CS7026

Visual Interface Design
Interface Design

- Visual interface designers are concerned with finding representations best suited to *communicating* the specific behaviour of the interactive product that they are designing.

- Try to present behaviour and information in such a way that it is understandable and useful, and supports
  - the branding objectives of the organization
  - the experience goals of the personas.
Aesthetic concerns are important but should be placed within a functional framework.

Visual Interface design emphasizes
- the organizational aspects of the design
- the way in which visual cues and affordances communicate behaviour to users.

Focus on how to match the visual structure of the interface to the logical structure of both the users’ mental models and the program’s behaviours.
At its root, interface design is concerned with the treatment and arrangement of visual elements to communicate behaviour and information.

Every element in a visual composition has a number of properties, such as shape and colour, that work together to create meaning.

There is rarely an inherent meaning to any one of these properties. Rather, the differences and similarities in the way these properties are applied to each element come together to allow users to make sense of an interface.
The Building Blocks of Visual Interface Design

- When two objects share properties, users will assume they are related or similar.

- When users perceive contrast in these properties, they assume the items are not related.

- The items with the greatest contrast tend to demand our attention.
Shape

Is it round, square, or a blob?

- Shape is the primary way we recognize what an object is.

- We tend to recognize objects by their outlines (a silhouette of a pineapple that’s been textured with blue fur still reads as a pineapple).

- However, distinguishing among different shapes takes a higher level of attention than distinguishing some other properties such as colour or size.

- This means it’s not the best property to contrast when your purpose is to capture a user’s attention.
Size

How big or small is it in relation to other items on the screen?

- Larger items draw our attention more, particularly when they’re much larger than similar things around them.

- Size is also an ordered and quantitative variable, which means that people automatically sequence objects in terms of their size and tend to assign relative quantities to those differences.

- E.g., if we have four sizes of text, we assume relative importance increases with size, and that bold type is more important than regular. This makes size a useful property in conveying information hierarchies.
Size

- Sufficient distinction in size is also enough to draw our attention quickly.

- In his classic *The Semiology of Graphics*, Jacques Bertin describes size as a dissociative property, which means that when something is very small or very large, it can be difficult to decipher other variables, such as shape.
Value

How light or dark is it?

- Of course, the idea of lightness or darkness is meaningful primarily in context of the value of the background.

- On a dark background, dark type is faint, whereas on a light background, dark type is pronounced.

- Like size, value can be dissociative; if a photo is too dark or light, for example, you can no longer perceive what’s in it.
Value

- Contrasts in value are something people perceive quickly and easily, so value can be a good tool for drawing attention to elements that need to stand out.

- Value is also an ordered variable - for example, lower-value (darker) colours on a map are easy to interpret as deeper water or denser population.
Hue

Is it yellow, red, or orange?

- Differences in hue draw our attention quickly.

- In some domains, hue has specific meaning we can take advantage of.
  - E.g., an accountant sees red as negative and black as positive, and a securities trader sees blue as “buy” and red as “sell” (in the US, at least).

- Colours also take on meaning from the social contexts in which we’ve grown up.
  - E.g., to Westerners who’ve grown up with traffic signals, red means “stop” and sometimes even “danger,” whereas in China, red is the colour of good luck. Similarly, white is associated with purity and peace in the West, and with funerals and death in Asia.
Hue

- Unlike size or value, though, hue is not intrinsically ordered or quantitative, so it’s less ideal for conveying that sort of data.

- Also, we don’t want to rely on hue as the sole communication vector, since colour-blindness is quite common.
Hue

- To create an effective visual system that allows users to identify similarities and differences between elements, you should use a limited number of hues.

- The carnival effect overwhelms users and limits your ability to communicate.

- Hue is also where the branding needs and communication needs of an interface can collide.
Orientation

Is it pointing up, down, or sideways?

- This is a useful variable to employ when you have directional information to convey (up or down, backward or forward).

- Orientation can be difficult to perceive with some shapes or at small sizes, though, so it’s best used as a secondary communication vector.

- E.g., if you want to show the stock market is going down, you might want to use a downward-pointing arrow that’s also red.
Texture

Is it rough or smooth, regular or uneven?

- Of course, elements on a screen don’t have real texture, but they can have the appearance of it.

- Texture is seldom useful for conveying differences or calling attention, since it requires a lot of attention to distinguish.

- However, it can be an important affordance cue; when we see a textured rubber area on a device, we assume that’s where we’re meant to grab it.

- Ridges or bumps on a user-interface (UI) element generally indicate that it’s draggable, and a bevel or drop-shadow on a button makes it seem more clickable.
Position

Where is it relative to other elements?

- Like size, position is both an ordered and a quantitative variable, which means it’s useful for conveying information about hierarchy.

- We can leverage the reading order of a screen to locate elements sequentially, with the most important or first used in the top and left.

- Position can also be used to create spatial relationships between objects on the screen and objects in the physical world.
Visual interfaces should:

1. Use visual properties to group elements and create a clear hierarchy

2. Provide visual structure and flow at each level of organization

3. Use cohesive, consistent, and contextually appropriate imagery

4. Integrate style and function comprehensively and purposefully

5. Avoid visual noise and clutter
Use visual properties to group elements and create a clear hierarchy

- Our visual interfaces should provide answers to 2 questions:

1. “What’s important here?”

2. “How are these things related?”
Use visual properties to group elements and create a clear hierarchy

- Determine which controls and bits of data users need to understand instantly, which are secondary, and which are needed only by exception.

- This ranking informs the visual hierarchy.

- Next use hue, saturation, value, size, and position to distinguish levels of hierarchy.
Use visual properties to group elements and create a clear hierarchy

- The most important elements should
  - be larger,
  - have greater contrast in hue, saturation, and value in relation to the background, and
  - be positioned above or outdented in relation to other items.

- Items meant to stand out are best rendered in saturated colours.
Use visual properties to group elements and create a clear hierarchy

- Less important elements should
  - be less saturated,
  - have less value and hue contrast against the background, and
  - should also be smaller, or indented.

- Desaturated, neutral colours tend to recede.
Use visual properties to group elements and create a clear hierarchy

**Establishing Relationships**

- Determine not only which elements have similar functions but also which elements are used together most often.

- Elements that tend to be used together should generally be grouped spatially to minimize mouse movement.

- Elements that aren’t necessarily used together but have similar functions may be grouped visually even if they are not grouped spatially.
Provide visual structure and flow at each level of organization

**Alignment**

- In general, every element on the screen should be aligned with as many other elements as possible.

- The decision not to align two elements or groups of elements should be made judiciously, and always to achieve a specific differentiating effect.
Provide visual structure and flow at each level of organization

**Alignment**

- In particular, designers should take care to:

  - Align labels - Labels for controls stacked vertically should be aligned with each other; unless labels differ widely in length, left-justification is easier for users to scan than right justification.

  - Align within a set of controls - A related group of check boxes, radio buttons, or text fields should be aligned according to a regular grid.

  - Align across control groups and panes - Groups of controls and other screen elements should all follow the same grid wherever possible.
Provide visual structure and flow at each level of organization

**The Grid**

- The use of a grid provides a uniform and consistent structure to layout.

- Typically, the grid divides the screen into several large horizontal and vertical regions.

- A well-designed grid employs an *atomic grid unit* that represents the smallest spacing between elements.

- E.g., if your atomic unit is four pixels, spacing between screen elements and groups will all be in multiples of four pixels.
Provide visual structure and flow at each level of organization

The Grid

- Ideally, a grid should also have consistent relationships between the sizes of different screen areas.

- These relationships are typically expressed as ratios.

- Commonly used ratios include:
  - the celebrated “golden section,” or phi (approximately 1.61), which is found frequently in nature and is thought to be particularly harmonious to the human eye;
  - the square root of two (approximately 1:1.14), which is the basis of the international paper size standard (e.g. the A4 sheet); and
  - 4:3, the aspect ratio of most computer displays.
Provide visual structure and flow at each level of organization

**Benefits of the Grid**

- **Usability**
  - Regularising positioning of elements means users are able to learn quickly where to find key interface elements.
  - Consistent spacing and positioning support people’s innate visual processing mechanisms.
  - A well-designed grid greatly improves the readability of the screen.

- **Aesthetic appeal**
  - Creates a sense of order that feels comfortable to users and invites them to interact with the product.

- **Efficiency**
  - Standardizing layouts reduces the amount of labour required to produce interfaces.
  - Results in designs that can be modified and extended should alterations prove necessary.
Provide visual structure and flow at each level of organization

Create a logical path

**Good logical flow**
Eye movements match the path through the interface

**Bad logical flow**
Everything is all over the place
Use cohesive, consistent, and contextually appropriate imagery

- Use of icons and other illustrative elements can help users understand an interface.

- Or, if poorly executed, can irritate, confuse, or insult.

- Have a good understanding of
  - Your personas and their mental models
  - Cultural Issues
  - Domains (e.g. in hospitals yellow means radiation)

I.e., Make sure you understand the visual language of your users’ domains and environments before forging ahead.
Integrate style and function comprehensively and purposefully

- Purely aesthetic considerations should not interfere with the meaning of the interface or a user’s ability to interact with it.
Avoid visual noise and clutter

- **Visual noise** within an interface is caused by superfluous visual elements that distract from the primary objective of directly communicating software function and behaviour.

- **Cluttered interfaces** attempt to provide an excess of functionality in a constrained space, resulting in controls that visually interfere with each other.
Keep it simple

- In general, interfaces should use
  - simple geometric forms,
  - minimal contours,
  - a restricted colour palette comprised primarily of less-saturated or neutral colours balanced with a few high-contrast accent colours that emphasize important information.

- Typography should not vary widely in an interface:
  Typically one or two typefaces, specified to display at just a few sizes, will be sufficient.
Keep it simple

- When multiple design elements (controls, panes, windows) are required for similar or related logical purposes, they should be visually rendered in a consistent fashion to take advantage of the concept of inheritance.

- Inheritance provides the opportunity for an understanding of one element to transfer to other elements that are similar.

- Elements intended to stand out should be visually contrasted with any regularized elements through adjustment of one or more visual properties, such as size, colour, and position.
Text in visual interfaces

- Avoid using all caps in your interfaces. WORDS TYPED IN ALL CAPITAL LETTERS ARE HARDER TO READ than upper/lowercase.

- Interfaces should try to minimize the amount of text that must be read in order to navigate the interface successfully.

- After a user has navigated to something interesting, he should be able to read details if appropriate.

- Using short, easily recognized words facilitates navigation with minimal conscious reading.
Text in visual interfaces

- Phrase your text clearly - Make your text understandable by using the fewest words necessary to clearly convey meaning. Also, try to avoid abbreviations. If you must abbreviate, use standard abbreviations.

- Use high contrast text - Make sure that the text is in high contrast with the background and do not use complementary colours that may affect readability.
Text in visual interfaces

- Choose an appropriate typeface and size.
  - In general, a crisp sans-serif font such as Verdana or Tahoma is your best bet for readability.
  - Serif typefaces such as Times or Georgia can appear “hairy” onscreen, but using a large enough size and font smoothing or appropriate anti-aliasing can often mitigate this issue.
  - Type sizes of less than 10 pixels are difficult to read in most situations, and if you must use small type, it’s usually best to go with a sans-serif typeface without anti-aliasing.
Colour in visual interfaces

- Colour is part of the visual language of an interface, and users will impart meaning to its use.

- For most applications, colour should be used sparingly and integrate well into the other elements of the visual language: symbols and icons, text, and the spatial relationships they maintain in the interface.

- Used appropriately, colour can
  - draw attention to important items,
  - indicate relationships, and
  - communicate status or other information.
Colour in visual interfaces

- **Too many colours**
  - Adding one colour to distinguish important items in a set significantly reduces search time.
  - Adding more colours still improves user performance, but at seven or more, search performance degrades significantly.
  - This number is consistent with how much information we can hold in our short-term memories; when there are too many colours, we spend time trying to remember what the colours mean, so that slows us down.
Colour in visual interfaces

Use of saturated complementary colours

- Complementary colours are the inverse of each other in colour computation.

- These colours, when highly saturated and positioned adjacent to each other, can create perceptual artifacts that are difficult to perceive correctly or focus on.

- A similar effect is the result of chromostereopsis, in which colours on the extreme ends of the spectrum “vibrate” when placed adjacent to one another.

- (Just try looking at saturated red text on a saturated blue background and see how quickly you get a headache!)
**Colour in visual interfaces**

- **Excessive saturation**
  
  - Highly saturated colours tend to look garish and draw too much attention.
  
  - Moderately saturated colours can be appropriate in small swatches to capture a user’s attention but should always be used sparingly.
  
  - When multiple saturated colours are used together, chromostereopsis and other perceptual artefacts often occur.
Colour in visual interfaces

- **Inadequate contrast**
  - When object colours differ from background colours only in hue, but not in saturation or value (brightness), they become difficult to perceive.
  - Objects and background should vary in brightness or saturation, in addition to hue, and colour text on colour backgrounds should also be avoided when possible.
Inadequate attention to colour impairment

- Roughly 10% of the male population has some degree of colour-blindness. Thus care should be taken when using red and green hues (in particular) to communicate important information.

- Any colours used to communicate should also vary by saturation or brightness to distinguish them from each other.

- If a grayscale conversion of your colour palette is easily distinguishable, colour-blind users should be able to distinguish the colour version.

- There are also applications and filters, such as Fujitsu’s ColorDoctor, that can be used to see how people with various forms of colour-blindness would perceive your product.
Visual interface design for mobile and other handheld devices

- Designing for a handheld or other device such as a mobile phone or medical equipment has its own set of challenges related to
  - a smaller screen size,
  - mobile usage context, and
  - diverse input methods.
Visual interface design for mobile and other handheld devices

- Onscreen controls should be prominent.
  - Because handheld devices are used while standing, walking, riding on bumpy trains, and in all sorts of busy medical and industrial environments, onscreen controls must be much more obvious than their desktop counterparts.
  - Different hardware and contexts require different tactics, but as a general rule using high-contrast designs is a good idea.
  - If your hardware limits your ability to do this, you may have to resort to size, colour, or line weight to accomplish this.

- Provide visual landmarks.
  - To accomplish a task, handheld users frequently must traverse several screens.
  - As a result it’s important to use visual cues to orient users.
Visual interface design for mobile and other handheld devices

- Onscreen controls should be large if you’re using a touch screen.
  - If you are using a touch screen on your device, controls should be large enough to be touchable by fingers.

- Use larger, sans-serif fonts.
  - Serif fonts are hard to read at low resolution; sans-serif fonts should be used particularly for low-resolution handheld displays.

- Clearly indicate when there is more data offscreen.
  - A small screen has more scrolling information.
  - If there is more data than fits on a screen, make sure to boldly indicate that more data is available, ideally with a hint as to how to access it.