926989 8
0246299687402655762798638904567923276928546098677209 8
9083457980279075904709827908579084772908759082790875 4
9870985674906897578625984569024379047219079070981145 0
8568972698468976268976445892265986598655489768926989 8

Cultural Guidelines

Colour	Western European	Japanese	Chinese	Arabic
Red	Danger, aristocracy (France)	Anger, danger	Joy, festive occasions	
Yellow	Caution, cowardice	Grace, nobility, childish, gaiety	Honor, royality	Happiness, prosperity
Green	Safe, Sour, Criminality (France)	Future, youth, energy		Fertility, strength
Blue	Masculinity, sweet, calm, authority	Villianity		Virtue, faith, truth
White	Purity, virtue	Death, mourning	Death, mourning	
Black	Death	Evil		

HCI Guidelines for Colour

- Use colour conservatively
- Limit the number of colours
- recognize the power of colour as a coding technique
- ensure that colour coding supports the task
- have colour coding appear with minimal user effort
- place colour coding under user control
- design for monochrome first
- consider the needs of colour-deficient users
- use colour to help in formatting
- be consistent in colour coding
- be alert to common expectations about colour codes

HCI Guidelines for Colour

- Be alert to problems with colour pairings
- use colour changes to indicate status changes
- use colour in graphic displays for greater information density