Psychological and Cognitive Motivations

- Intro
- Principles (Design Rules)
- Foundations
  - Perception
  - Vision
  - Attention
  - Memory
  - Task Execution

Reference for the lectures : "**Designing with the mind in mind**", Jeff Johnson

What they do come from?

- They are motivated by human cognitive and perception processes
- Science on how people
  - Perceive
  - Learn
  - Remember
  - Reason
  - Ground Intentions into Actions

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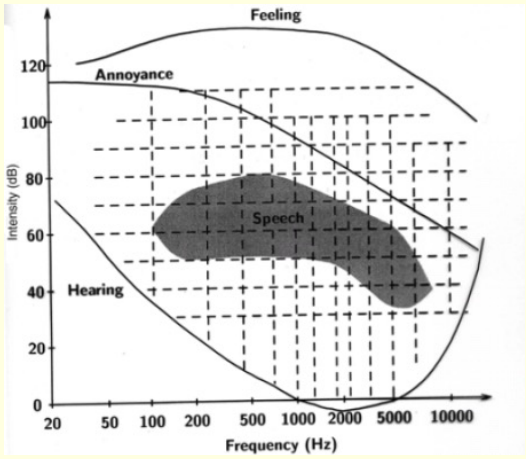
Perception

- 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)

Speech Perception Limits

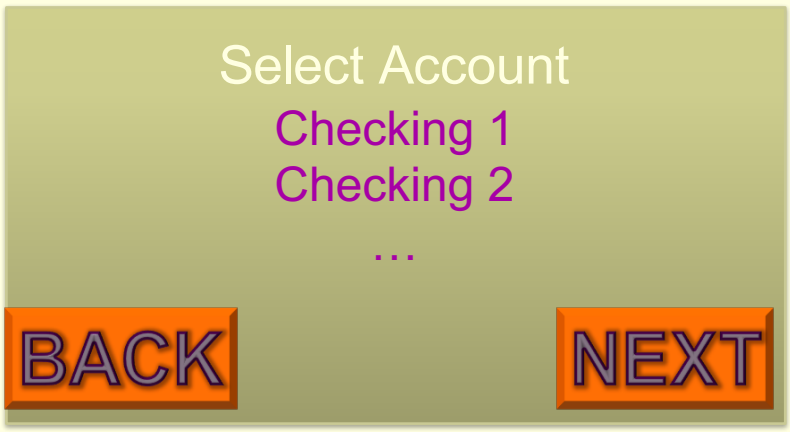


Perception is biased by

- **Past** : Experience or prior information

"Vision", W. H. Freeman, New York, NY

ATM Transaction



ATM Transaction (cont.d)

ATM Transaction (cont.d)

ATM Transaction

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)

Language is Ambiguous

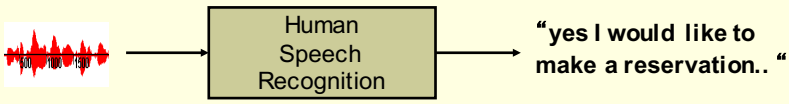
Quanti significati ha la parola banco ?:

- 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
- **Future** : Our Goals
  - Our goals may filter our perception
    - "Look for your red car in the stadium parking lot" → all red cars will pop up!
  - Example of goal oriented information over web
  - Ignoring information ≠ Do not notice information

"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

Influencing where we look

Observing, Measuring and Evaluating

EyeTracker

Perception

- Perception is biased by prior conditions, experience, expectations.
  - The bias maybe random (not controlled) or managed.
- Not only Bottom-up Processing!
  - Selective Attention Test

Take Away Guidelines

Perception

- **Avoid Ambiguity**
  - Requires effort
- **Be Consistent**
  - Exploit or Take into account users' past experience (e.g. Apple watch) and expectations
- **Understand users' goals**
  - Either be explicit
  - Or Implicitly track them

The Gestalt Theory

Visual Perception

- *Gestalt* = Shape or Figure
- 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

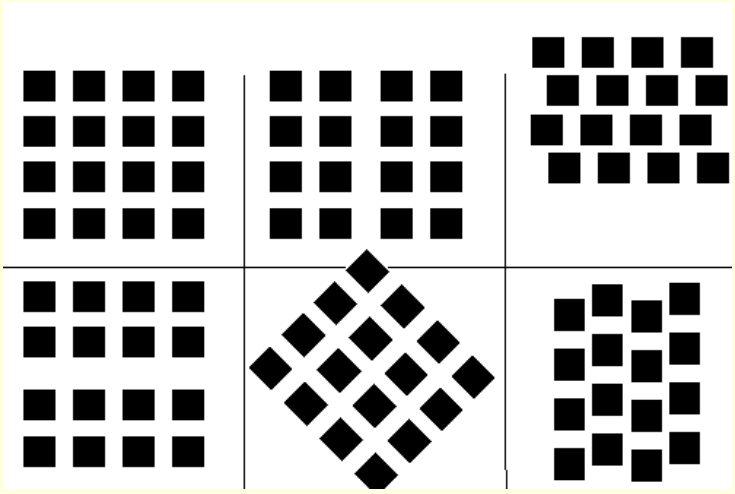
human visual perception

groups tokens together

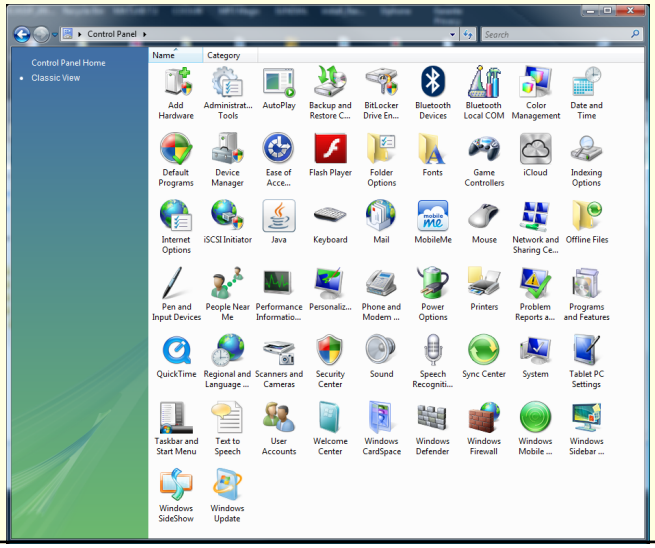
Rules

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

Proximity (1)

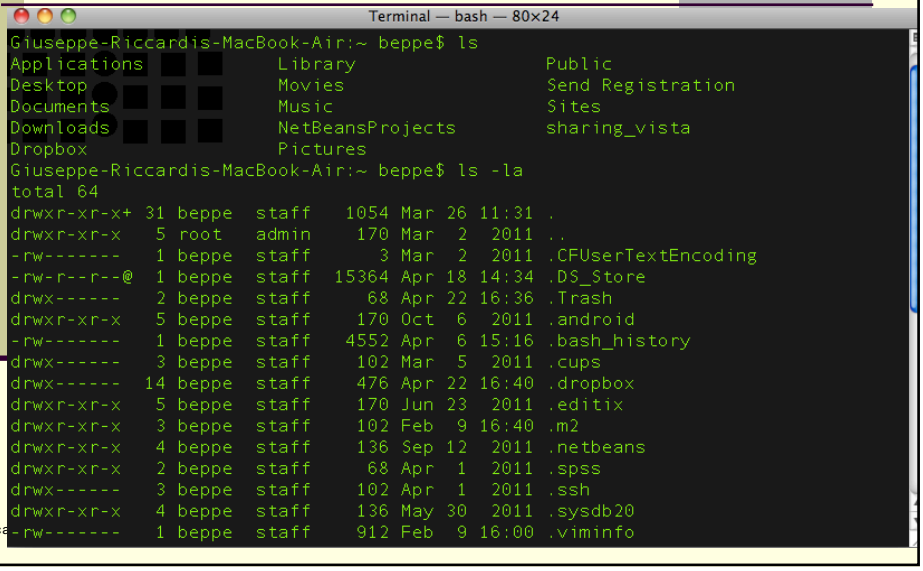


Proximity (2)

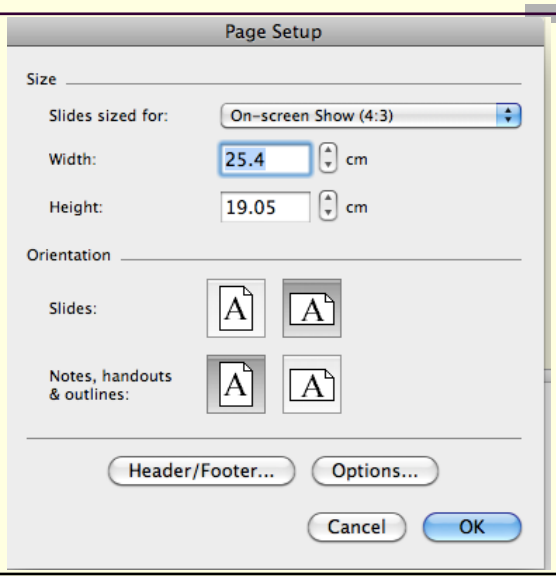


Proximity (3)

Proximity (4)



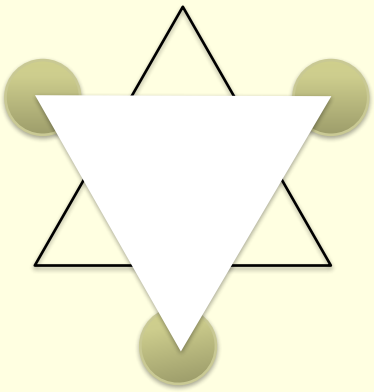
Similarity



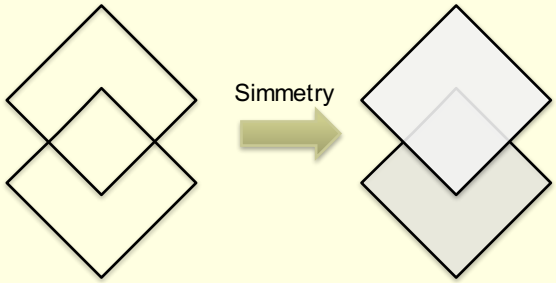
Continuity (1)

Continuity (2)

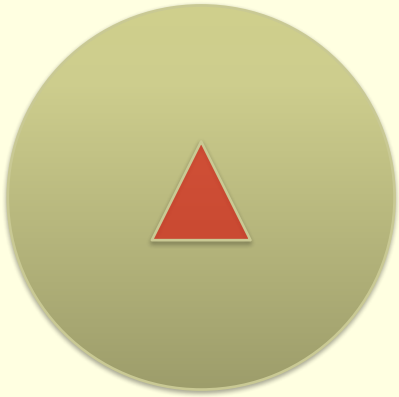
Closure (1)



Simmetry



Figure/Ground (1)



Figure/Ground (2)

Common Fate

Moving Objects

Closure-Symmetry-Continuity

Cover of "Coherence in Thought and Action" book by Paul Thagard

SiS LAB

Signals & Interactive Systems

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

Products, Services, Systems

- They serve a purpose, a task SOMEBODY may be interested!

What they do come from?

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User Tasks

- A **task** is what a user
  - Does regularly during the day
    - "Drives to work", "Use cash for payments"
  - Does sometimes
    - "Go out for dinner"
  - Does rarely
    - "Buy a gift for his in-laws"
  - May be doing in the future
    - "Gone fishing"
  - **Never thought of doing it**
    - "Optimizing his gas/electric bill with AI"

Learning a Task

- Learning from scratch
- Learning and recalling 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 requires resources (attention, skills, background)!
- Too much or too little data to learn from or too many conclusions to draw
- Learning from errors may be painful but effective
- Credibility of the experience to learn from
  - Whose experience was that (brother vs friend..)
- (Over) Generalization 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", "Reading a Newspaper"…
  - 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)

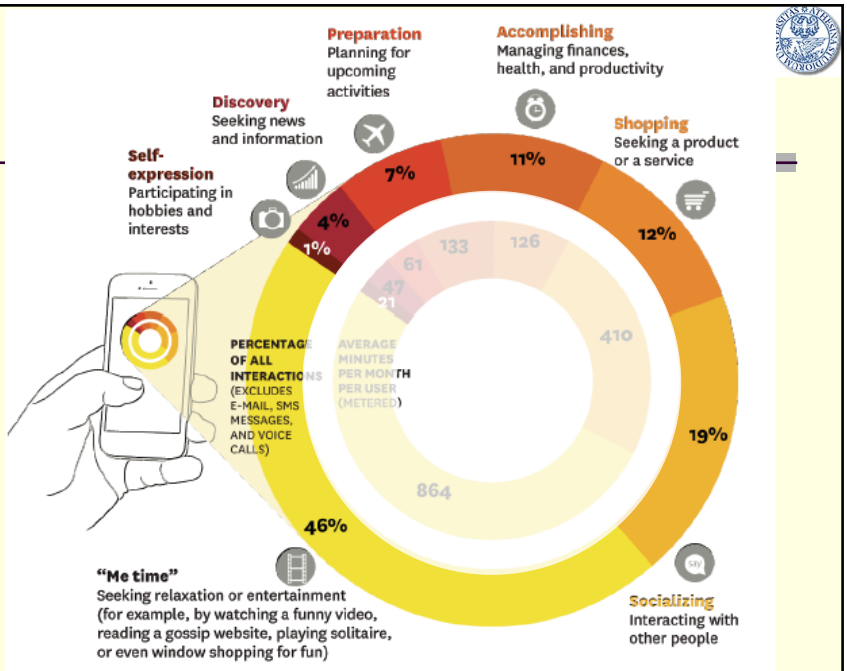
Take Away Guidelines

- 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

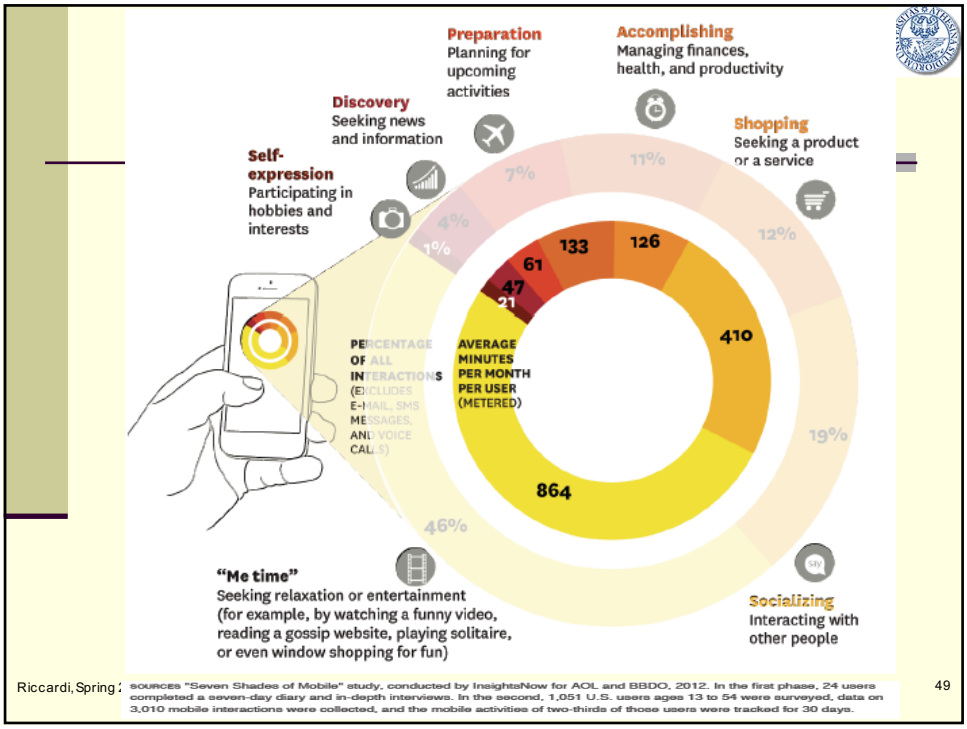
Putting Together User Interface, User Interaction/Experience

- The production process of an App.
- Conceptualizing
- Designing
- Prototyping
- Refining
- Evaluating
- Your App.

Why People Really use Mobile Phones ?



SOURCES "Seven Shades of Mobile" study, conducted by InsightsNow for AOL and BBDO, 2012. In the first phase, 24 users completed a seven-day diary and in-depth interviews. In the second, 1,051 U.S. users ages 13 to 54 were surveyed, data on 3,010 mobile interactions were collected, and the mobile activities of two-thirds of those users were tracked for 30 days.



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12 Myths of Mobile App Design

Over the years (2005 A. Marcus and adapted)

- Users want power and aesthetics. Features are everything
- What we really need is a Swiss army knife
- 3G is the future!
- Focus groups and other traditional market analysis tools are the best way to determine user needs
- If it works in New York, it will work anywhere
- The killer app will be games, --er, no, I mean, nightlife, or gps.... uh...
- Mobile devices will essentially be phones, organizers, or combinations with maybe music/video added on
- The industry is converging on a UI standard
- Highly usable systems are just around the corner
- One operating system will dominate
- Mobile devices will be free-or nearly free
- Advanced data-oriented services are just around the corner

The App Concept

The story begins

- At the office during a meeting
- At home, with my kids
- On Vacation with my friends
- 24/7
- A teacher with 1-10 grades students in class
- Recruiter on face-to-face interviews

APP concept: Create a Story

I want to easily create a shopping list easily, quickly and share it with my family.

I want my camera to tell me when is the best timing/lighting for me to shoot a picture

I want to check how much exercise while I go to work, do sports and share it with my doctor

I want to plan my next summer vacation in the countryside and select from friends' advices and social websites

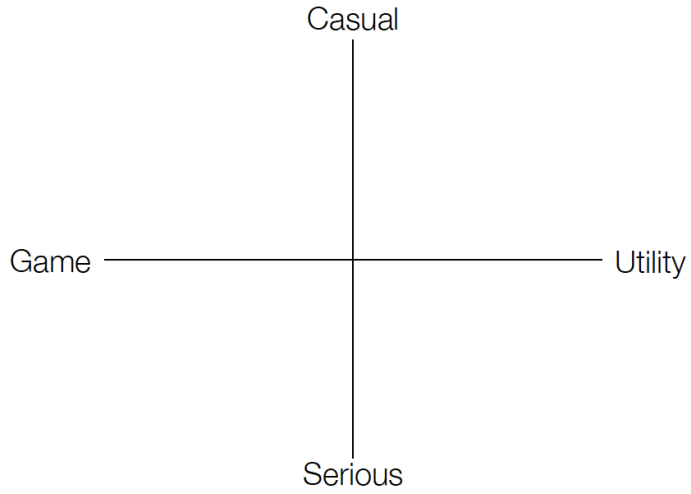
I want to know where is the cheapest gas station wherever I am considering the mileage to reach it.

I want to monitor and improve my mnemonic skills

Extreme Use Cases

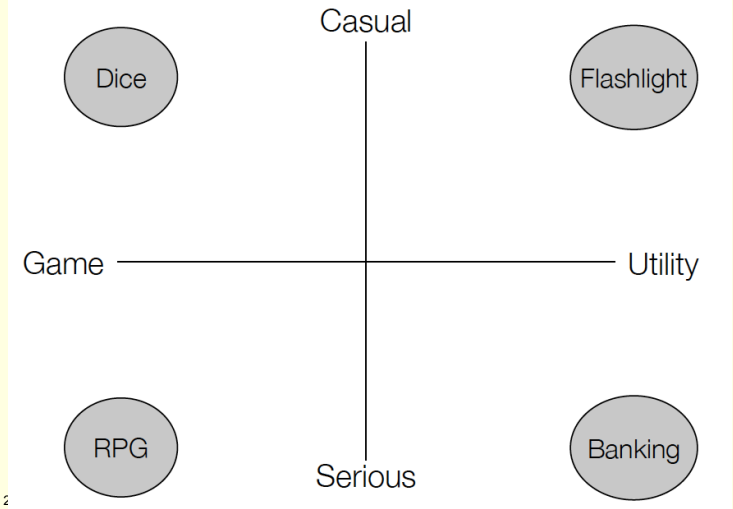
- 60 SECONDS use case
  - Soccer match scores, weather, stock quotes..
- 60 MINUTES use case
  - Video watching, Reading (emails) , Writing (blogs) , making dinner plans..

Extreme Use Cases



From Nathan . Freitas

Extreme Use Cases



From Nathan . Freitas

App Design Process

1. Create an Application Concept-Story
2. Identify Your User-Group
3. List All the Features App may support
4. Filter the Feature List Through the User-Group Definition
5. Review
6. Prototype
7. Iterate
8. EVALUATE (may happen at the end of step 6)

Example

- "Help People Shop for Groceries"
- Features: *CreatingList, GettingRelatedRecipes, GettingCoupons,…*
- Who needs it?: *PennyPinching, Gourmet, BusyMom, Single people*
- Filter the Feature List by choosing target audience: Thrifty People
- Prototype, Iterate
- EVALUATE! : Yourself, Friends, Group of Potential Users

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