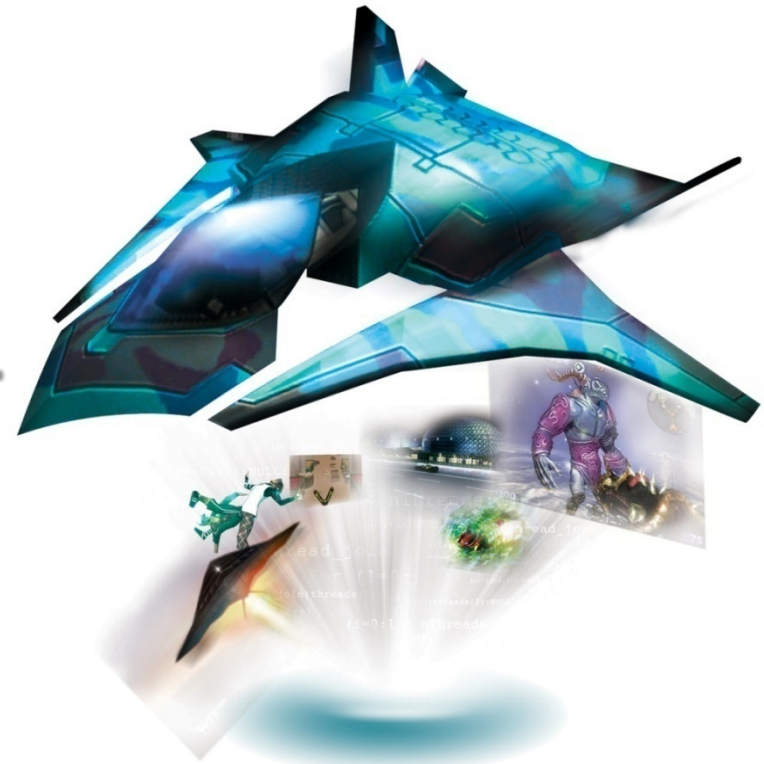




DM2112 **DIGITAL** **ENTERTAINMENT** **SYSTEMS**



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



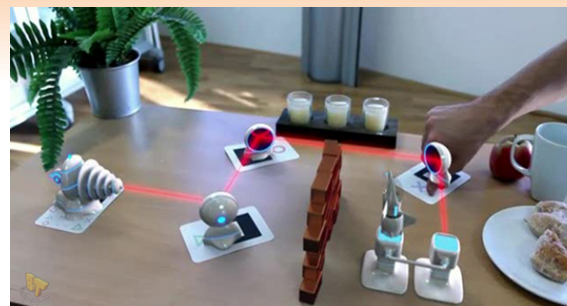
Output Devices

- 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

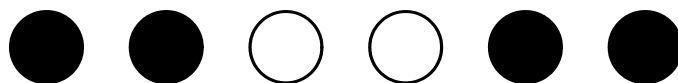
Worse!

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?

AA AAAA



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



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



Grids Provide Structure Using Common Fate

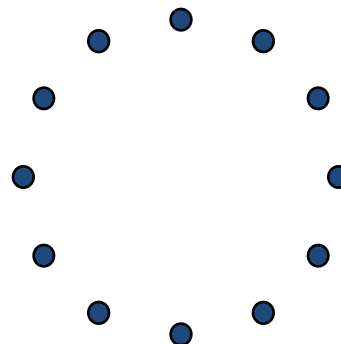
- Grids are (hidden) horizontal and vertical lines
 - They help place graphic elements
- Alignment to same grid line creates logical grouping
 - Common fate
- Grids avoid disconcerting irregularities
 - That attract the eye
 - Like

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?

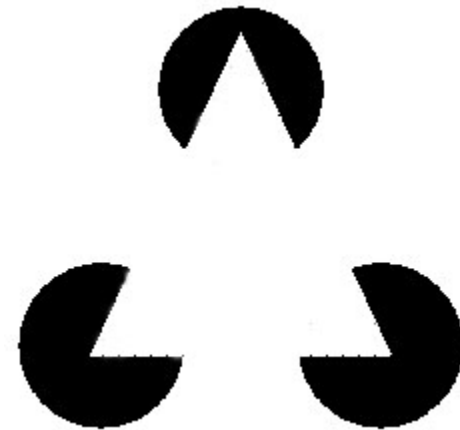
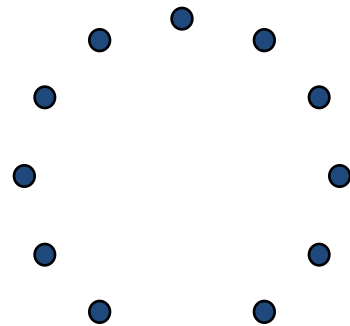


- More will answer “A circle”

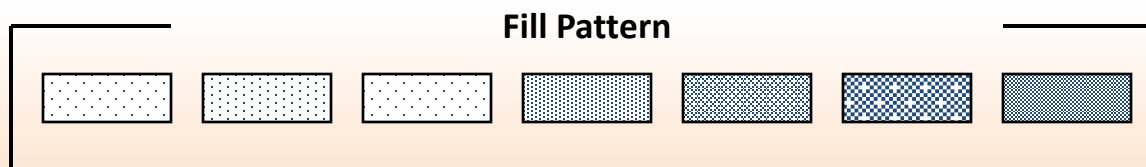
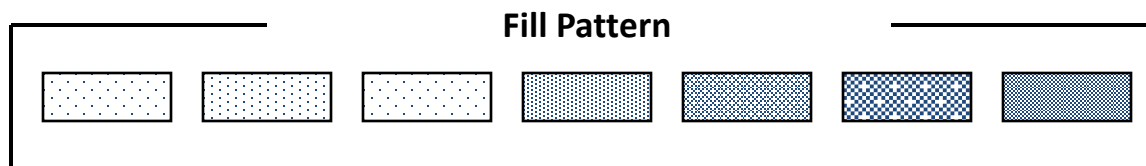
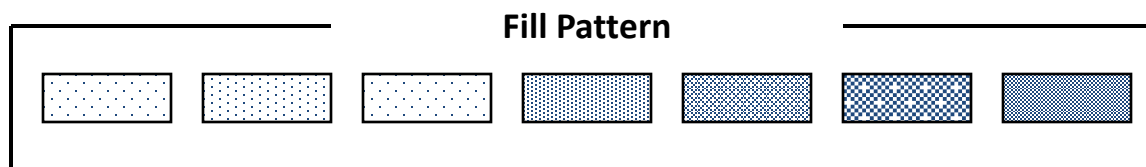


Closure Example

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

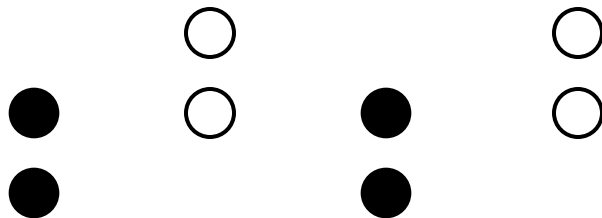


Closure Example – Each Palette Has Progressively Less Closure - and Works



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)

The screenshot shows the Delta website interface with several annotations. A blue box on the left contains the text "Grouping defined by background (common fate) and by box (closure)", with a line pointing to the "Round-Trip Reservations" section. Another blue box below it contains the text "Grouping defined by background (common fate)", with a line pointing to the "Links" section. A third blue box at the bottom left contains the text "Grid (common fate)", with a line pointing to the "Flight Schedules" link. The website layout includes a top navigation bar with links like HOME, TRAVEL, SKYMILES, PROGRAMS & SERVICES, INSIDE DELTA, and CUSTOMER CARE. The main content area is divided into sections: "Round-Trip Reservations" (with a yellow background), "Customer Advisory" (with a white background), "Arrival / Departure Info" (with a yellow background), and "NEW from delta.com Online Hotel Reservations" (with a dark blue background). The "Round-Trip Reservations" section contains a form with fields for "leaving from", "Select departure date and time", "Going to", "Select return date and time", and "Passengers and preferred cabin". The "Customer Advisory" section contains text about flight delays and cancellations. The "Arrival / Departure Info" section contains a form for "Flight number" and "Get instant arrival and departure information". The "Online Hotel Reservations" section contains a banner for "Book your ideal hotel, B&B, or resort worldwide".

Grouping: Poor Dialogue Box Design

- Logical structure hard to understand – proximity problem

Align Objects

- | | | |
|----------------------------------|-----------------------------------|-----------------------------------|
| <input type="radio"/> Left sides | <input type="radio"/> L/R Centers | <input type="radio"/> Right sides |
| <input type="radio"/> Tops | <input type="radio"/> T/B Centers | <input type="radio"/> Bottoms |

An example of bad logical structure



Which is the Logical Structure?

Align Objects

- Left sides
- Tops

- L/R Centers
- T/B Centers

- Right sides
- Bottoms

Align Objects

- Left sides

- L/R Centers

- Right sides

- Tops

- T/B Centers

- Bottoms

An example of bad logical structure



Grouping: Two solutions; Which is Better?

More vertical space
creates
less vertical proximity

Align Objects

- Left sides
- L/R Centers
- Right sides
- Tops
- T/B Centers
- Bottoms

Horizontal rule creates
two areas (closure) to
overcome proximity

Align Objects

- Left sides
- L/R Centers
- Right sides
- Tops
- T/B Centers
- Bottoms

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

Advanced FAX Settings

Aptive Communication Center

Speaker setting

☐ On ☒ On until connect ☐ Off

Wait 45 seconds for connection

Retry after 60 seconds Number of retries 3

Resolution

☒ Fine ☐ Standard

Maximum transmit rate: 14400 bps

Paper size: Letter (8 1/2 x 11 in)

☒ Use custom editor: xe C:\Phoenix\Fax_inst.wri Browse...

Save Cancel Help

Bad Example

Form Title -- (appears above URL in most browsers and is used by 'www' search engines)		Background Color:
Q&D Software Development Order Desk		FFFBF0
Form Heading -- (appears at top of Web page in bold type)		Text Color:
Q&D Software Development Order Desk		000080
E-Mail responses to (will not appear on Web page)	Alternate (for mailto forms only)	Background Graphic
dversch@q-d.com		
Text to appear in Submit button	Text to appear in Reset button	<input type="radio"/> Mailto
Send Order	Clear Form	<input checked="" type="radio"/> CGI
Scrolling Status Bar Message (max length = 200 characters)		
WebMania 1.5b with Image Map Wizard is here!		
<< Prev Tab		Next Tab >>

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

A Well-Designed Dialogue Box

Strong grid structure
(common fate)

Spelling				
Not in Dictionary:	a's			
Change to:	ax's	Resume	Ignore All	
Suggestions:	ax's as	Change	Change All	
		Add	Suggest	
Add words to:	Custom Dictionary	AutoCorrect	Close	

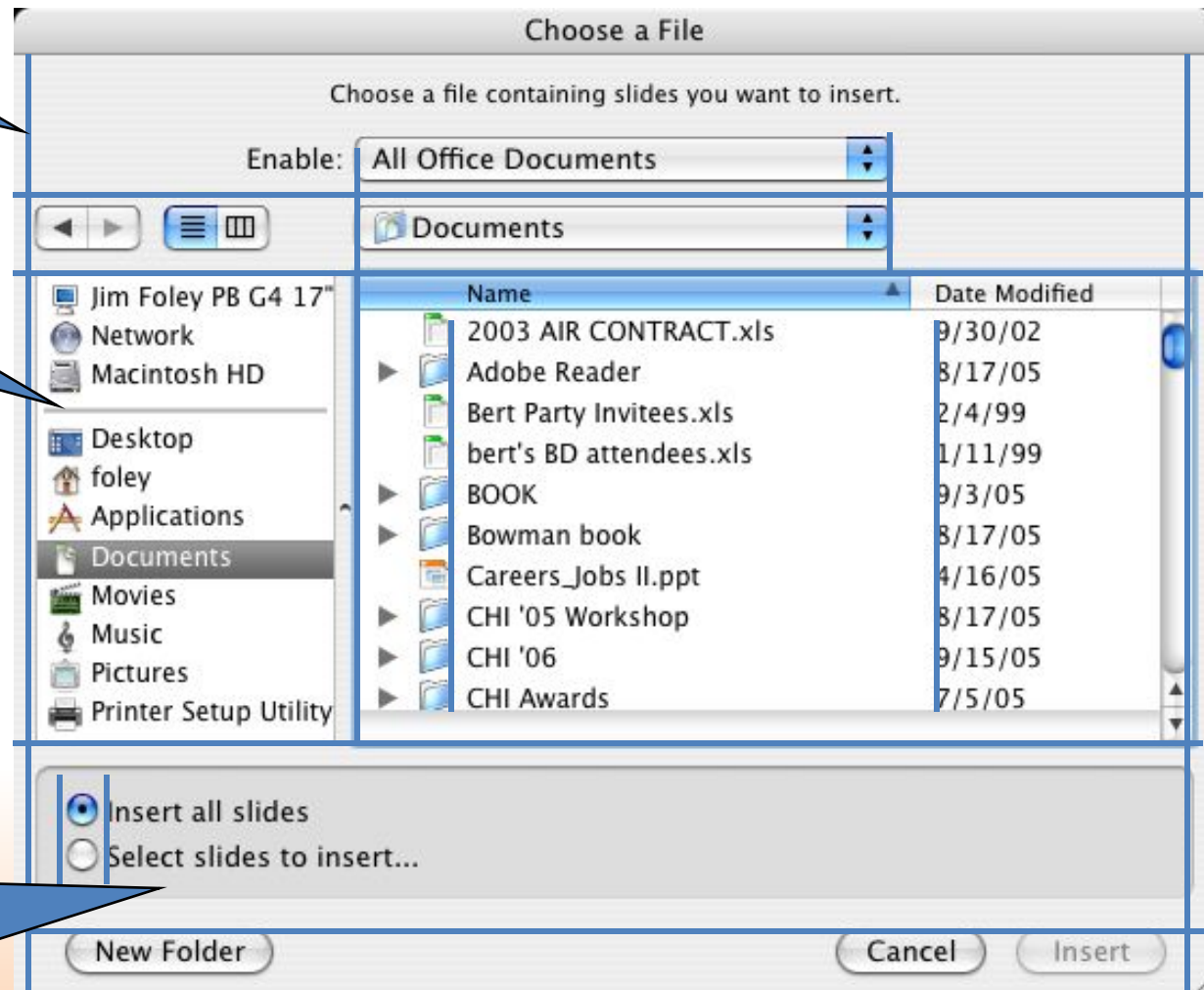


Another Well-Designed Dialogue Box

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.

