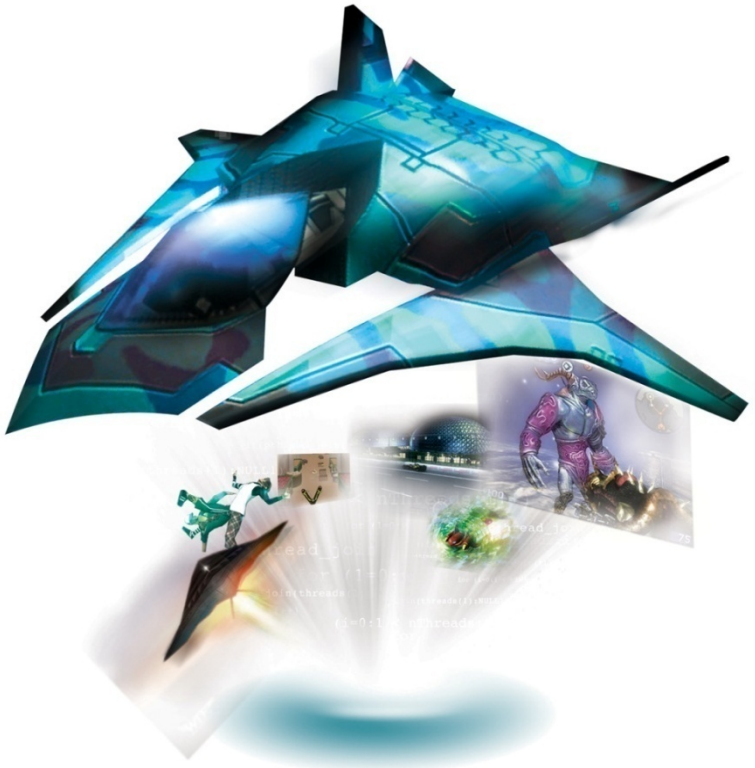
DM2112
DIGITAL ENTERTAINMENT SYSTEMS



Human-Computer Interaction

Human Computer Interaction (HCI)

- **Study, design & implementation** of **interactions** between **humans** and **computers** to make computers more usable

- Key factor for high-interaction applications such as **games** and **simulation systems**

Human Senses

- Sight (visual)
- Hearing (aural / audio)
- Touch (tactile)
- Taste
- Smell

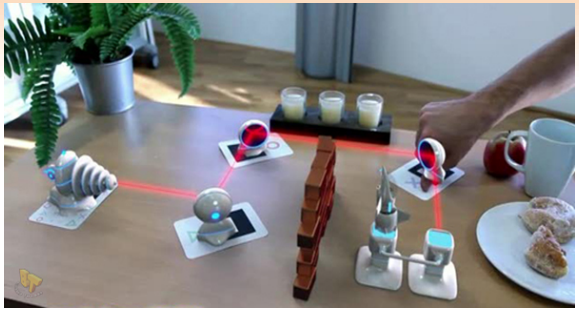
Also:

- Acceleration
- Balance

Output Devices

- Visual
  - Monitors, Headsets (e.g. Oculus Rift, Sony Morpheus), 3D glasses
- Audio
  - Surround speakers, headphones
- Tactile
  - Force feedback steering wheels
- Acceleration & Balance
  - Motion platforms

Sensor Devices



- Camera-based
  - Patterns
  - Movement
  - Biometric, Facial recognition, Temperature Sensors
- Position & Force sensors
  - Keyboards, Mice, Game Controllers, Steering wheels, Head tracking

RFID

- Radio-Frequency Identification
- With or without local power source
  - Range: from less than 1m up to hundreds of meters
- Allows tracking when an identified tag enters or leaves an area
  - Tracking goods on a production line
  - Tagging pets for identification
  - Electronic Road Pricing (ERP)
  - Security badges
  - NFC
- Allow triggering events when tags are detected/scanned

Augmented vs Virtual Reality

- Augmented Reality
  - Live view of real-world environment with elements augmented (or supplemented) by computer generated information (e.g. Google glass)
- Virtual Reality
  - Live view of computer-simulated environment that can simulate physical presence in real or imagined worlds (e.g. Oculus Rift, Sony Morpheus)

Software Interface Layout

Four Gestalt Psychology Principles

1. Proximity
2. Similarity
3. Common Fate
4. Closure

Principle 1: Proximity

- Our eyes/brain logically group together visual elements that are “proximate” (close) to one another.
- Given the following image, do you see
  - Six squares?
  - Three groups of two squares?

Proximity Example

- Items close together appear to have a relationship
- Distance implies no relationship

Time:

Time:

Visual Structure (Proximity) Reinforces Logical Structure

- Proximity creates groups to reinforce alphabetization

ATE	GET
BAT	GOT
BIT	HAT
CAT	HIT
DOG	HOT
EAT	LAP
FAR	MAP
FAT	PAT

ATE	BAT	BIT	CAT	DOG	EAT
FAR	FAT	GET	GOT	HAT	HIT
HOT	LAP	MAP	PAT		

Visual Structure (Proximity) Opposes Logical Structure!

- Proximity counters alphabetization

Bad

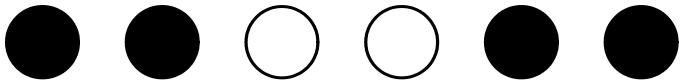
ATE	BAT
BIT	CAT
DOG	EAT
FAR	FAT
GET	GOT
HAT	HIT
HOT	LAP
MAP	PAT

Worse!

ATE	BAT
BIT	CAT
DOG	EAT
FAR	FAT
GET	GOT
HAT	HIT
HOT	LAP
MAP	PAT

Principle 2: Similarity

- Our eyes/brain logically group together visual elements that are similar to one another.
- Given the following image, do you see
  - Six circles
  - Three groups of two circles



Similarity Example

- Given the following image, do you see
  - Six letter ‘A’s?
  - Three groups of two ‘A’s?

AAAAAA

Similarity Creates a Typographical Hierarchy

This is a level 1 heading

This is a level 2 heading

This is another level 2 heading

This is a level 3 heading

Yet another level 3 heading

Back up to level 2

Down to level 3

Still at level 3

Back to level 1

Principle 3: Common Fate

- Our eyes/brain associate elements that are similar to one another (not same as similarity for grouping).
- What associations do you see here?

Lines are not vertically aligned
=> do not have common fate
=> do not seem grouped together

Lines are vertically aligned
=> do have common fate
=> do seem grouped together

Grids Provide Structure Using Common Fate

- Grids are (hidden) horizontal and vertical lines
  - They help place graphic elements
- Alignment to same grid line creates logical grouping
  - Common fate
- Grids avoid disconcerting irregularities
  - That attract the eye

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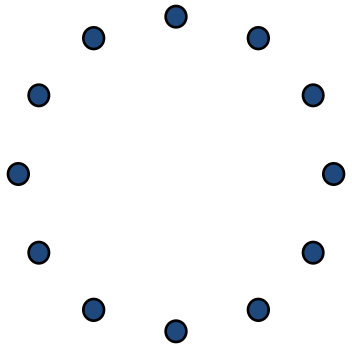
- Alignment to same grid line creates logical grouping
  - Common fate
- Grids avoid disconcerting irregularities
  - That attract the eye
  - Like

this

Principle 4: Closure

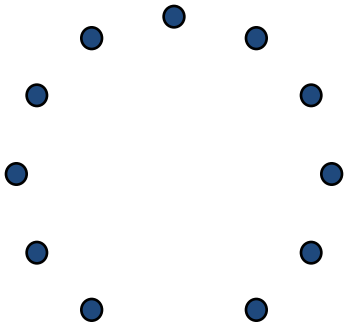
- Our eyes/brain logically group together visual elements that approximate a closed shape, to form that closed shape
- Given the following image, do you see
  - Twelve dots?
  - A circle?

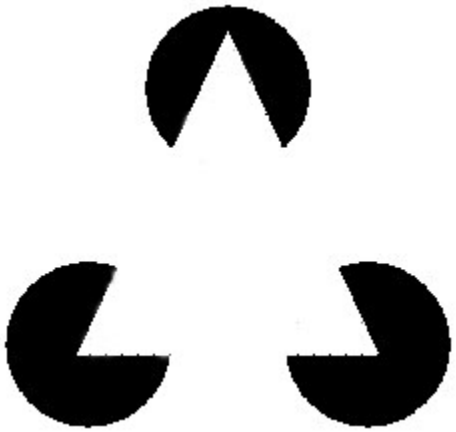


- More will answer “A circle”

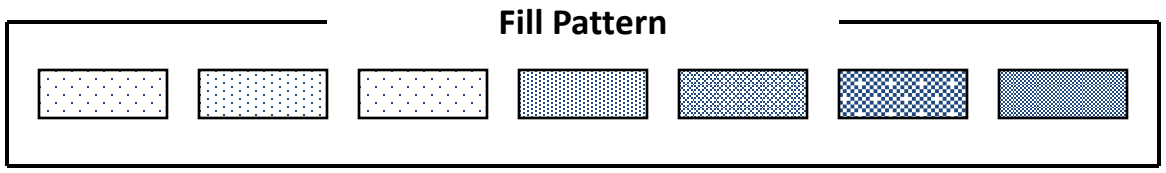
Closure Example

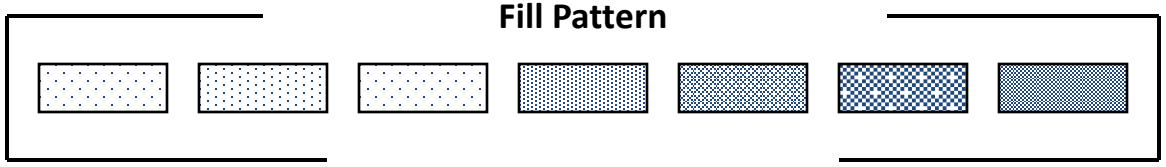
- Given the following image, do you see
  - Eleven dots?
  - A circle?

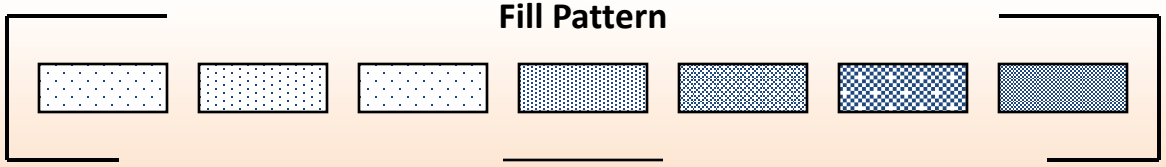




Closure Example – Each Palette Has Progressively Less Closure - and Works

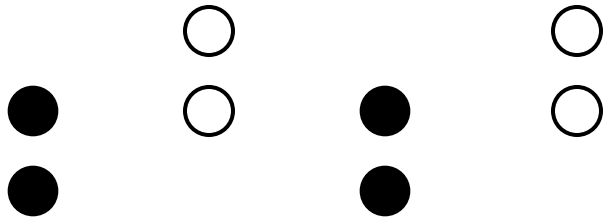






Principles can be Combined

- Proximity and similarity => grouping



- Proximity and closure => grouping

[ ] [ ]

- Proximity opposes closure

][ ][ ] [

Combining Principles - Menu Example

No visual structure to reinforce logical structure

Rotate X
Rotate Y
Rotate Z
Zoom In
Zoom Out

Grouping created by

- Proximity within clusters
- Visual separation between clusters

Rotate X
Rotate Y
Rotate Z

Zoom In
Zoom Out

Hierarchy created by

- Indentation (common fate)

Rotate
  X
  Y
  Z

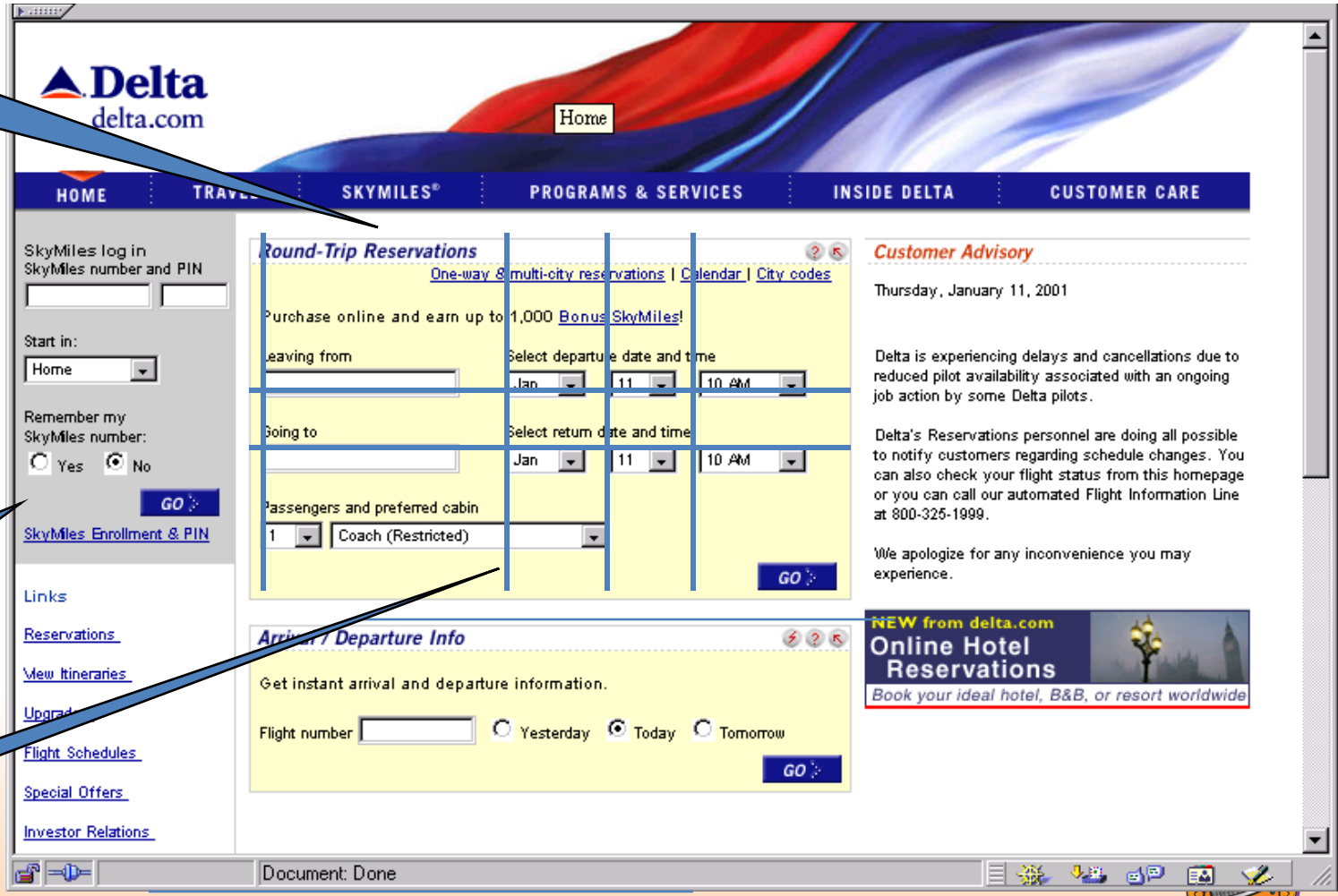
Zoom
  In
  Out

Combining Principles – Web Example

Grouping defined by background (common fate) and by box (closure)

Grouping defined by background (common fate)

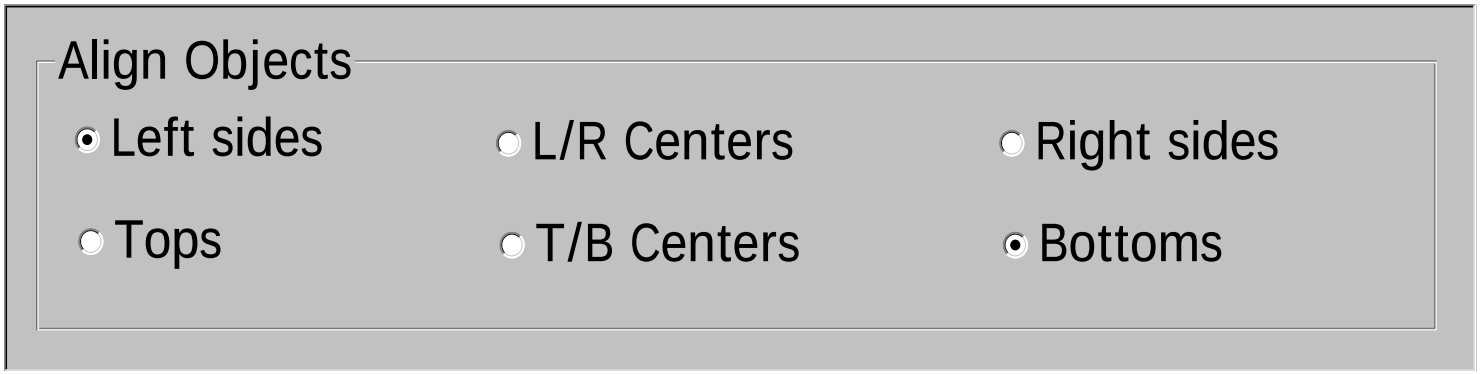
Grid (common fate)



www.delta.com

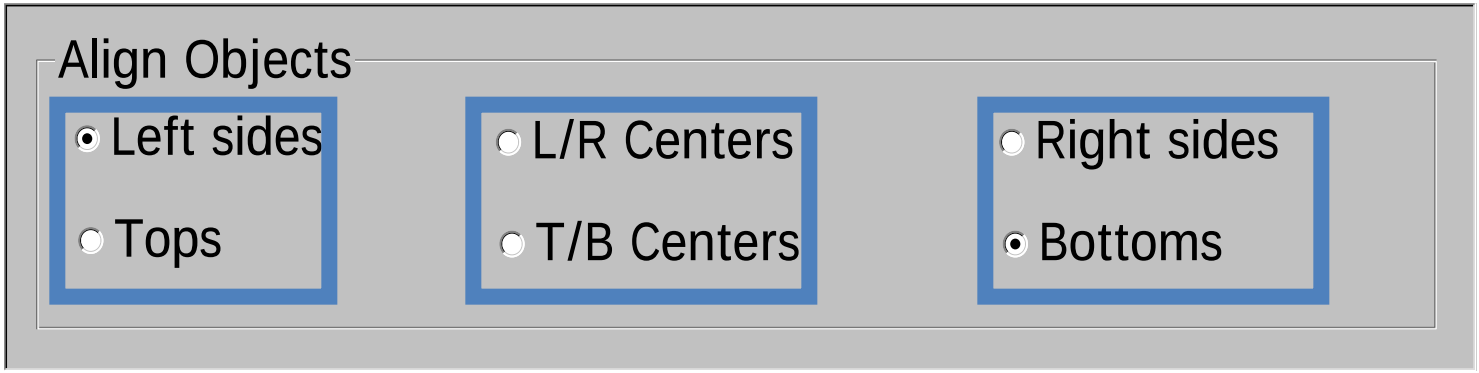
Grouping: Poor Dialogue Box Design

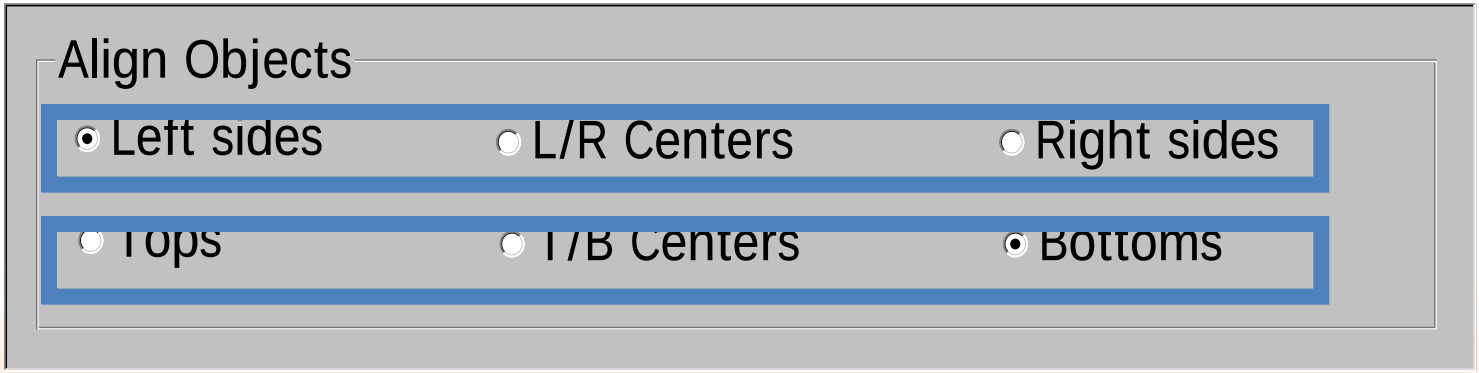
- Logical structure hard to understand – proximity problem



An example of bad logical structure

Which is the Logical Structure?

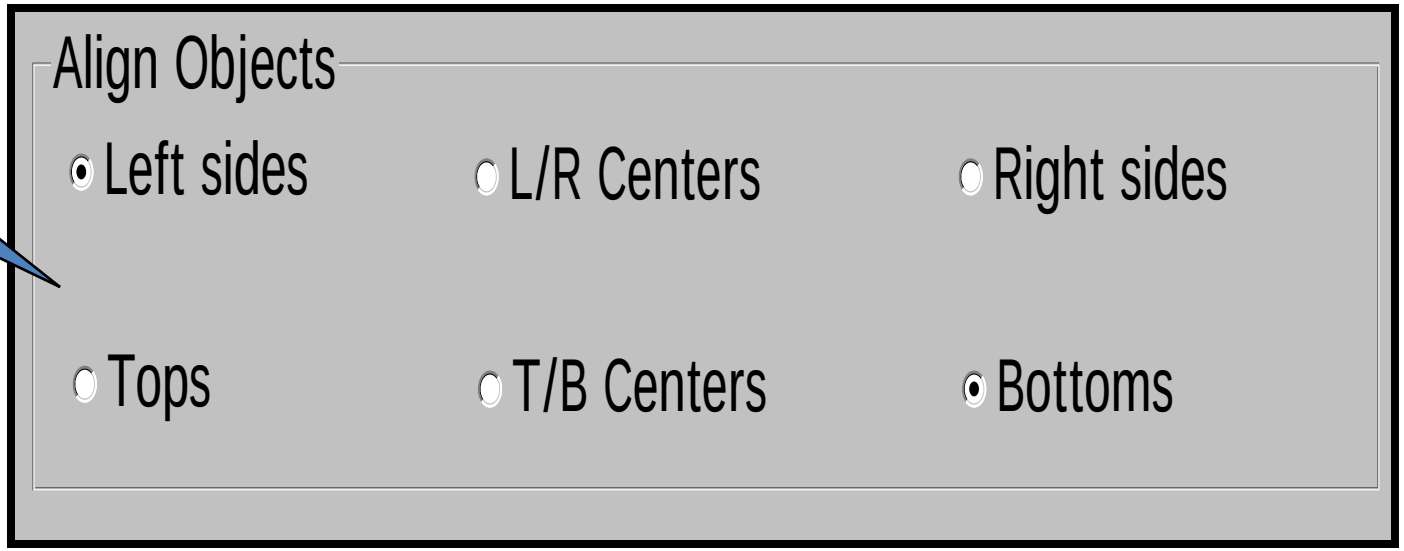




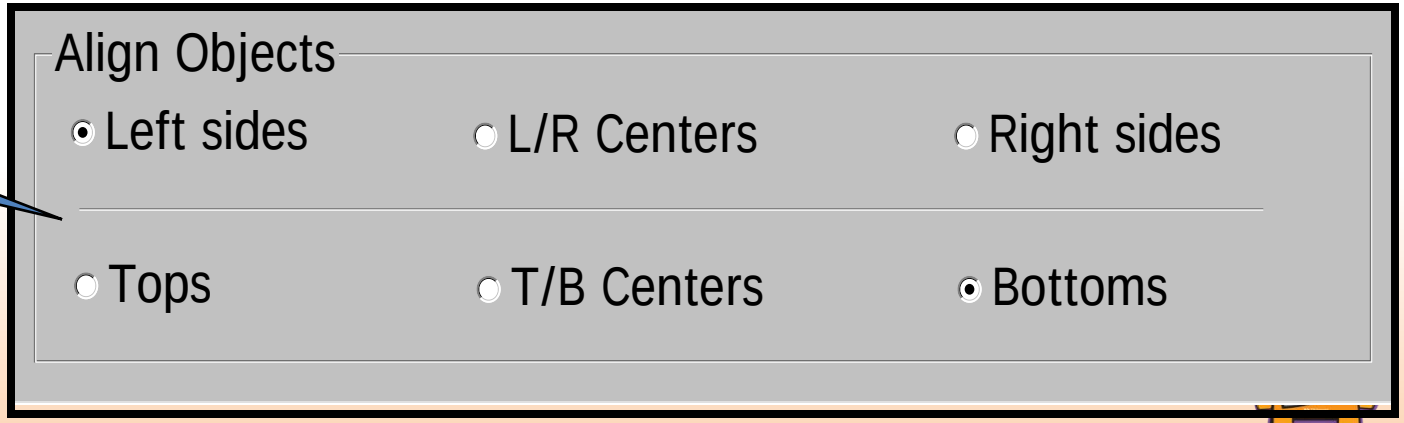
An example of bad logical structure

Grouping: Two solutions; Which is Better?

More vertical space creates less vertical proximity



Horizontal rule creates two areas (closure) to overcome proximity



Combine Similarity + Common Fate => Stronger Typographical Hierarchy

This is a level 1 heading

This is a level 2 heading

This is another level 2 heading

This is a level 3 heading

Yet another level 3 heading

Back up to level 2

Down to level 3

Still at level 3

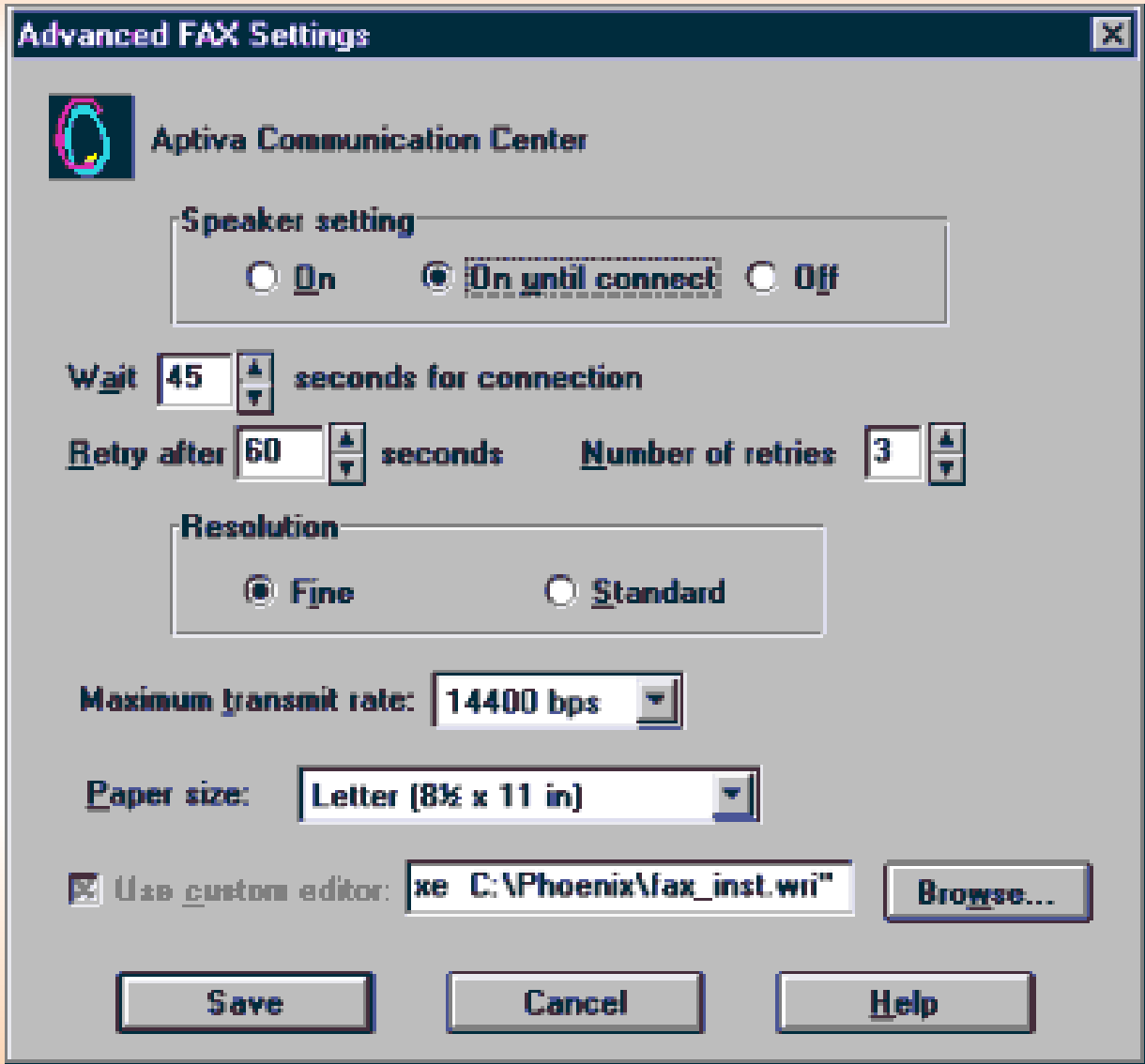
Back to level 1

Using Gestalt Principles is REALLY, REALLY Important

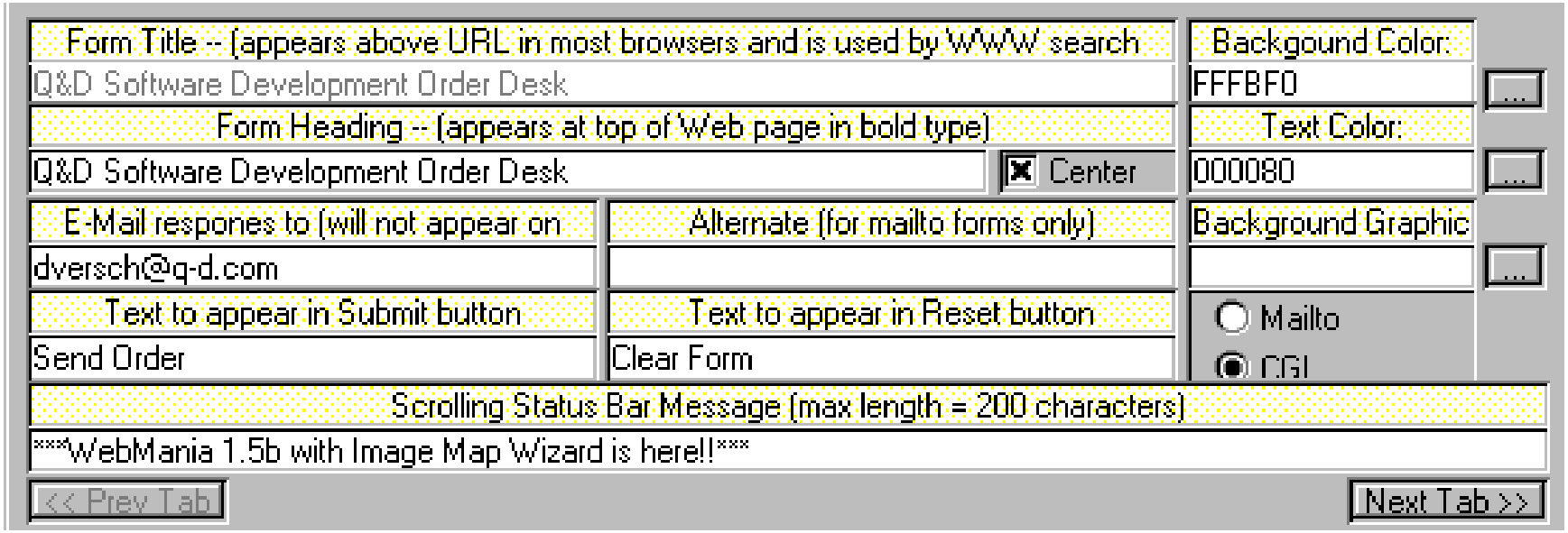
- ***Use visual structure to reinforce the underlying logical structure***

Bad Example

- No gridding
- Inconsistent use of visual cues for grouping
- Inconsistent space between label and data



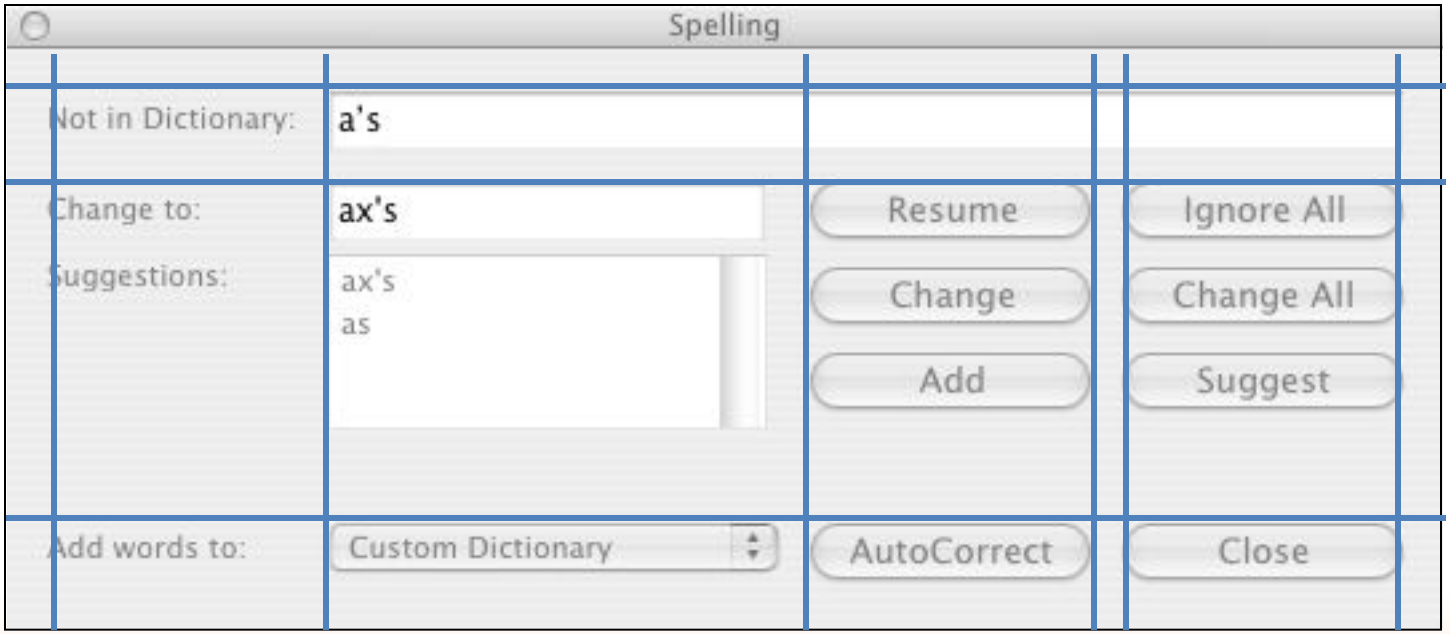
Bad Example



- Hint: Yellow fields are labels
- So-so visual grouping
- So-so logical grouping

A Well-Designed Dialogue Box

Strong grid structure (common fate)

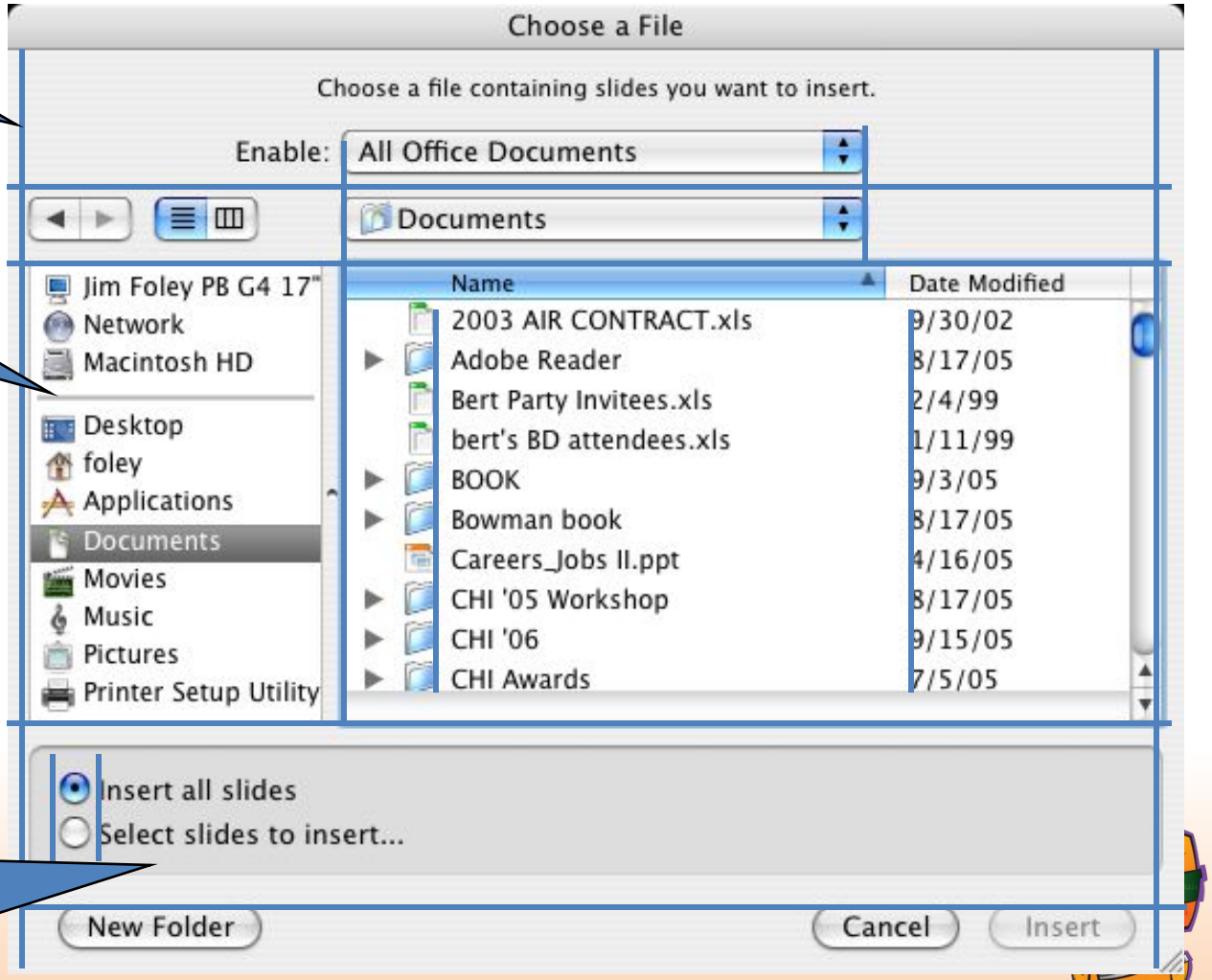


Another Well-Designed Dialogue Box

Strong grid structure (common fate)

Horizontal line uses closure to create two groups and counter proximity

Box surrounding related Items (closure) Different background color (common fate)



Summary

- Gestalt rules for visual design
  - Proximity
  - Similarity
  - Common Fate
  - Closure
- Related to human psychology of perception
- Very important to design a visually pleasing and logically organized UI

Acknowledgements

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  - The guest lecture was for DM2112 students, and was held in LTM-1, NYP in 2007.

- Slides reused with permission.