



UI Design Principles

- They guide towards optimal equilibrium of requirements
- Do not provide analytical solution
- Should allow to avoid errors in early phases
 - System, User Requirements, Prototyping
- And not to rediscover each time dos and donts
 - "color blindness"
- They may be **Ambiguous and Contradictory**
- Goal to **UNDERSTAND** the motivations of such principles so to **GUIDED** in executive decisions.



Guidelines - A

(Shneiderman 1987)

- Strive for Consistency
- Cater to Universal Usability
- Offer Informative Feedback
- Design Tasks Flows to yield closure
- Prevent Errors
- Permit Easy Reversal of Actions
- Make Users feel They are in Control
- Minimize Short-Term Memory Load



Guidelines - B

(Nielsen and Molich 1990)

- Consistency and Standards
- Visibility of System Status
- Match between System and Real World
- User Control and Freedom
- Error Prevention
- Flexibility and Efficiency of Use
- Aesthetics and Minimalist Design
- Help Users Recognize, Diagnose and Recover from Errors
- Provide Online Documentation and Help



What they do come from?

- They are inspired from human psychology processes
- Science on how people
 - Perceive
 - Learn
 - Remember
 - Reason
 - Ground Intentions into Actions



Perception

- Perception is the process of interpreting signals being collected by our sense organs into our nervous system.

Hearing (Hair Cells),

Sight (Retina)

Smell (Olfactory Receptors)

Taste (Taste buds)

Touch (Neural Receptors)

- Not only Bottom-up Processing!





ATM Transaction

Select Account

Checking 1

Checking 2

...

BACK

NEXT



ATM Transaction (cont.d)

What would you like to do?

Withdrawal

Transfer

...

BACK

NEXT



ATM Transaction (cont.d)

Please Confirm Amount

200 \$?

BACK

OK



ATM Transaction

Printed receipt ?

OK

DONE



Perception is biased by

-
- **Past** : Experience or prior information



Language is Ambiguous

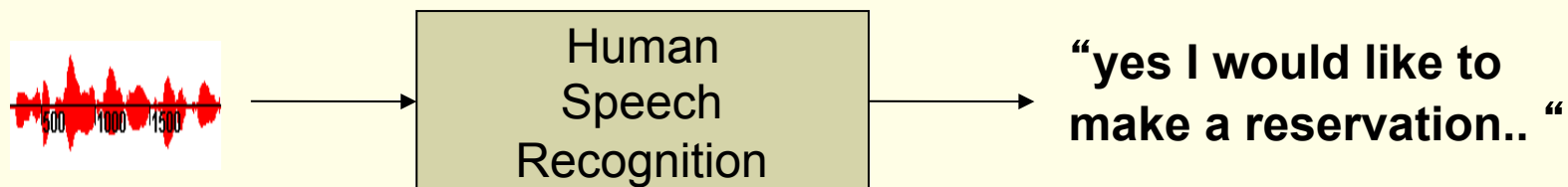
- Giorgio e Luca erano compagni di **banco**
 - Senso → **Mobile**
- Il direttore del **banco** di Napoli
 - Senso → **Istituzione di credito**
- Il nuovo test sara' il **banco** di prova
 - Senso → **Test**
-**Banco** ottico
-






Perception is biased by

- **Past** : Experience or prior information
- **Present** : Current Context
 - Also from concurrent signals from different sensorial information (sight & hearing)
 - Influence/Reinforce each other (e.g. lip reading)

“Cocktail Party Problem”



- Human Perception Experiment
- Multiple audio sources
- Humans can “adaptively” **separate** a specific sound source
- Cocktail Party Problem
 - Audio sample 1 source 
 - Audio sample 2 source 
 - Audio sample 3 source 



Perception is biased by

- **Past** : Experience or prior information
- **Present** : Current Context
- **Future** : Our Goals
 - Our goals may filter our perception
 - Example of goal oriented information over web
 - Ignoring information ≠ Do not notice information

Influencing where we look

Observing, Measuring and Evaluating

EyeTracker





Take Away Guidelines

Perception

- **Avoid Ambiguity**
 - Requires effort
- **Be Consistent**
 - Exploit users past experience
- **Understand users' goals**
 - Either be explicit
 - Or Implicitly track them



The Gestalt Theory

Visual Perception

- Psychologists proposed in 20th century to explain how visual perception works
- Supported now by neurophysiological experiments
- Descriptive framework
- Support for graphic and user interface design



The Gestalt Theory

Visual Perception

It identifies rules/principles
human visual perception
groups tokens together

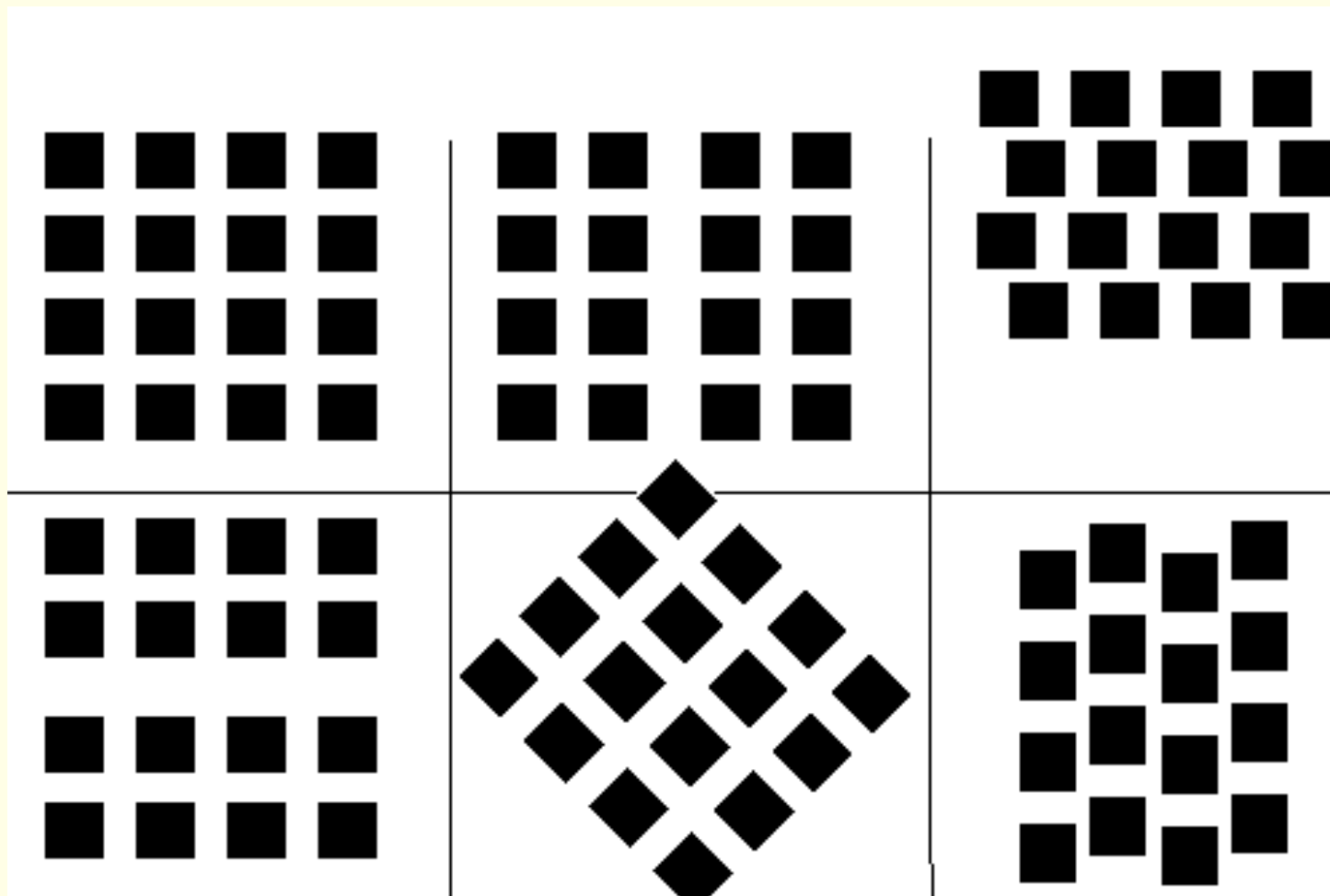


Rules

- Proximity
- Similarity
- Continuity
- Closure
- Symmetry
- Figure/Ground

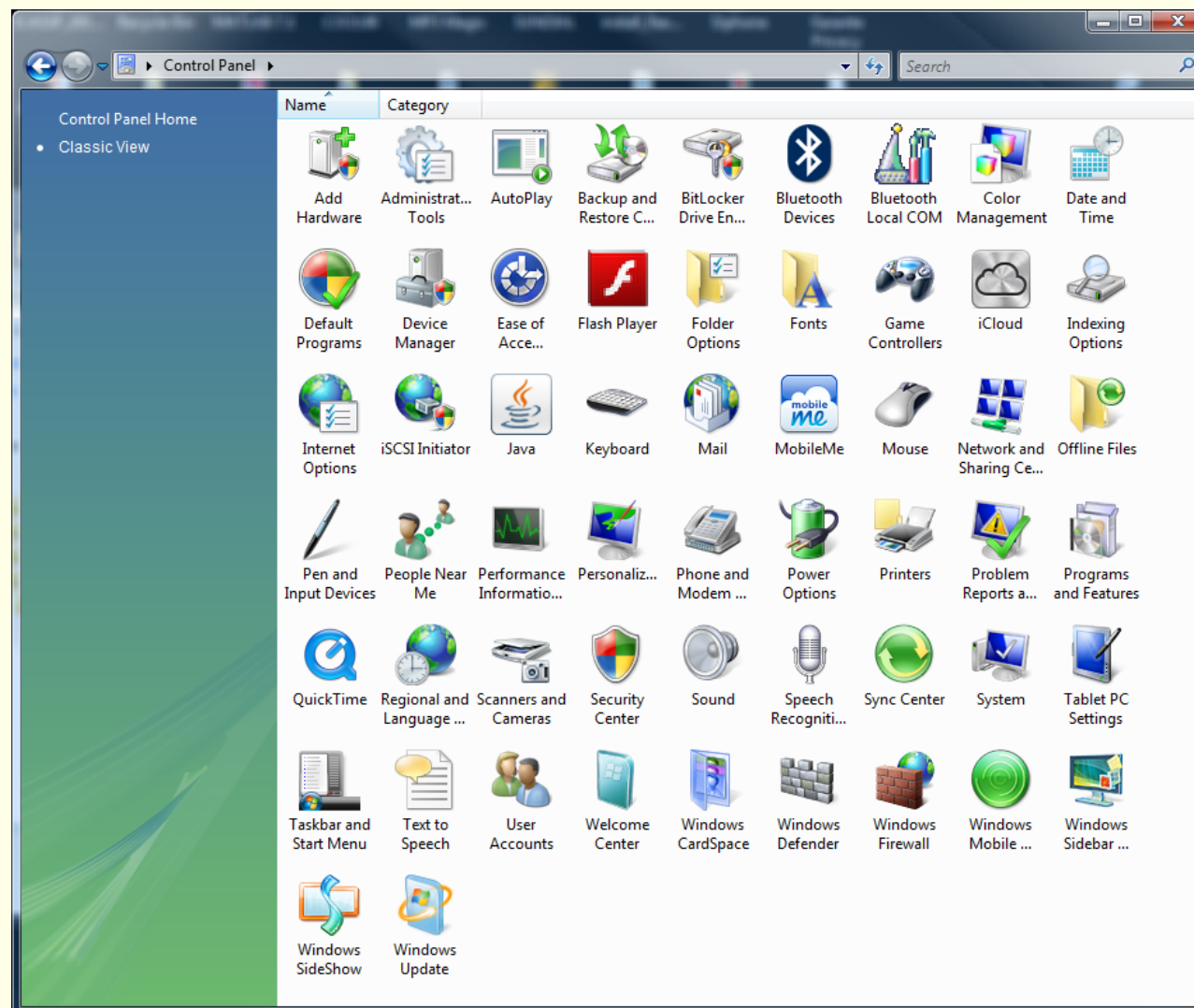


Proximity (1)



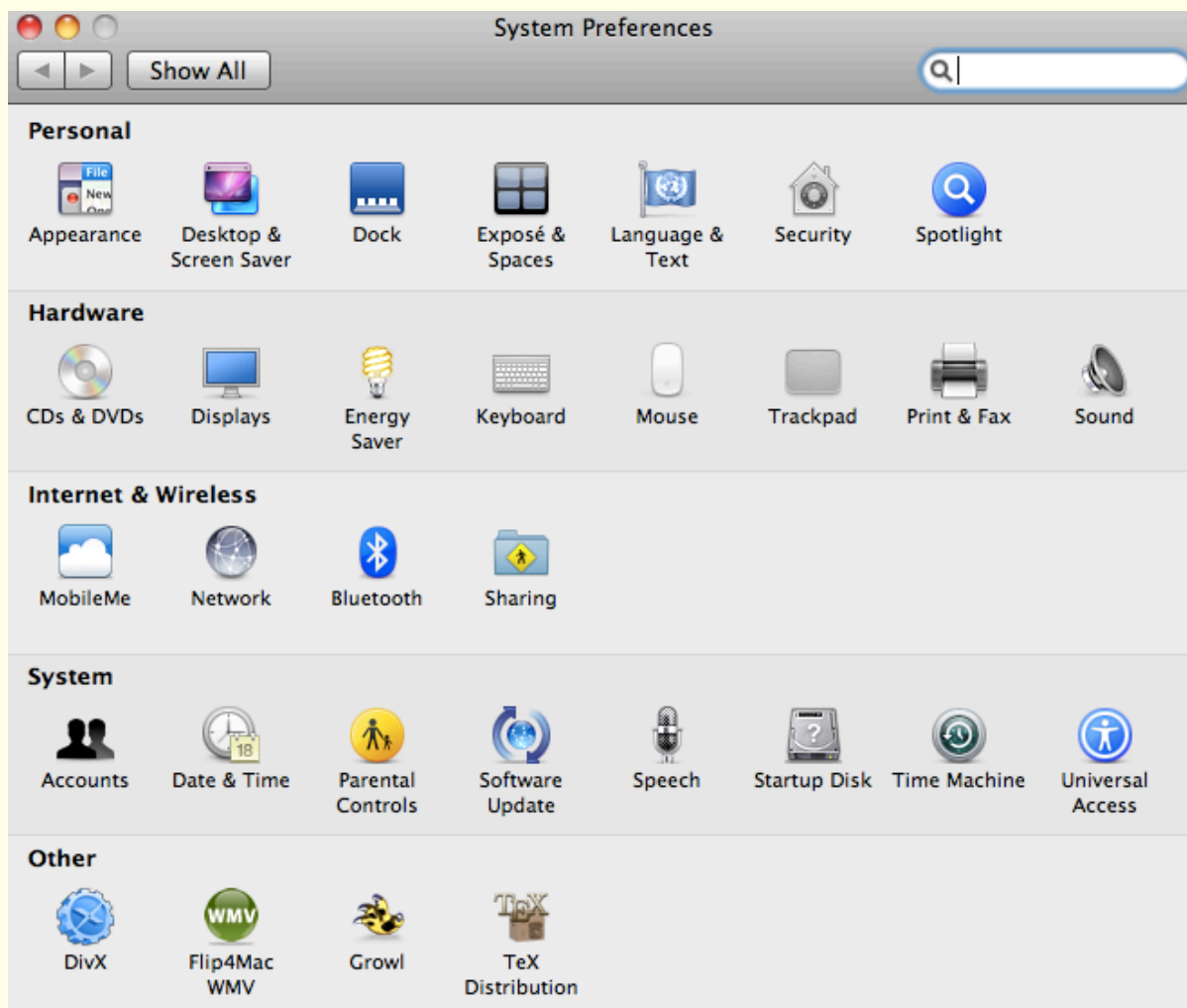


Proximity (2)





Proximity (3)



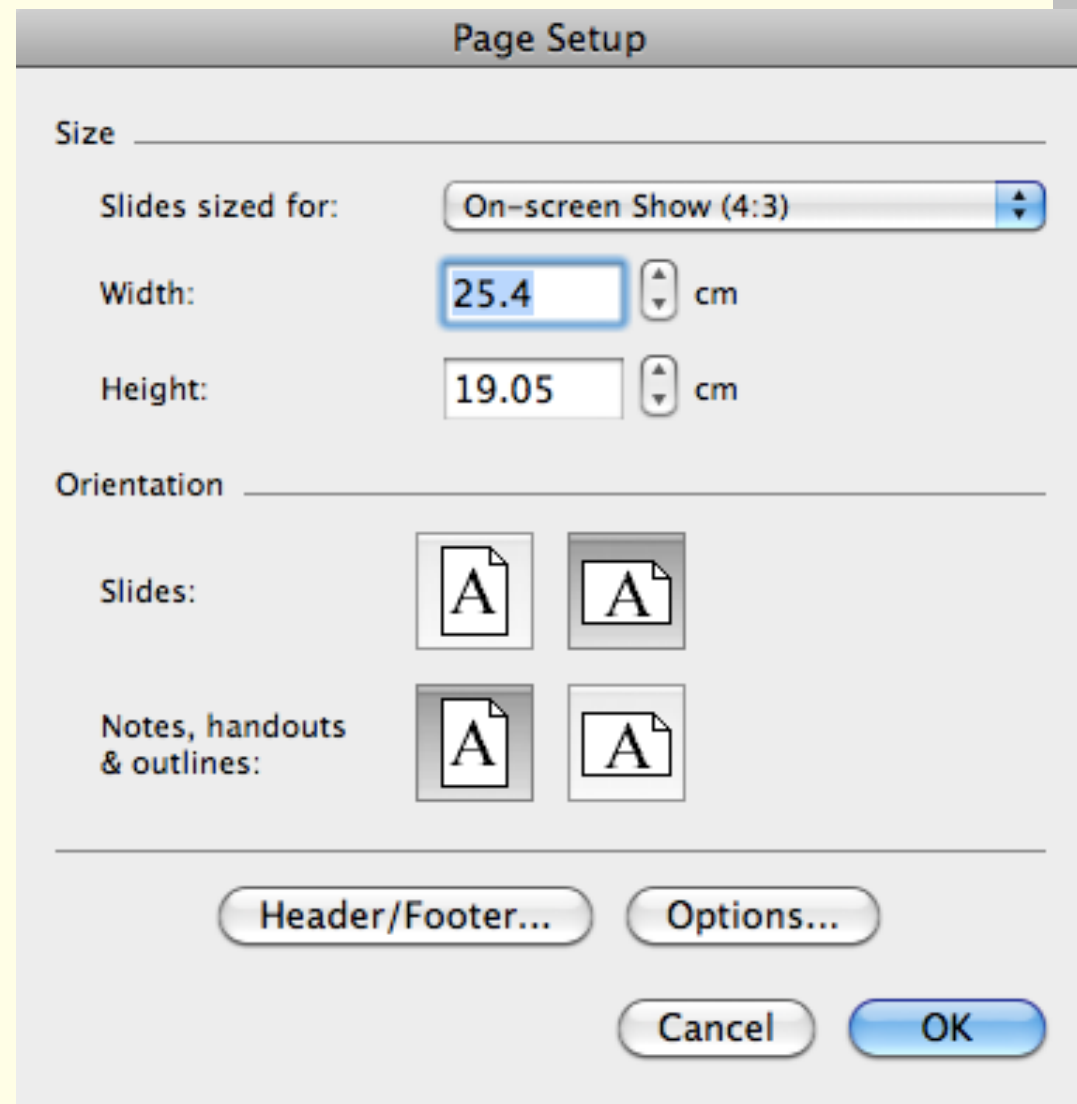


Proximity (4)

```
Terminal — bash — 80x24
Giuseppe-Riccardis-MacBook-Air:~ beppe$ ls
Applications      Library           Public
Desktop           Movies           Send Registration
Documents         Music            Sites
Downloads         NetBeansProjects sharing_vista
Dropbox           Pictures
Giuseppe-Riccardis-MacBook-Air:~ beppe$ ls -la
total 64
drwxr-xr-x+ 31 beppe  staff   1054 Mar 26 11:31 .
drwxr-xr-x   5 root   admin   170  Mar  2  2011 ..
-rw-----   1 beppe  staff     3  Mar  2  2011 .CFUserTextEncoding
-rw-r--r--@  1 beppe  staff 15364  Apr 18 14:34 .DS_Store
drwx-----   2 beppe  staff    68  Apr 22 16:36 .Trash
drwxr-xr-x   5 beppe  staff   170  Oct  6  2011 .android
-rw-----   1 beppe  staff  4552  Apr  6 15:16 .bash_history
drwx-----   3 beppe  staff   102  Mar  5  2011 .cups
drwx-----  14 beppe  staff   476  Apr 22 16:40 .dropbox
drwxr-xr-x   5 beppe  staff   170  Jun 23  2011 .editix
drwxr-xr-x   3 beppe  staff   102  Feb  9 16:40 .m2
drwxr-xr-x   4 beppe  staff   136  Sep 12  2011 .netbeans
drwxr-xr-x   2 beppe  staff    68  Apr  1  2011 .spss
drwx-----   3 beppe  staff   102  Apr  1  2011 .ssh
drwxr-xr-x   4 beppe  staff   136  May 30  2011 .sysdb20
-rw-----   1 beppe  staff   912  Feb  9 16:00 .viminfo
```



Similarity





Continuity (1)



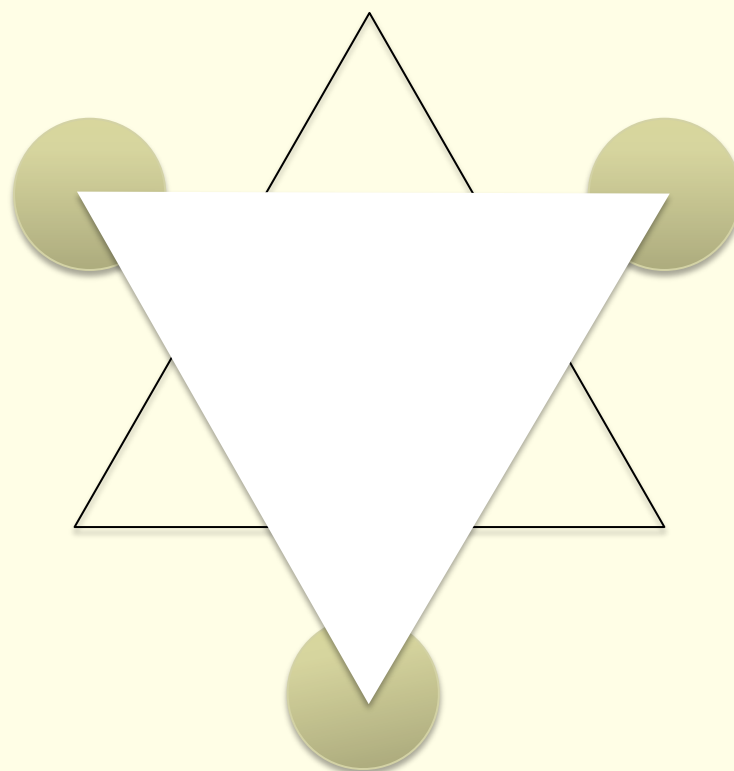


Continuity (2)



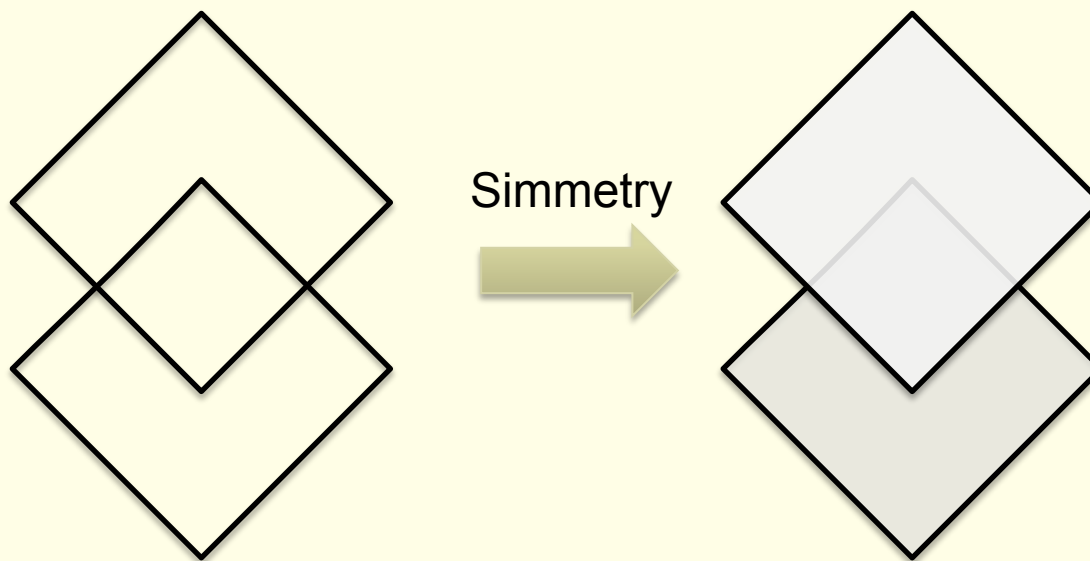


Closure (1)



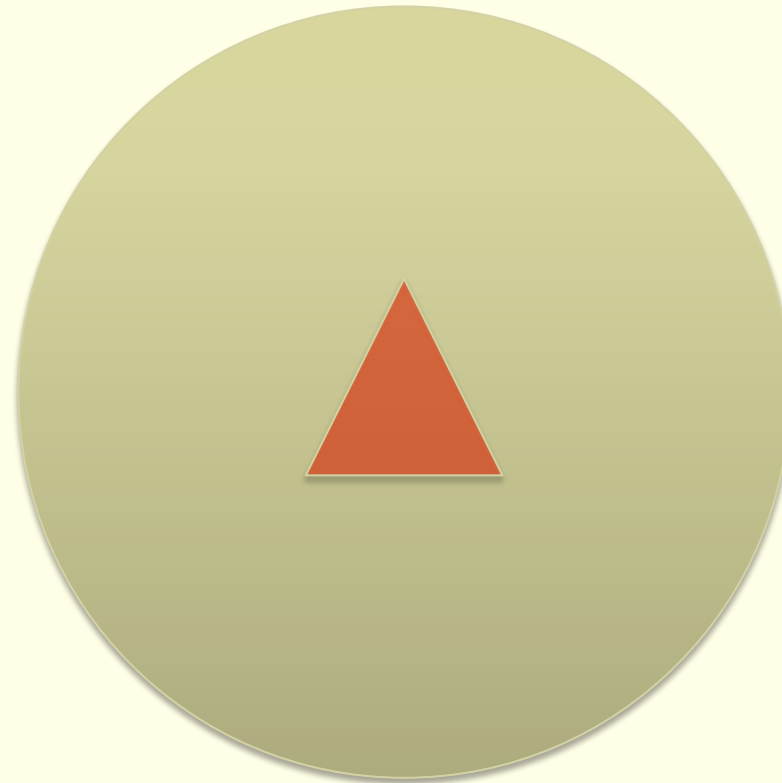


Simmetry





Figure/Ground (1)





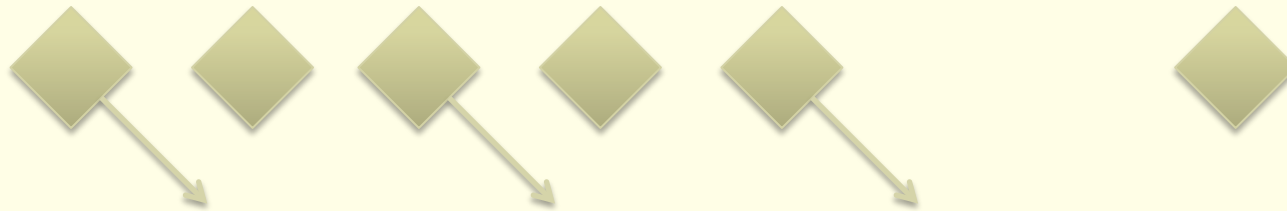
Figure/Ground (2)





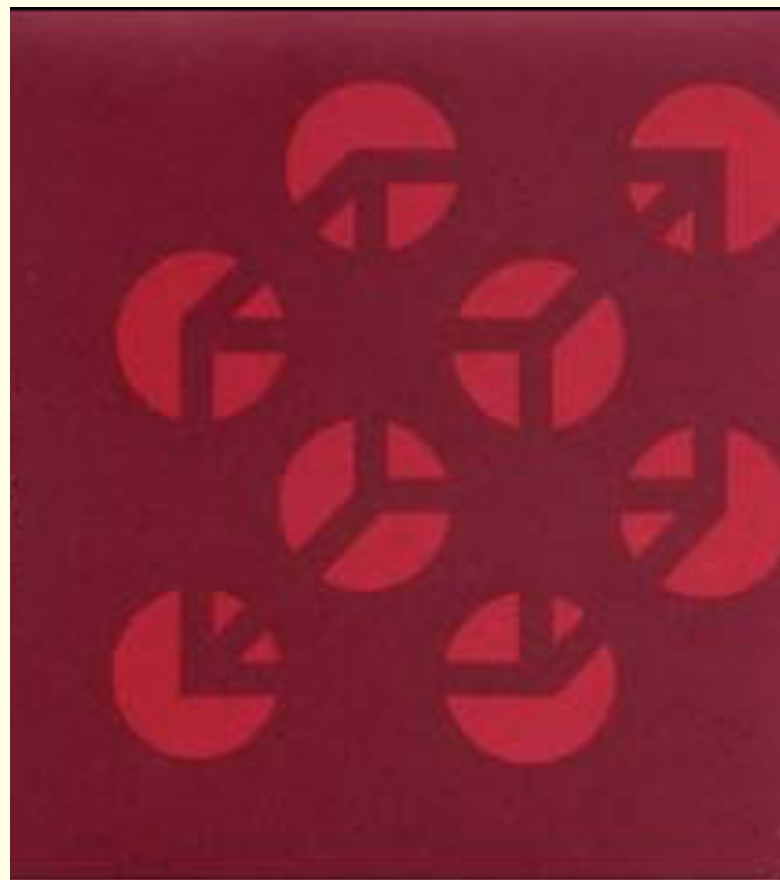
Common Fate

Moving Objects





Closure-Symmetry-Continuity





sis **LAB**

Signals & Interactive Systems



Learning

- Learning a task
- Recall from experience
 - Personal Past experience → Learned Actions are easy to perform

"Stay away from walking over the edge of a cliff"

"Do not execute .exe files received from unknown recipients"

"Facebook is good for making friends" (User 1)

"Facebook is a waste of time" (User 2)



Learning from Experience

Issues

- Learning from experience is in general difficult and not perfect both for human and machines!
- Too much or too little data to learn from or too many conclusions to draw
- Learning from errors is not easy
- Credibility of the experience to learn from
 - Whose experience was that (brother vs friend..)
- Overgeneralization is used both by humans and machines and can undeniably lead to errors.



Learned actions easy to perform

- Many tasks may be performed routinely
 - "Riding a bike", "Driving a car", "Walking on the sidewalk" ...
 - For most part of the experience we do not consume any conscious resources (attention or memory) (Schneider & Shiffrin 1977)
 - We automate how and when to change gears
 - We have learned from past experience
 - We pay attention to obstacle avoidance



Examples of Learned vs New Tasks

- "Recite letters of the alphabet A through P"
- "Recite letters of the alphabet from P to A"
- "Drive to work using your normal route"
- "Drive to work an unfamiliar one"
- "Spell out your telephone number"
- "Spell out your telephone number by grouping numbers by four"
- Write and post a letter at the post office
- Write and send an email (users age >50)



Take Away Guidelines

Perception

- Provide System status and Users' progress toward their goal
 - Relieve attention strain and minimize short-memory
- Guide users to goal
 - Consider one-time user or repeat-user experience
 - Expliciting needed information (do not overload either)
- Let Computer do the "math"/"algorithm"
 - "Go the middle of the document" → Solve it graphically



Why People Really use Mobile Phones ?

