Human Computer Interaction

Design and Visual Perception

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Outline

Motivating examples

Preview: visual perception

- Our perception of the world around us is not a true depiction of what is actually there.
- We perceive, to a large extent, what we expect to perceive.
- Our perception is biased by several factors.
- [PERCEPTION IS BIASED BY EXPERIENCE (building)]

Preview: experience bias

- Architectural sketch of building layout:

Preview: experience bias

- Did you clearly see the building plans in the diagram shown on the previous slide?
- Can you picture (maybe only vaguely) the general outlines of the five buildings?
- Any other observations?

Preview: experience bias

Preview: experience bias

- This effect is present also without explicit priming.
- Rather, the lack of priming (expectation) can lead to a failure to interpret.

Preview: experience bias

Preview: experience bias

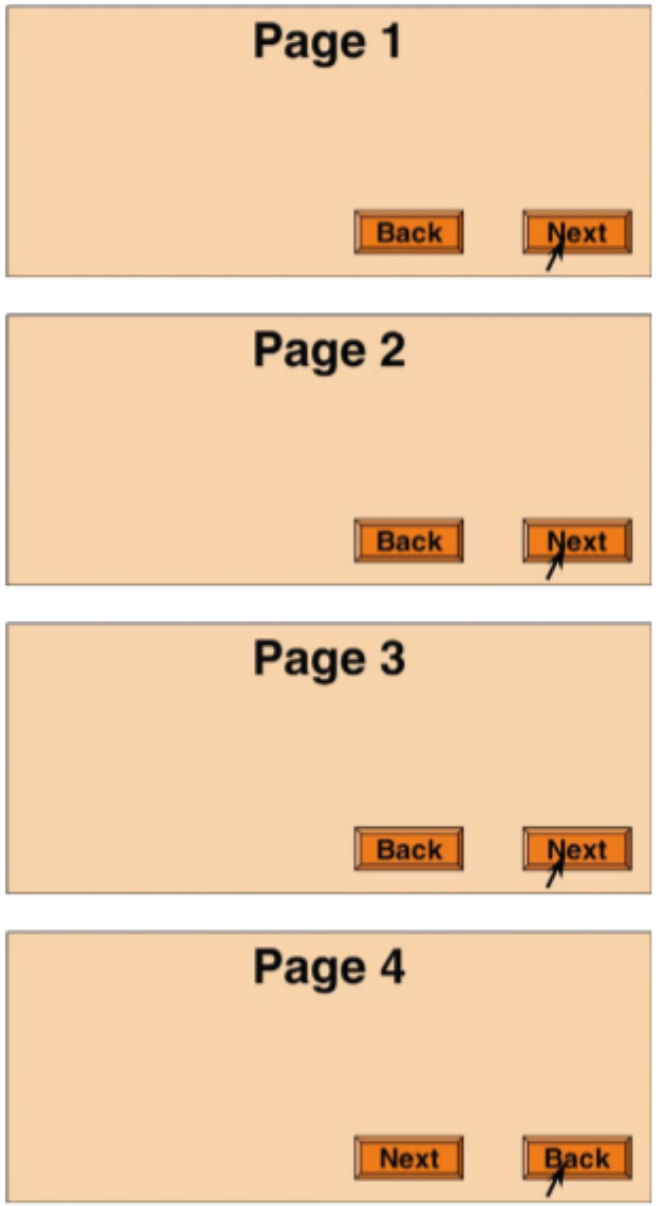
- This is a very famous example, so maybe we need to find a new example of this phenomenon. . .
- Did you all see what the previous slide had a picture of on it?
- What if I tell you specifically what to look for?

Preview: experience bias

Preview: experience bias

- In graphical user interfaces experience bias is a critical factor, also because the user will potentially spend a significant amount of time interacting with your system.
- Consistency of experience is critical.

Preview: experience bias



The Gestalt rules of visual organization

Overview of Gestalt theory

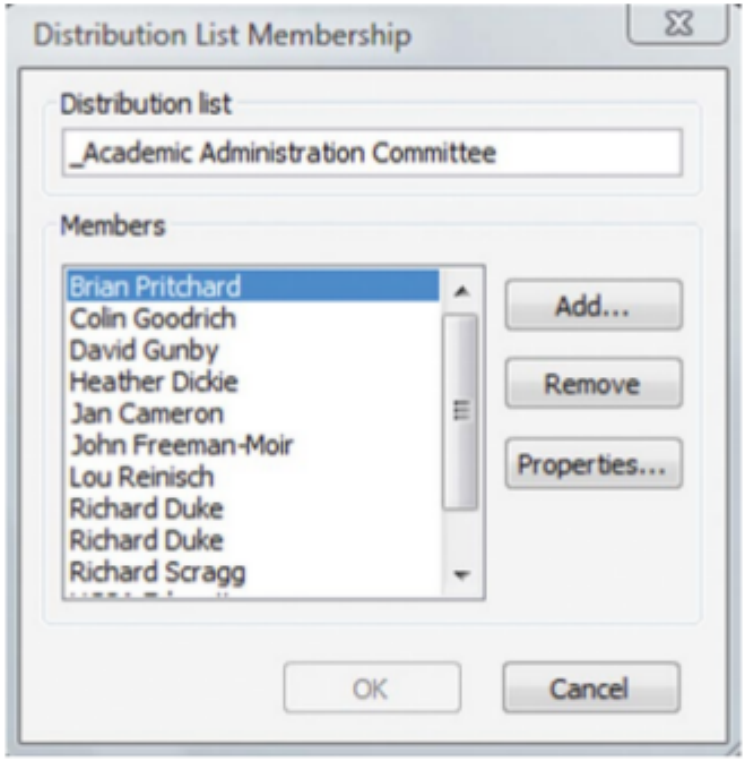
- A group of German psychologists in the early 20th century sought to explain how human visual perception works.
- One of their findings was that human vision is holistic: Our visual system automatically imposes structure on visual input and is wired to perceive whole shapes, figures, and objects rather than "features" like disconnected edges, lines, and areas.
- The German word for "shape" or "figure" is Gestalt, so these theories became known as the Gestalt principles of visual perception.
- For design purposes, the most important Gestalt principles are: Proximity, Similarity, Continuity, Closure, Symmetry, Figure/Ground, and Common Fate.

Gestalt principle: proximity

- The Principle of Proximity is that the relative distance between objects in a display affects our perception of whether and how the objects are organized into sub-groups.
- Objects that are near each other (relative to other objects) appear grouped, while those that are farther apart do not.

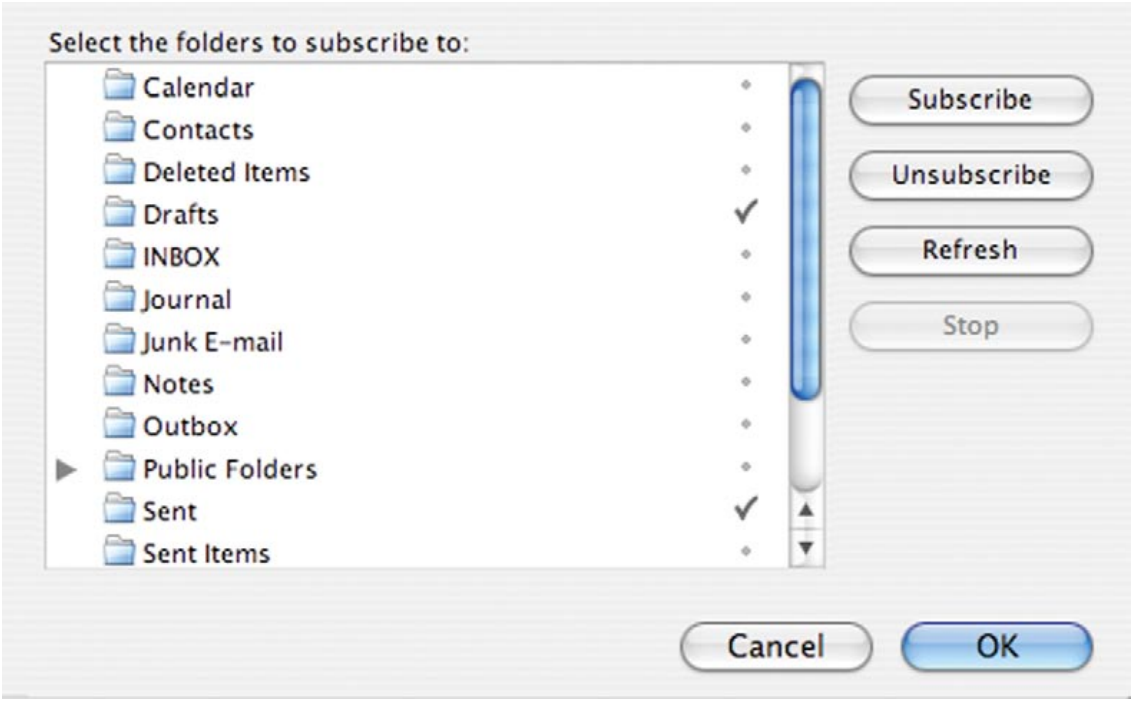
Gestalt principle: proximity

- The Proximity principle has obvious relevance to the layout of controls, Web sites, and electronic appliances.
- Designers separate groups of on-screen controls and data-displays by enclosing them in group boxes or by placing separators between groups.



Gestalt principle: proximity

- However, according to the Proximity principle, items on a display can be visually grouped simply by spacing them closer together to each other than to other controls, without group boxes or visible borders.
- Many graphic design experts recommend this approach in order to reduce visual clutter and code size in a user interface.[1]



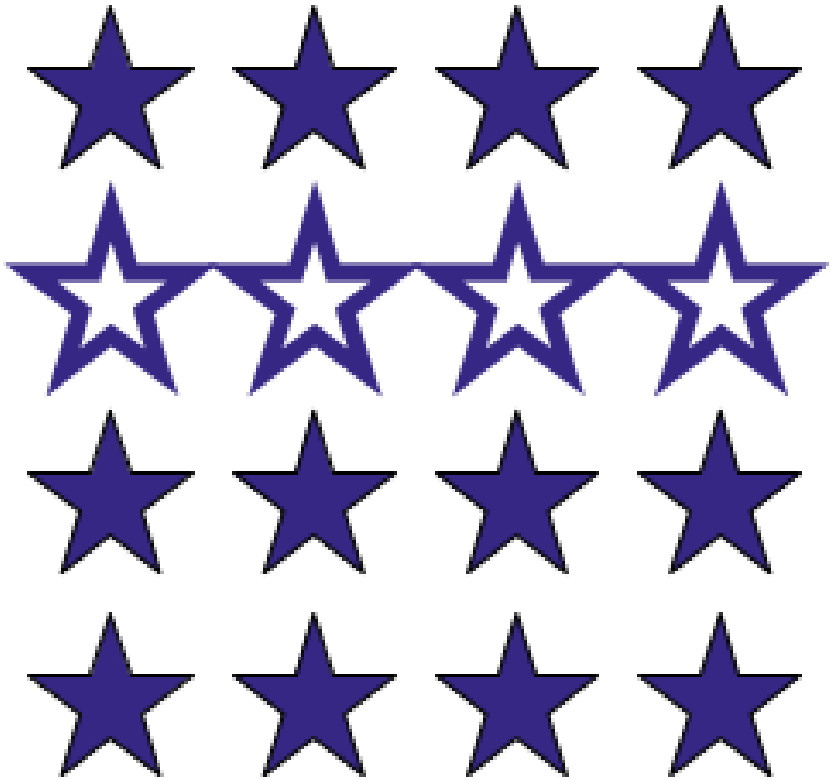
[1] Mullet and Sano. *Designing visual interfaces: Communication oriented techniques*, 1994

Gestalt principle: proximity

- When controls are poorly placed, or when the relative distances are not different enough to aid grouping, we have trouble perceiving the intended groups.

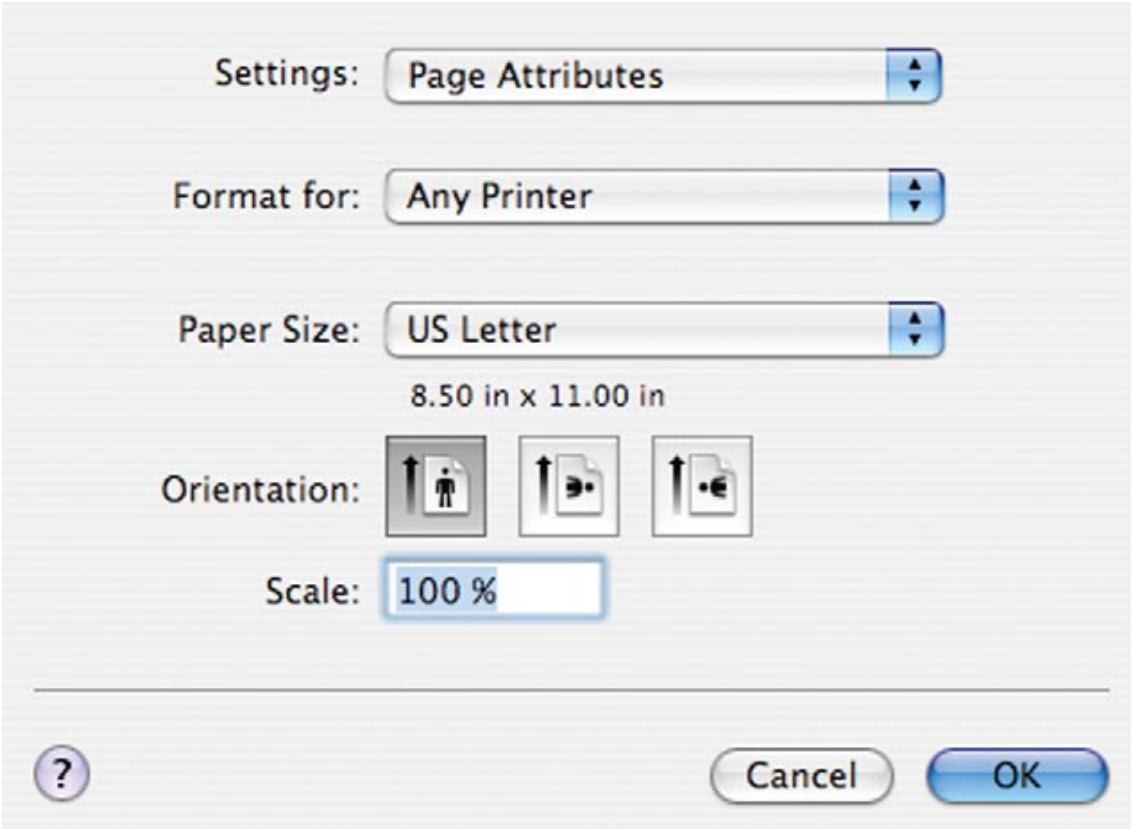
Gestalt principle: similarity

- Another factor that affects our perception of grouping is expressed in the Principle of Similarity.
- Objects that look similar appear grouped, all other things being equal.



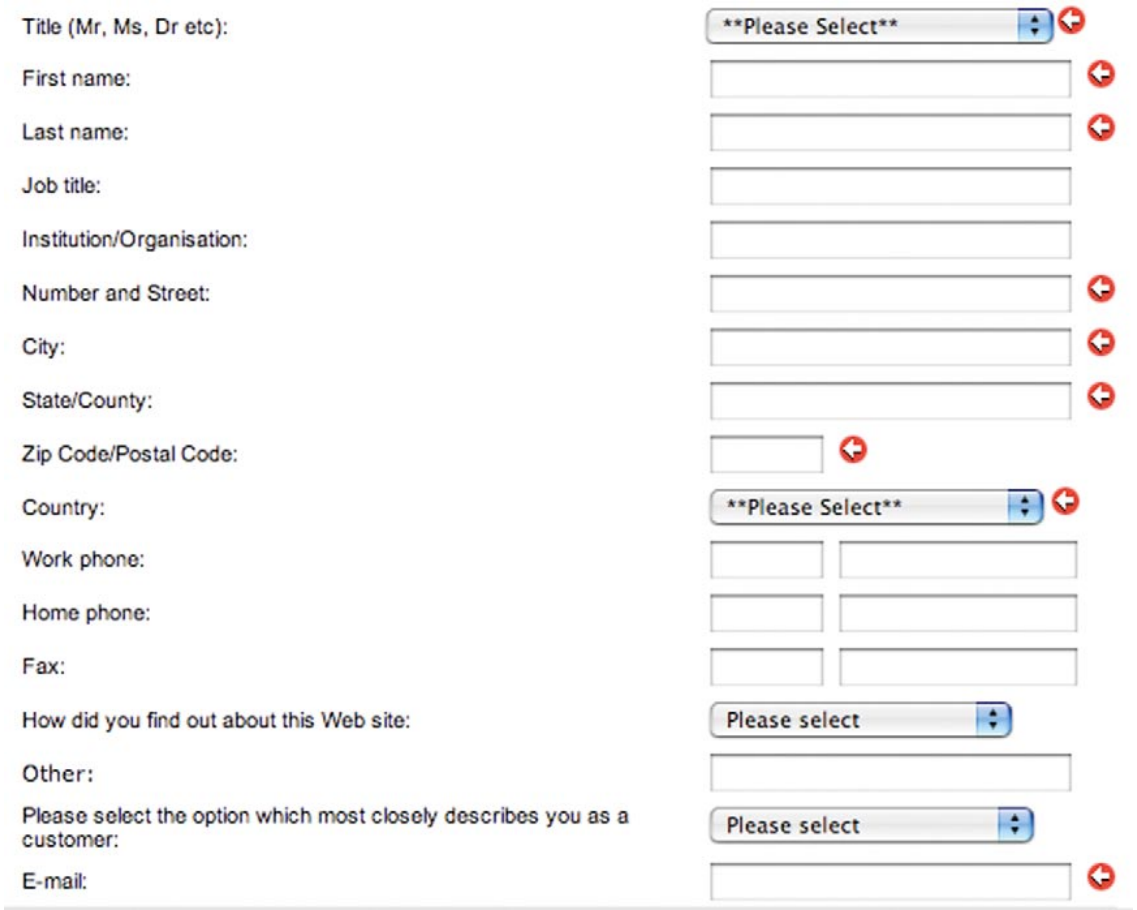
Gestalt principle: similarity

- Similarity is also important (and useful) in interface design.
- Not only is it effective, but it can save real estate that would normally be sacrificed in favor of proximity to indicate grouping.



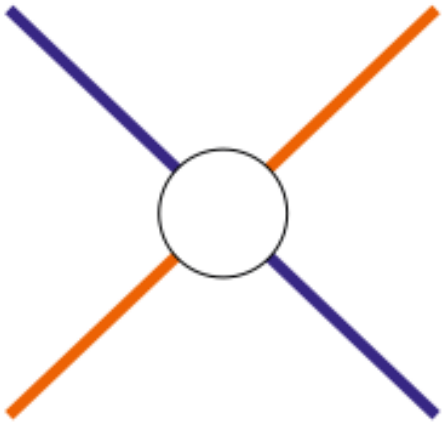
Gestalt principle: similarity

- Getting similarity and proximity both correct is essential.
- The menu items help group text fields due to similarity, while the lack of proximity of labels and text fields makes it hard to group them.



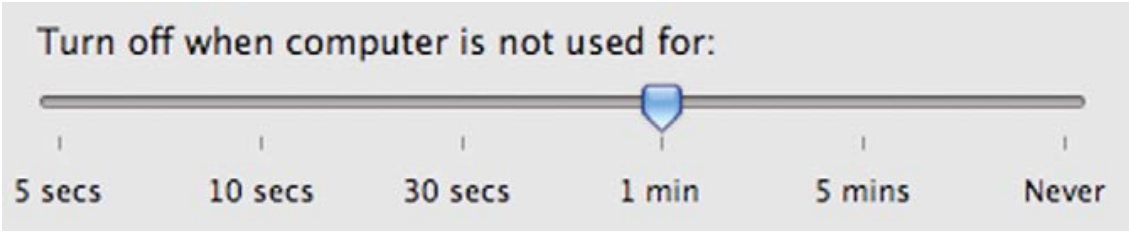
Gestalt principle: continuity

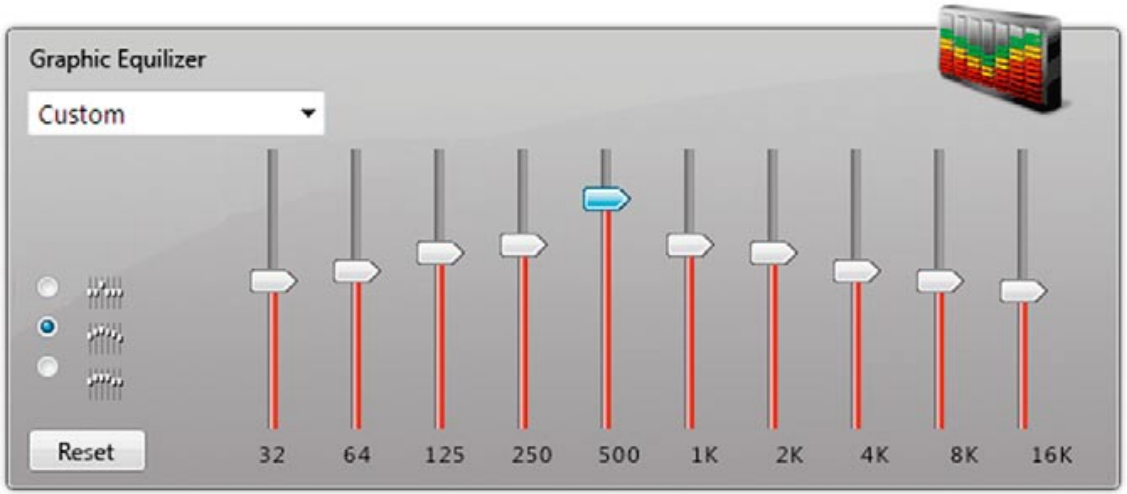
- In organizing objects into groups, several Gestalt principles describe our tendency to resolve ambiguity or fill in missing data in such a way as to perceive whole objects.
- The Principle of Continuity, states that our visual perception is biased to perceive continuous forms rather than disconnected segments.



Gestalt principle: continuity

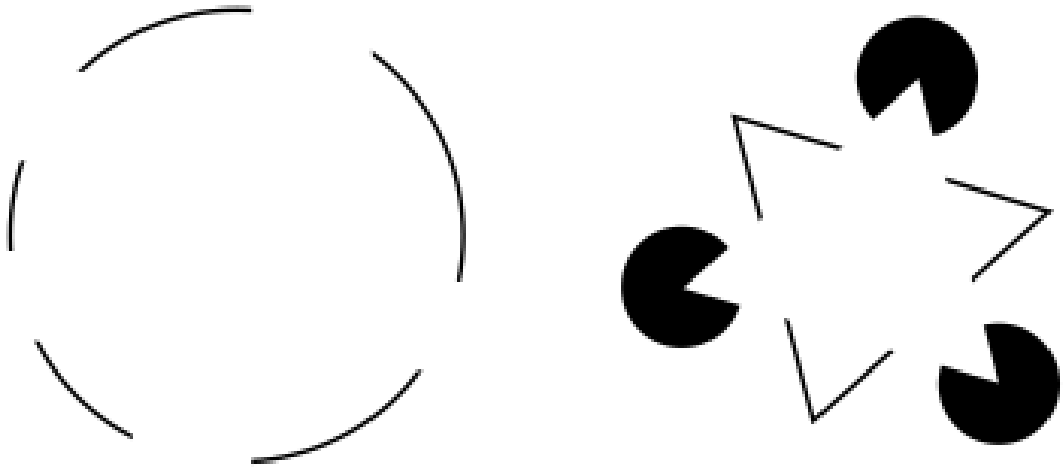
- In slider interfaces, we see the continuation of the slider range, not two ranges separated by the slider control.
- Even if the color of the two sides is different, this doesn't break our interpretation as a single range.





Gestalt principle: closure

- Related to Continuity is the Principle of Closure, which states that our visual system automatically tries to close open figures so that they are perceived as whole objects rather than separate pieces.

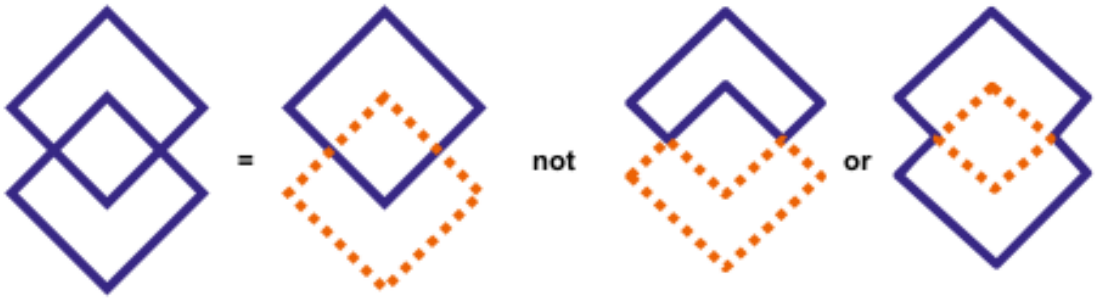


Gestalt principle: closure

- The Closure Principle is often applied to iconography in graphical user interfaces.
- For example, GUIs often represent collections of objects as stacks
- Showing one whole object and the edges of others "behind" it is enough.

Gestalt principle: symmetry

- Another aspect the we we see objects is captured in the Gestalt Principle of Symmetry.
- We tend to parse complex scenes in a way that reduces the complexity.
- The data in our visual field usually has more than one possible interpretation, but our vision automatically organizes and interprets the data so as to simplify it and give it symmetry.



Gestalt principle: symmetry

- The use of symmetry in interface design is more difficult to find (for me).
- However, symmetry (in combination with Continuity and closure) helps us interpret 3D where there is none.[2]

[2] Thagard. *Coherence in Thought and Action*, 2002

Gestalt principle: symmetry

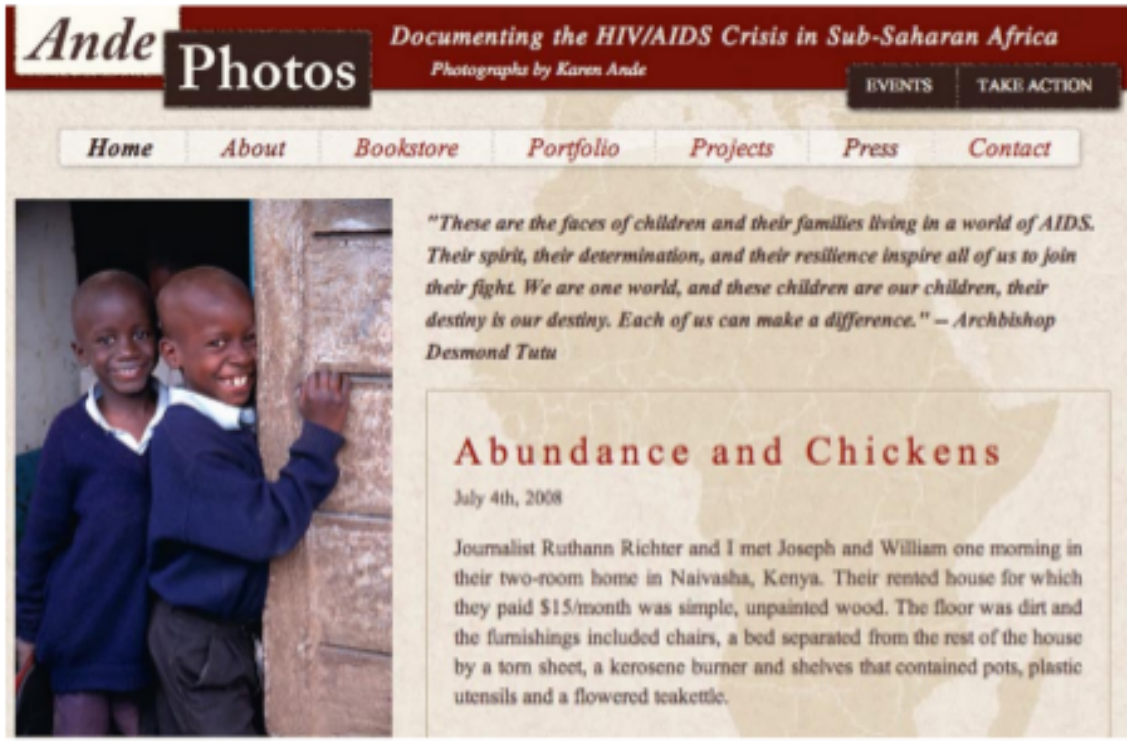
- In fact, symmetry – the process by which we implicitly seek the simplest interpretation of what we see – is the one of the only reasons why we see 3D scenes from purely 2D representations.
- It is very hard to interpret such images as a collection of primitive 2D parts.

Gestalt principle: figure/ground

- The next Gestalt principle that describes how our visual system structures the data it receives is the Principle of Figure/Ground.
- This principle states that our mind separates the visual field into the figure (the foreground) and ground (background).
- The foreground consists of those elements of a scene that are the object of our primary attention, and the background is everything else.
- This principle also specifies that our parsing of scenes into figure and ground is influenced by characteristics of the scene.
- When a small object overlaps a larger one, we tend to perceive the smaller as figure and

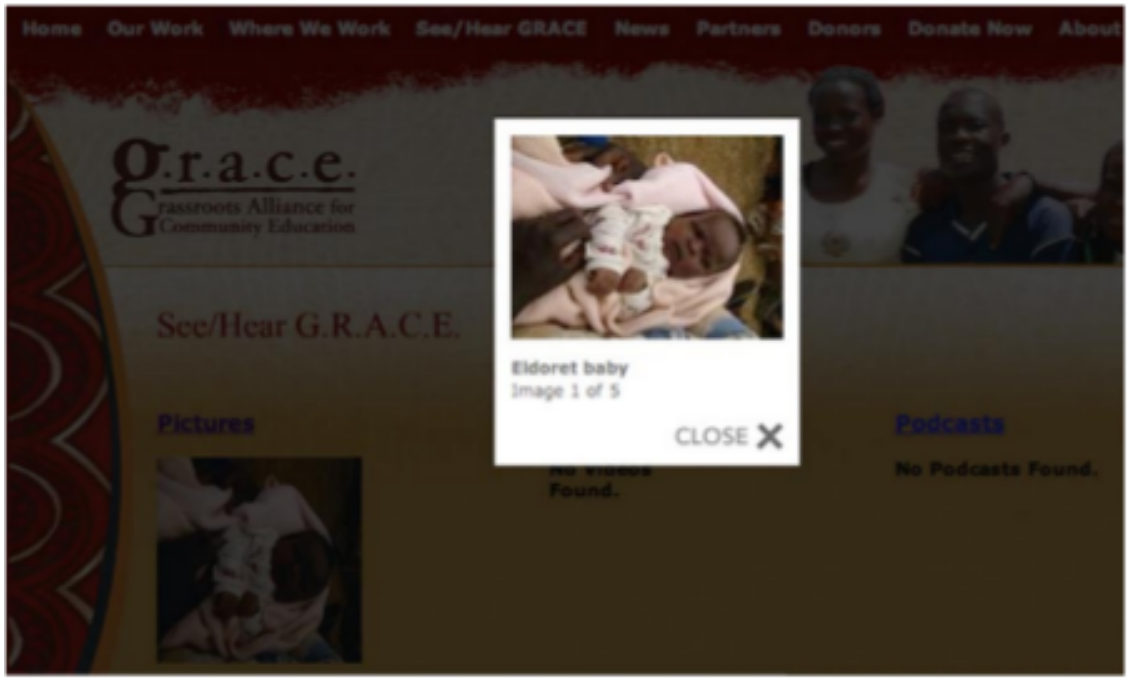
Gestalt principle: figure/ground

- In interface (especially Web) design, Figure/Ground is used to give an impression-inducing background image (Ground) behind the main content (Figure).
- The background can convey information like the user's current location, or it can suggest a theme, brand, or mood for interpretation of the content.



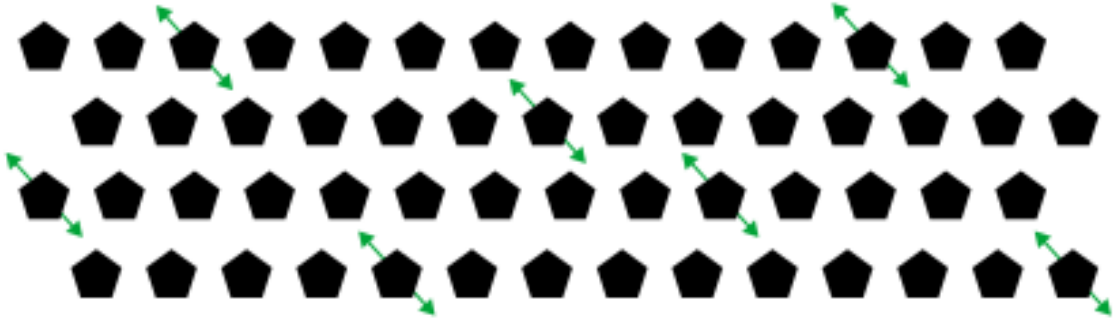
Gestalt principle: figure/ground

- Figure/Ground is also used to pop-up information on top of everything else.
- The has the affect of focusing attention on the desired elements.



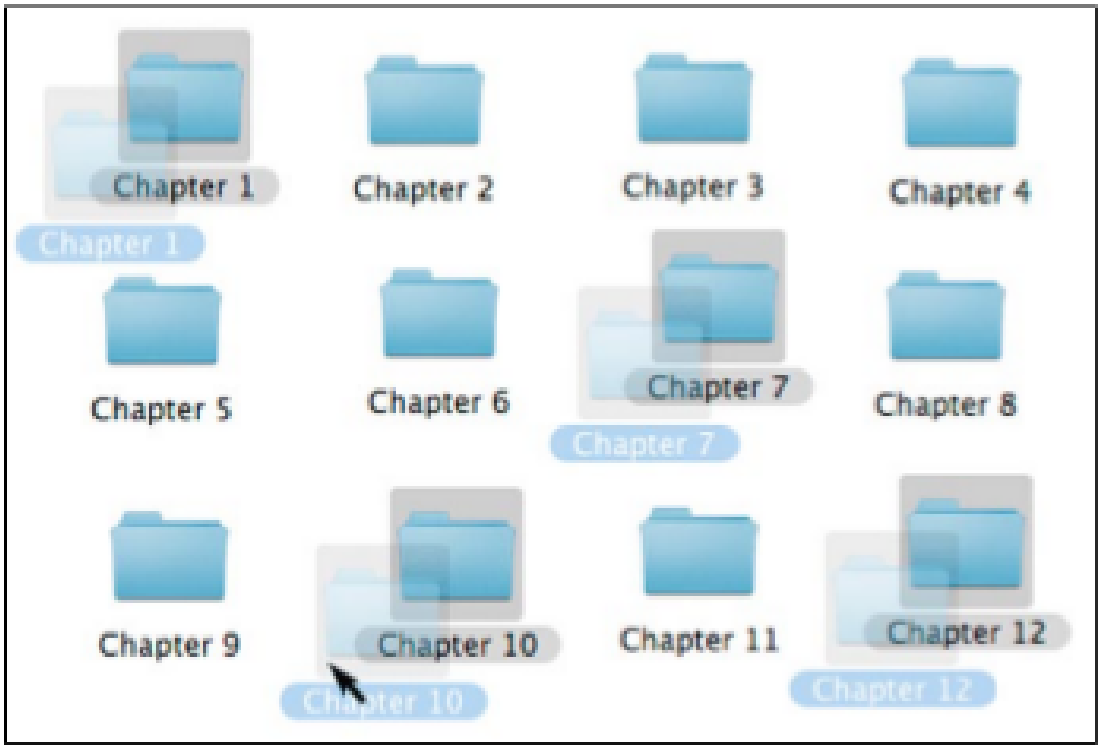
Gestalt principle: common fate

- And finally back to grouping: the Principle of Common Fate states that objects that move together are perceived as grouped or related.
- This principle is clearly related to Similarity and Proximity.
- Unlike the other principles, there is not static version of Common Fate.



Gestalt principle: common fate

- Perhaps the most common example of Common Fate is the drag-and-drop interface with grouping.
- The fact that the selected items move together emphasize the fact that they share a Common Fate.
- Actions apply to all.



Gestalt principles: combined

- Of course, in real-world visual scenes, the Gestalt principles work in concert, not in isolation.
- With all these Gestalt principles operating at once, unintended visual relationships can be implied by a design.
- A recommended practice, after designing a display, is to view it with each of the Gestalt principles in mind: Similarity, Continuity, Closure, Symmetry, Figure/Ground, and Common Fate.
- The objective is to see if the design suggests any relationships between elements that you do not intend.

We seek visual structure

We seek visual structure

- Perceiving structure in our environment helps us make sense of objects and events quickly.
- When people are navigating through software or Web sites, they don't scrutinize screens carefully and read every word – they scan quickly for relevant information.
- When information is presented in a terse, structured way, it is easier for people to scan and understand.

Unstructured:

You are booked on United flight 237, which departs from Auckland at 14:30 on Tuesday 15 Oct and arrives at San Francisco at 11:40 on Tuesday 15 Oct.

Structured:

Flight: **United 237, Auckland → San Francisco**
Depart: **14:30 Tue 15 Oct**
Arrive: **11:40 Tue 15 Oct**

Visual structure: parsing information

- The more structured and terse the presentation of information, the more quickly and easily people can scan and comprehend it.
- Wordy, repetitive links slow users down and "bury" the important words they need to see.

Renewals, Duplicates, and Information Changes for Driver Licenses and/or ID Cards

- How to renew your driver license in person
- How to renew your driver license by mail
- How to renew your driver license by Internet
- How to renew your instruction permit
- How to apply for a duplicate driver license or identification (ID) card
- How to change your name on your driver license and/or identification (ID) card
- How to notify DMV of my change of address
- How to register for the organ donor gift of life program

Licenses & ID Cards:	**Renewals, Duplicates, Changes**		
• Renew license:	in person	by mail	by Internet
• Renew:	instruction permit		
• Apply for duplicate:	license	ID card	
• Change of:	name	address	
• Register as:	organ donor		

Visual structure: terseness not enough

- Of course, for visual communication to be effective terseness is not enough.
- The rules of Gestalt organization must be respected as well.

Mortgage Summary	
$1,840.59	$662,611.22
Monthly Payment	Total of 360 Payments
$318,861.22	Sep, 2037
Total Interest Paid	Pay-off Date
$93,750.00	$0.00
Total Tax Paid	Total PMI Paid

Mortgage Summary	
Monthly Payment	$ 1,840.59
Number of Payments	360
Total of Payments	$ 662,611.22
Interest Total	$ 318,861.22
Tax Total	$ 93,750.00
PMI Total	$ 0.00
Pay-off Date	Sep 2037

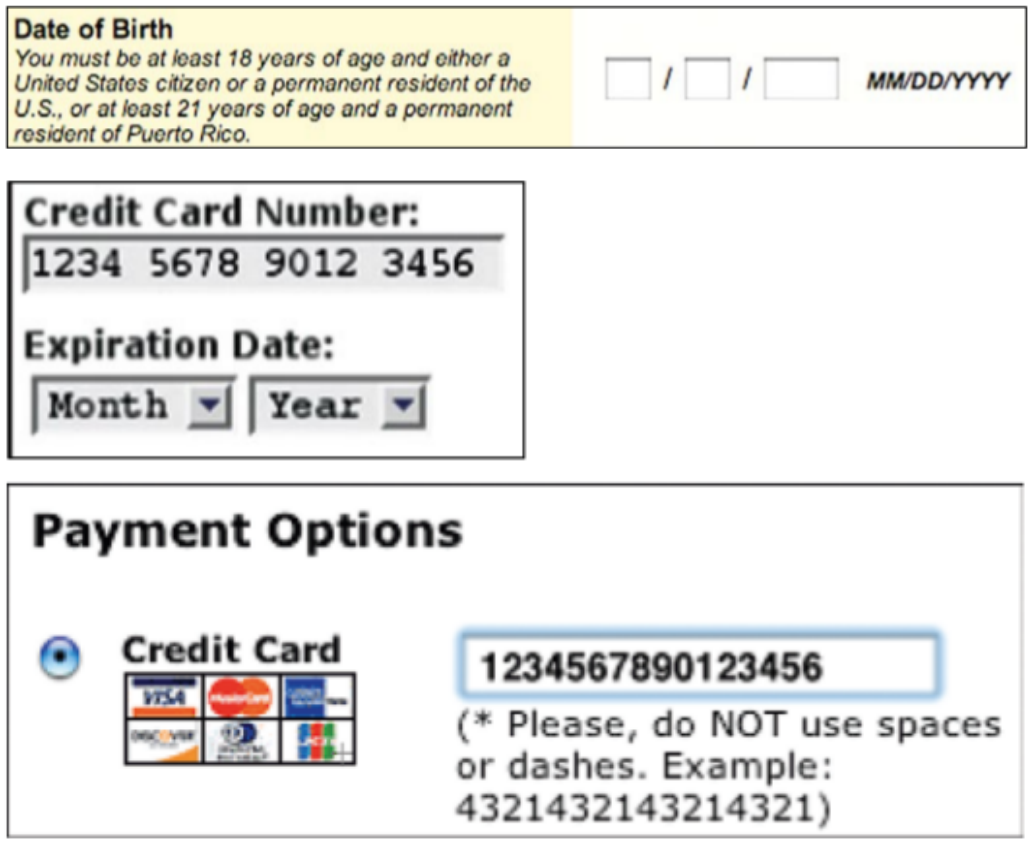
Visual structure: parsing numeric data

- Even small amounts of information can be made easier to scan if they are structured.
- Most numeric information (like phone numbers) can be logically broken down into component pieces (note that this may have cultural constraints).

Easy:	(415) 123-4567
Hard:	4151234567
Easy:	1234 5678 9012 3456
Hard:	1234567890123456

Visual structure: imposing numeric structure

- The user interface can break numbers up explicitly by providing a separate field for each part.
- Or, the interface can provide a single field, letting users break the number into parts.



Visual structure: data-specific controls

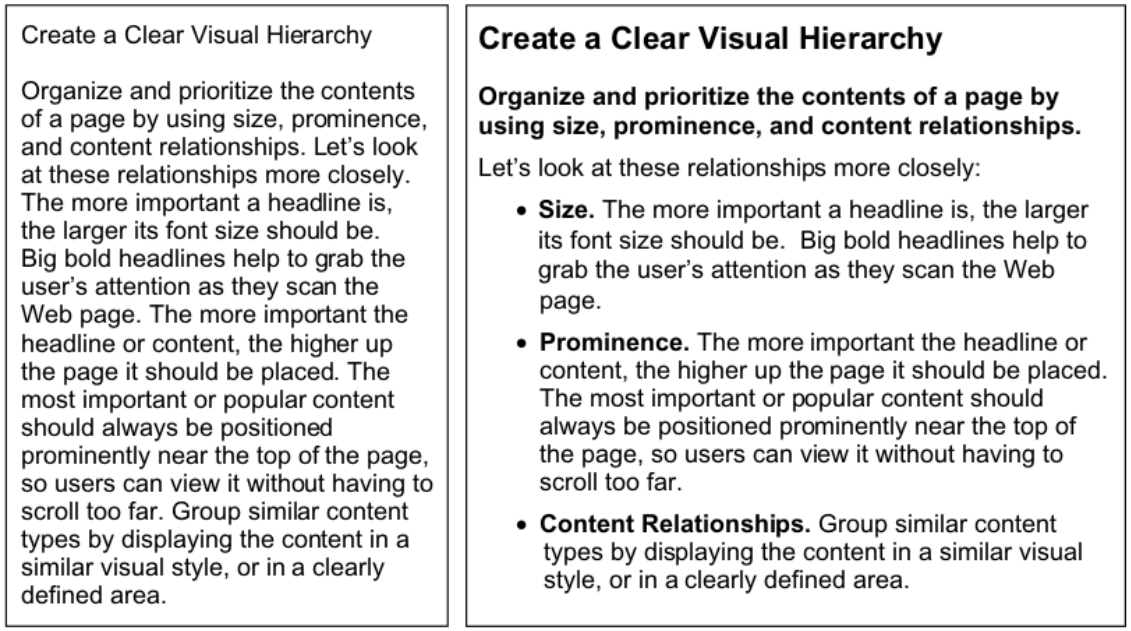
- A step up from separate fields for data components are data-specific controls.
- Instead of using simple text fields, designers can use controls designed specifically to display (and accept as input) a value of a specific type and composition.

Visual structure: visual hierarchy help

- The most important goal in structuring information is to provide a visual hierarchy that:
  - breaks the information into distinct sections, and breaks large sections into subsections;
  - labels each section and subsection prominently and in such a way as to clearly identify its content; and
  - presents sections and subsections as a hierarchy, with higher level sections presented more strongly than lower level ones.
- A visual hierarchy allows people to separate what is relevant to their goals from what is irrelevant.
- They find what they are looking for more quickly because they can easily skip everything else.

Visual structure: visual hierarchy

- There is a clear parallel with visual structure in formal writing and typesetting.
- Though these rules are often not observed in written communication either.



Create a Clear Visual Hierarchy

Organize and prioritize the contents of a page by using size, prominence, and content relationships. Let's look at these relationships more closely. The more important a headline is, the larger its font size should be. Big bold headlines help to grab the user's attention as they scan the Web page. The more important the headline or content, the higher up the page it should be placed. The most important or popular content should always be positioned prominently near the top of the page, so users can view it without having to scroll too far. Group similar content types by displaying the content in a similar visual style, or in a clearly defined area.

Create a Clear Visual Hierarchy

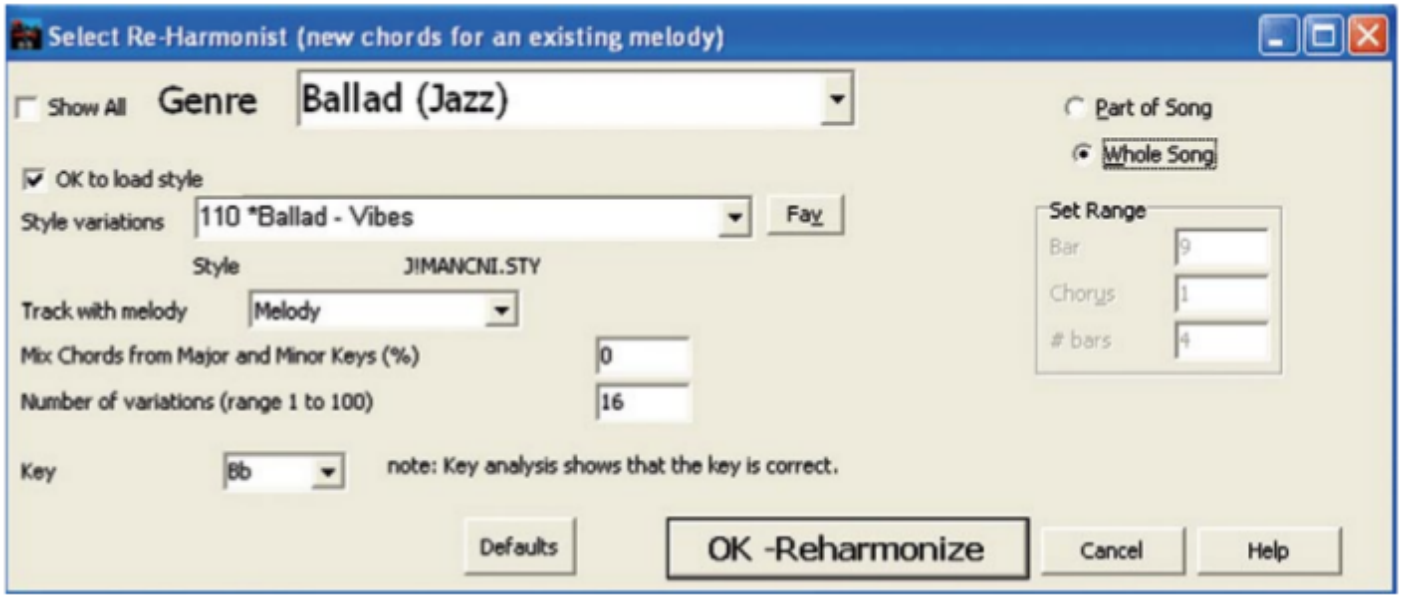
Organize and prioritize the contents of a page by using size, prominence, and content relationships.

Let's look at these relationships more closely:

- **Size.** The more important a headline is, the larger its font size should be. Big bold headlines help to grab the user's attention as they scan the Web page.
- **Prominence.** The more important the headline or content, the higher up the page it should be placed. The most important or popular content should always be positioned prominently near the top of the page, so users can view it without having to scroll too far.
- **Content Relationships.** Group similar content types by displaying the content in a similar visual style, or in a clearly defined area.

Visual structure: hierarchy in interface design

- When there is no logical hierarchy, it is difficult for users to orient themselves when navigating controls.



Visual structure: hierarchy in interface design

- When the principles of Gestalt organization are used effectively, a natural hierarchy of controls and information appears.

Homework

Homework

NONE for now.