



The User: Perception & Attention



Overview of Lecture

- **Cognitive processes:**

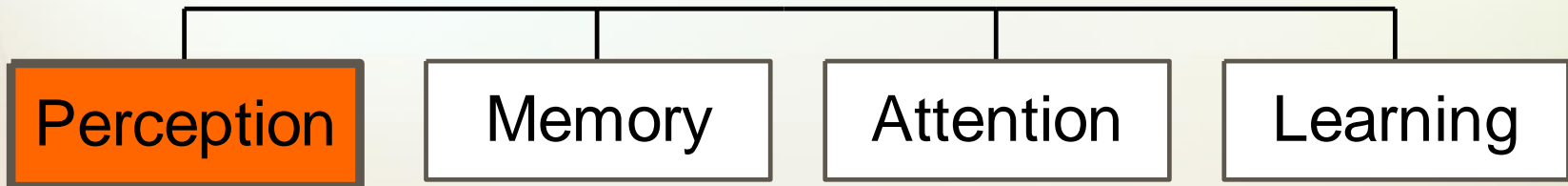
- **Perception**

- **Attention**



Cognitive Processes - Perception

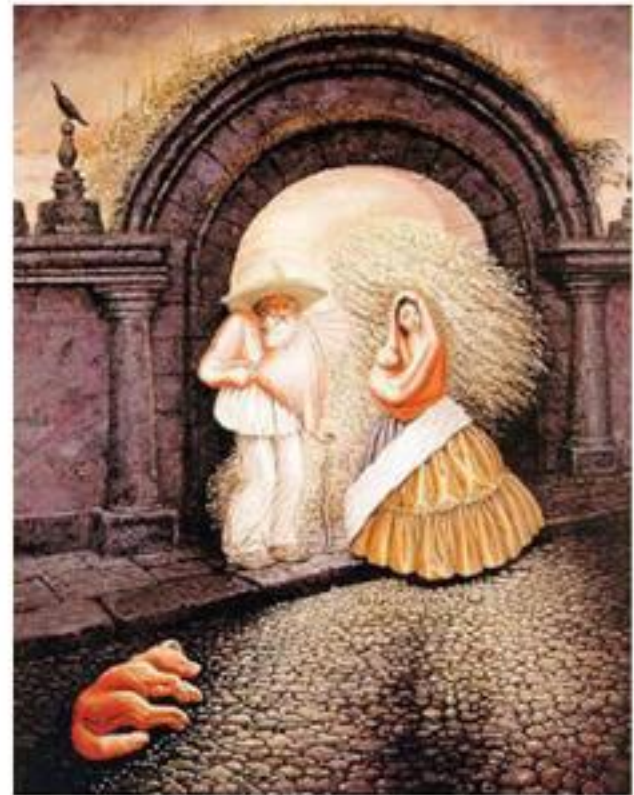
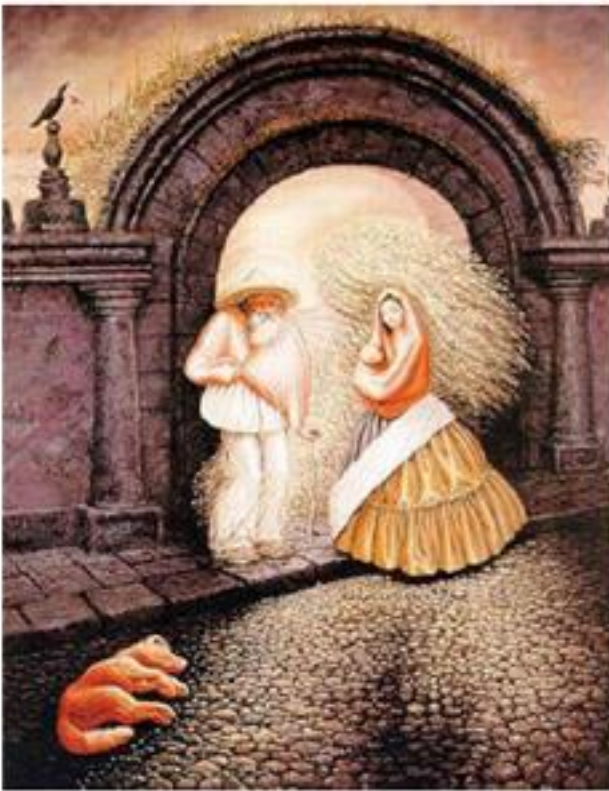
Human Processes





Cognitive Processes - Perception

Are these 2 pictures the same?





Cognitive Processes - Perception

- **Perception** is fundamental to interacting with computers
- Perception can involve all the different senses (visual, hearing, touch, smell..)
- To date, mostly concerned with visual perception because screen is usually the interface



Cognitive Processes - Perception

- Two classes of **Visual Perception Theory**
 - Constructive
 - Ecological



Cognitive Processes – Perception

Constructive

Constructive perception: Anything perceived on a screen is also a result of our prior knowledge and expectations



Cognitive Processes – Perception

Constructive Example





Cognitive Processes – Perception

Constructive Example

- **Prior knowledge of what a dalmation looks like helps us to construct the image**
- **Without prior knowledge, we would not be able to make sense of the picture**
- **Once we know what the picture depicts it is impossible to perceive it as random dots again, we have a meaningful interpretation**



Cognitive Processes – Perception

Constructive Example

- **Constructivism uses context to interpret and understand what we perceive**
- **Not initially concerned with specific detail, more interested in the overall meaning of the scene**





Cognitive Processes – Perception

Constructive Example

- **Which did you see – a seal or a donkey?**





Cognitive Processes – Perception

Constructive Example

- **Which did you see – a duck or a hare?**



Visual Perception

Constructive

Gestalt laws of perceptual organisation

‘Laws’ of perception that are regarded as being innate

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



Visual Perception

Constructive



Proximity

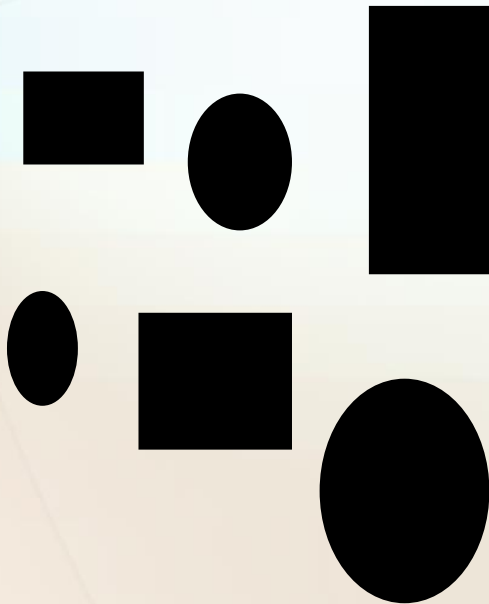
- The elements appear as groups rather than a random cluster of elements

<http://edition.cnn.com/> uses proximity



Visual Perception

Constructive



Similarity

- there is a tendency for elements of the same shape or colour to be seen as belonging together



Visual Perception

Constructive

Comment on the use of similarity in this photo ..





Visual Perception

Constructive

Use of Similarity (& Proximity)





Visual Perception

Constructive



Closure

- missing parts of the figure are filled in to complete it



<http://www.youtube.com/watch?v=ne6tB2KiZuk> - closure demonstrated in a different way



Visual Perception *Constructive*

Use of Closure

The screenshot shows the Usabilla website homepage. The layout uses closure to guide the user's eye. The navigation bar at the top includes links for Home, Why Usabilla?, Clients, Features, Pricing & Signup (highlighted in orange), and Contact. The main heading "Micro usability tests" is followed by the subtext "Use fast & fun visual feedback to optimize continuously". Below this, a large blue question mark icon is positioned next to a list of questions: "Where do you click for contact details?", "Click on the things that draw your attention.", "Click on the things you like on this page.", and "Where do you click to buy this product?". To the right of the text are images of a laptop, a tablet, and a smartphone displaying the Usabilla interface. Further right is a screenshot of the "Test results" page, which shows a map of the world with various data points. At the bottom, a green button says "Sign up for an account" with the text "Get started in 3 minutes. It's free!" below it. To the right of the button is a link that says "or take a look at our features". The footer contains the text "More than 8000 innovative and user-centric companies use Usabilla to test webpages, mockups, and concepts:" followed by logos for adaptive path, Disney, BOOKING.COM, LEVI'S, Discovery, howstuffworks, SONY, bolt|peters, and EA.

Usabilla

Already got an account? Login:

Home [Why Usabilla?](#) [Clients](#) [Features](#) [Pricing & Signup](#) [Contact](#)

Micro usability tests

Use fast & fun visual feedback to optimize continuously

Where do you **click** for contact details?
Click on the things that draw your attention.
Click on the things you like on this page.
Where do you **click** to buy this product?

Participate in a 30 second survey

Test results

Select the pages or images you want to improve and add your questions. Participants answer your questions with points and notes on top of your page or image. You visualize your results and use quick insights to optimize your design.

[Sign up for an account](#)
Get started in 3 minutes. It's free!

[or take a look at our features](#)

More than 8000 innovative and user-centric companies use Usabilla to test webpages, mockups, and concepts:

adaptive path Disney BOOKING.COM LEVI'S Discovery howstuffworks SONY bolt|peters EA



Visual Perception

Constructive

Use of Closure

LOOK IN IDE

This example likely requires too much effort to allow closure to occur and the message may be lost.

LOOK INSIDE

This example makes it easy for closure to occur. Therefore the message is clear.



Visual Perception

Constructive



Continuity

- The eye will naturally follow a line or curve



Visual Perception

Constructive

Use of Continuity





Visual Perception

Constructive

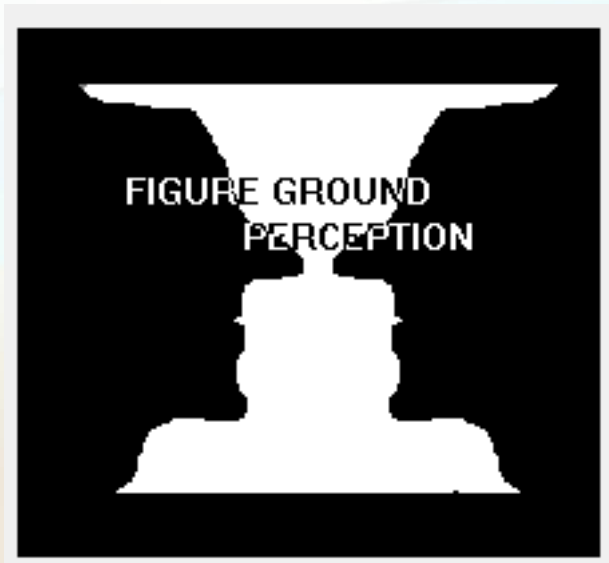


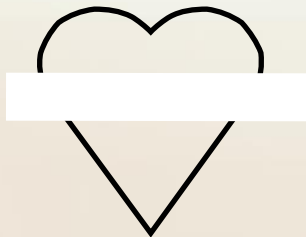
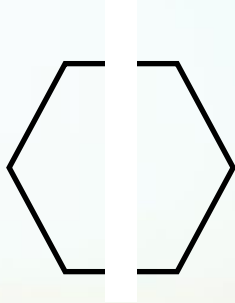
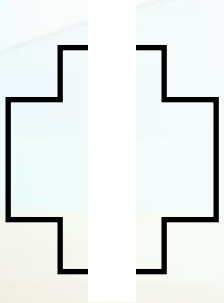
Figure-Ground

- Simplifies the visual scene into the figure that we look at and everything else is the background.



Visual Perception

Constructive



Symmetry

- regions bounded by symmetrical borders tend to be perceived as coherent figures

<http://www.bbc.co.uk/news> uses symmetry



Visual Perception *Constructive*

Use of Symmetry





Cognitive Processes – **Perception** *Ecological*

- **Ecological theory** argues that visual perception is a direct process



Cognitive Processes – Perception

Ecological - Affordance

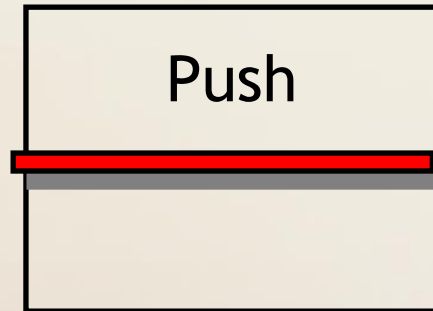
- A central concept of the ecological approach is the notion of **affordance**
- When the affordance of an object is perceptually obvious (perceptual affordance), it is easy for us to know how to interact with it
- When the opposite is true, we tend to make mistakes when trying to interact with the object



Cognitive Processes – Perception

Ecological - Affordance

- Scroll bars - intuitive to dragging upwards/downwards
- Door handle – good affordance for pushing/pulling





Cognitive Processes – Perception

Ecological - Affordance

- **Affordance** is very important with regards to interface objects such as buttons, scrollbars etc. (direct manipulation systems)
- How are affordances affected with **flat design**?



Exercise 1:

**Let's look at the following 2 websites.
How do they use the *Gestalt laws*?**





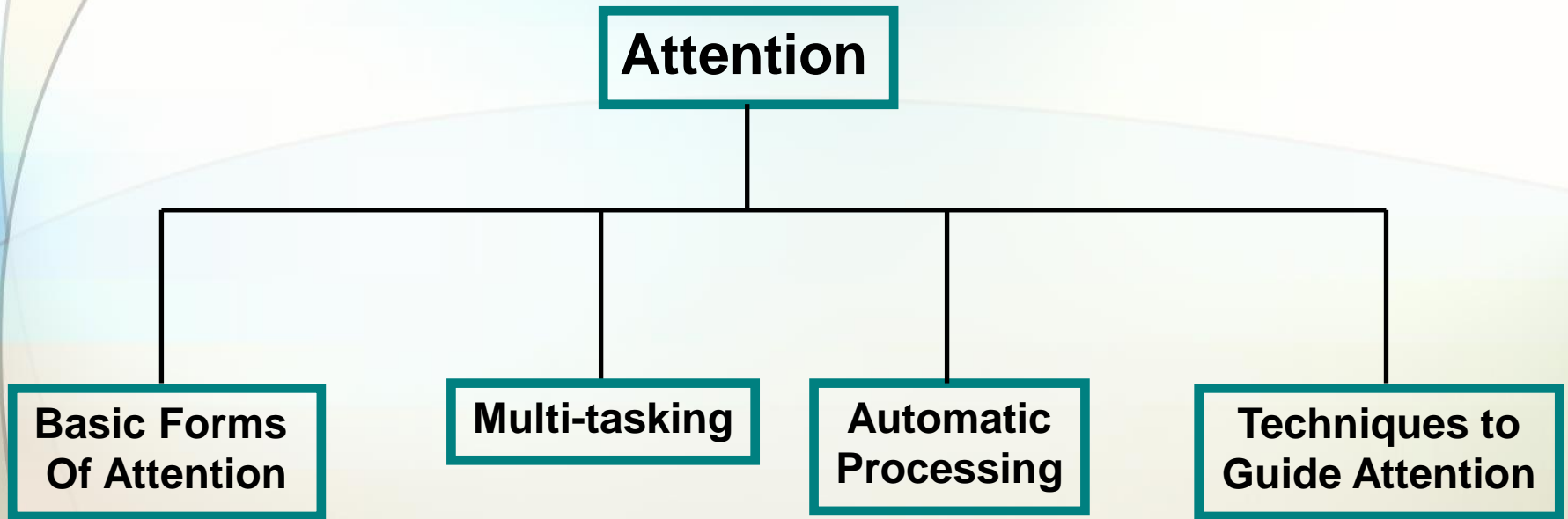
Cognitive Processes - Attention

Human Processes





Cognitive Processes - Attention





Cognitive Processes - Attention

Basic Forms of Attention

- Our ability to attend to one event out of a mass of stimuli is known as *focused attention*
- We are also capable of *divided attention*, e.g. driving while holding a conversation
- Attention may also be *voluntary* (we make a conscious effort to change our attention) or *involuntary* (a stimuli suddenly grabs our attention)



Cognitive Processes - Attention





Cognitive Processes - Attention

- How do you think that a user can be more focused?
 - One of the most important ways to help focus users attention to the information they need is to structure the interface so that it is easy to navigate through
 - Also, the perceptual laws of grouping should be used so that information can easily be perceived



Cognitive Processes - Attention

- The following slide contains an example screen from a hotel information system
- Answer the following questions from the example screen
 - What is the phone number of the Days Inn in Charleston?
 - Name the hotel that offers a double room for \$33?

| City | Hotel | Phone | Room | |
|------------|--------------|----------|--------|--------|
| | | | Single | Double |
| Charleston | Best Western | 575-3454 | \$23 | \$39 |
| Charleston | Days Inn | 878-3423 | \$20 | \$34 |
| Charleston | Holiday Inn | 234-4623 | \$36 | \$46 |
| Charleston | Howard Johns | 342-5728 | \$33 | \$47 |
| Charleston | Ramada Inn | 387-4523 | \$18 | \$28 |
| Charleston | Sheraton Inn | 764-5879 | \$40 | \$80 |
| Charleston | Marda Hotel | 476-5876 | \$26 | \$38 |
| | | | | |
| Columbia | Best Western | 422-7567 | \$32 | \$50 |
| Columbia | Carolina Inn | 336-8711 | \$20 | \$25 |
| Columbia | Holiday Inn | 761-4765 | \$22 | \$33 |
| Columbia | Howard Johns | 487-8232 | \$34 | \$40 |
| Columbia | Quality Inn | 471-4762 | \$20 | \$35 |
| Columbia | Ramada Inn | 479-9897 | \$33 | \$47 |



Cognitive Processes - Attention

- The following slide contains an example screen from a different hotel information system
- Again, answer the following questions from the example screen
- What is the phone number of the Holiday House?
- Name the hotel that offers a double room for \$27?

Pennsylvania

Bedford Motel/Hotel: Crinoline Courts

342-4657 S:\$18 D:\$28

Bedford Motel/Hotel: Holiday Inn

465-3865 S:\$29 D:\$36

Bedford Motel/Hotel: Midway

763-8623 S:\$21 D:\$26

Bedford Motel/Hotel: Penn Manor

654-9987 S:\$18 D:\$25

Bedford Motel/Hotel: Quality Inn

764-8766 S:\$22 D:\$29

Bradley Motel/Hotel: Holiday House

777-9898 S:\$28 D:\$24

Bradley Motel/Hotel: De Soto

7798-9836 S:\$22 D:\$25

Bradley Motel/Hotel: Holiday Inn

733-9851 S:\$32 D:\$27

Breezewood Motel/Hotel : Western Plaza

837-9373 S:\$28 D:\$29



Cognitive Processes - Attention

- In this example, the way information is structured at the interface has a major impact on our ability to find and attend to information
- In the original study, (Tullis 1984) average search times for a single item were **3.2 seconds** for the first screen and **5.5 seconds** for the second
- In the first screen, information is easier to find:
 - similar information has been grouped into categories
 - spacing is employed to facilitate the perceptual process



Cognitive Processes - Attention

What is Multitasking?



Cognitive Processes - Attention



The 1987 Northwest FL 255 crash was attributed to failure to extend flaps and slats for takeoff and non-performance of critical checklists.



Cognitive Processes - Attention

Automatic Processing

- Many activities that we carry out regularly become automated, we do them without really thinking about them
- **Cognitive processes** can also become automatic with practice
- Automatic cognitive processes are identified as
 - fast
 - demanding minimal attention and hence don't interfere with other activities
 - unavailable to consciousness



Cognitive Processes - Attention

The classic example used to demonstrate the phenomenon of automatic cognitive processing is the **Stroop Effect**

XHFG

EJHFU

EEF

KJBVN

DJEBSI

DJVBV

DKSNVL

SKHJSHE

FJJVN

EIJHFH

KSNNC

DSKA

KD

VNNVJR

EFJJIE

VKJNDS

EOEUJ

DJNVK

SSXZ

DJSD

DFJJNV

EIUGHBV

RED

YELLOW

BLUE

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YELLOW

BLUE

RED

YELLOW

BLUE

GREEN

BLACK



Cognitive Processes - Attention

- **It should have taken longer to say the colour names in the second list**
- **This is because in the second list there is a conflict between the automatic process of reading the words and the automatic process of perceiving the colours**
- **Difference between automatic and non-automatic cognitive processes**
 - **Automatic processes are not affected by the limited capacity of the brain**
 - **They require little attention and are extremely difficult to unlearn**



Cognitive Processes - Attention

Implications for HCI design

- **Consider a user who has learned a set of keyboard combinations for a particular word processor to the extent that they have become automatic processes**
- **If key combos have been changed -> major effort for the user to unlearn their automatic processes**
- **Leads to much frustration on the part of the user**
- **Potentially dangerous in critical applications such as process control plants**



Terms of Reference

- **Norman, D. (1990) *The Design of Everyday Things***
- **Preece, J. et al. (2002) *Interaction Design***
- **Shneiderman, B. & Plaisant, C. (2005) *Designing the User Interface***
- **Benyon, D. et al (2005) *Designing Interactive Systems***
- **Craik, K. (1943) *The Nature of Explanation***