

Syllabus

Part	Content	Week/Date	
Introduction	UI Revolution	1,2/Sep16, 23	HCI的价值取向、历史，研究方法
	Text-Entry; NUI project assignment	3/Sep30	
Human Ability	Ergonomics	4/Oct07	HCI以人的性能为优化目标，了解人的性能
	Perception; Cognition	5/Oct14	
	HIP Model; NUI project Proposal	6,7/Oct21, 28	
GUI	Fitts' Law study assignment	8/Nov04	GUI是主流界面模式，以交互效率为优化目标；实验理解优化模型
	GUI Design	9/Nov11	
	Fitts' Law Study/ NUI project Checkpoint1	10/Nov18	
	Hick's Law, KLM	11/Nov25	
	Evaluation Methods	12/Dec02	
NUI	AR, VR; Wearable; Smart Space / NUI project Checkpoint2	13/Dec09	NUI,实验实现自然交互技术
	VUI; Gesture; Hands free; Eyes-free NUI project report/demo	14,15/Dec16, 23	
	NUI discussion; NUI project report/demo	16/Dec30	

GUI Design and Evaluation

- Chap 1 Design Principles (for GUI)
 - Chap 2 Evaluation Methods
 - Chap 3 GUI Optimization
-
- 1973, Xerox Alto (WYSIWYG)
 - 1981, Xerox Star
 - 1983, Apple Lisa
 - 1984, Apple Macintosh
 - 1985, MS Windows
 - 1st computer to use the desktop metaphor and mouse driven GUI
-
- The diagram illustrates the conceptual connections between several key figures in the development of GUIs. It features five main nodes arranged in a circle, with dashed blue arrows indicating influences or relationships:
- Vannevar Bush** (top left) is connected to **J. Licklider** (bottom left) by a dashed arrow.
 - J. Licklider** is connected to **Ivan Sutherland** (bottom center) by a dashed arrow.
 - Ivan Sutherland** is connected to **Douglas Engelbart** (right) by a dashed arrow.
 - Douglas Engelbart** is connected to **Alan Kay** (bottom right) by a dashed arrow.
 - Alan Kay** is connected back to **Vannevar Bush** by a dashed arrow.
- Key terms and concepts are also labeled in blue:
- Desktop** is positioned above the top arc.
 - Symbiotic techs** is positioned below the left arc.
 - CG** (Computer Graphics) is positioned below the bottom-left arc.
 - OO** (Object-Oriented) is positioned below the bottom-right arc.
 - GUI** (Graphical User Interface) is positioned below the bottom arc.
 - Mouse** is positioned to the right of the bottom-right node.

1 Design Principles (for GUI)

1.1 GUI Features

1.2 GUI Design Principles

1.2.1 Visibility

1.2.2 Feedback

1.2.3 Mapping

1.2.4 Affordances

1.2.5 Consistency

1.1 GUI Features

1.1.1 Interface elements: WIMP

- **W (Windows): working area, more than one window on the screen**
- **I (Icons), graphical icon, easy to understand**
- **M (Menu), hints for functions can be selected by user**
- **P (Pointing Devices) Devices like mice to control objects on the screen**

1.1 GUI Features

1.1.2 User Model

Desktop Metaphor: The desktop (writing desk) metaphor (conceptual metaphor) treats the monitor of a computer as the user's desktop, upon which objects such as documents, folders and tools can be placed



1.1 GUI Features

1.1.3 Direct Manipulation

The term was introduced by Ben Shneiderman in 1983 within the context of office applications and the desktop metaphor.

**CL requires remembering lots of formal commands,
including the parameters for object position,
number of space, etc.**

**GUI allows user direct manipulating the objects on the
screen, for example, pointing, dragging, deleting,
rotating, enlarging, etc. Visual feedback will appear
in real time: What You See Is What You Get**

**Seeing and Pointing (mouse) instead of Remembering
and Typing (keyboard)**

1 Design Principles (for GUI)

1.1 GUI Features

1.2 GUI Design Principles

1.2.1 Visibility

1.2.2 Feedback

1.2.3 Mapping

1.2.4 Affordances

1.2.5 Consistency

1.2.1 Visibility

Be visible, WYSIWYG

information : 80% vision

screen design and layout

appropriate appearance

1.2.1 Visibility

Based on Gestalt Theory (完形心理学)

- law of closure
- law of similarity
- law of proximity
- law of symmetry
- law of continuity
- Figure-ground

1.2.1 Visibility

Based on Gestalt Theory

- law of closure

if something is missing in an otherwise complete figure, we will tend to add it.



1.2.1 Visibility

Based on Gestalt Theory

- law of closure

if something is missing in an otherwise complete figure, we will tend to add it.

S O I R

1.2.1 Visibility

Based on Gestalt Theory

- law of similarity

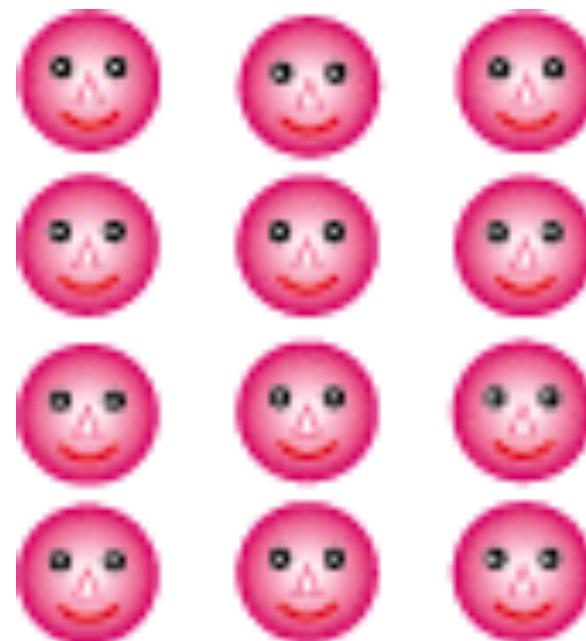
**we will tend to
group similar items
together, to see
them as forming a
gestalt, within
a larger form**



1.2.1 Visibility

Based on Gestalt Theory

- law of proximity rows or columns?



1.2.1 Visibility

Based on Gestalt Theory

- law of symmetry

Despite the pressure of proximity to group the brackets nearest each other together, symmetry overwhelms our perception and makes us see them as pairs of symmetrical brackets.

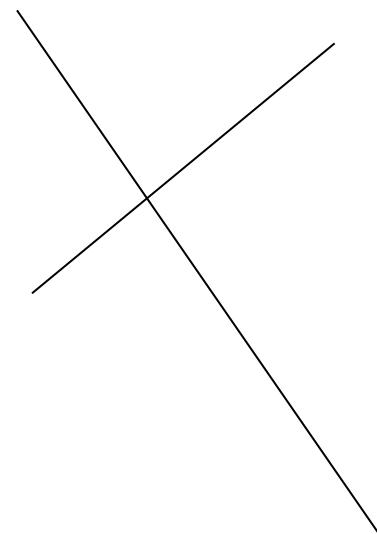
[]()[]

1.2.1 Visibility

Based on Gestalt Theory

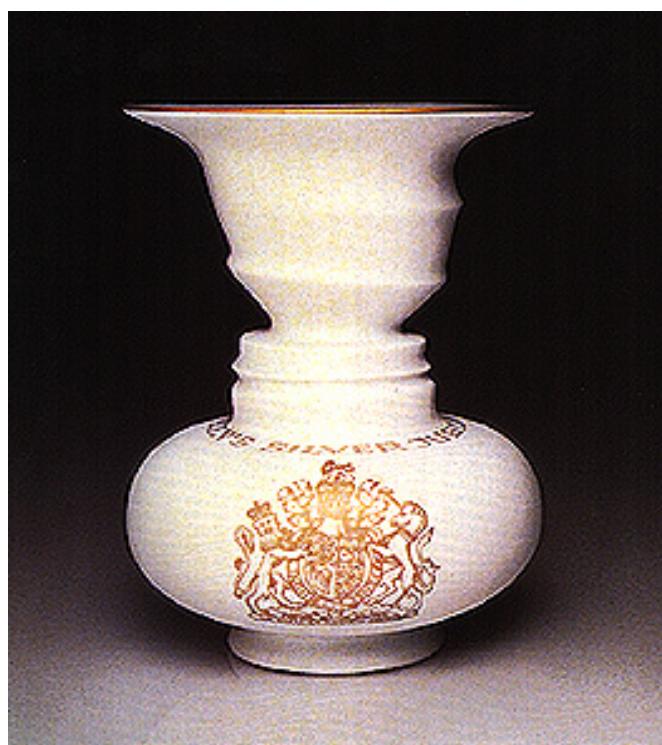
- law of continuity

for example, as continuing through another line, rather than stopping and starting, we will do so, as in this example, which we see as composed of two lines, not as a combination of two angles



1.2.1 Visibility

Based on Gestalt Theory



1.2.1 Visibility

screen design and layout

- grouping of items
- order of items
- decoration - fonts, boxes etc.
- alignment of items
- white space between items

1.2.1 Visibility

grouping and structure

logically together \Rightarrow physically together

Billing details:

Name

Address: ...

Credit card no

Delivery details:

Name

Address: ...

Delivery time

Order details:

item

size 10 screws (boxes)

.....

quantity cost/item cost

7 3.71 25.97

...

1.2.1 Visibility

grouping and structure

Color can also be used for grouping

Apple
Banana
Cantaloupe

Name
E-mail
Student Number

Apple	Banana	Cantaloupe
Name	E-mail	Student Number

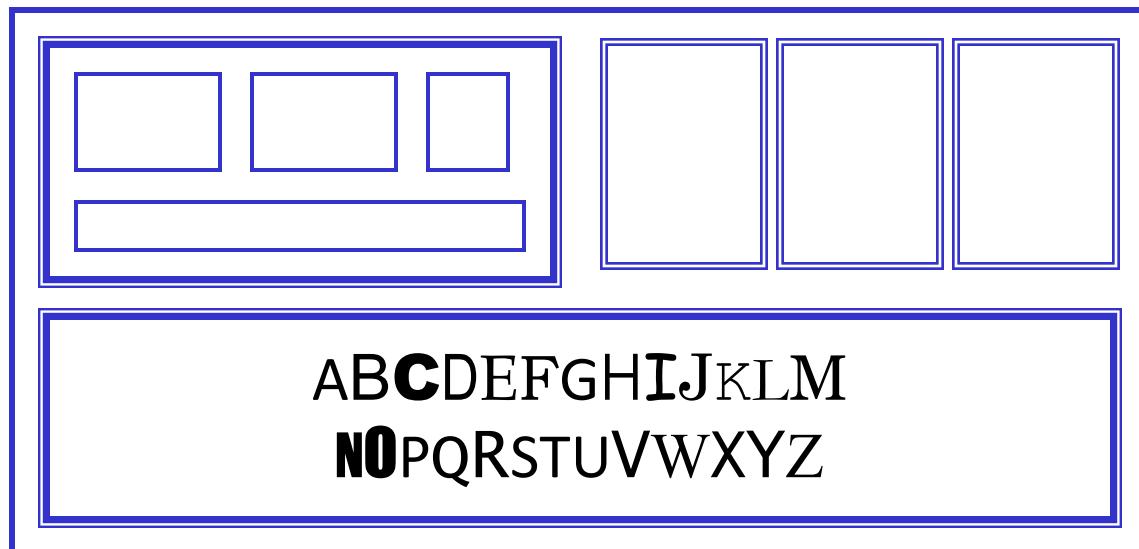
1.2.1 Visibility

order of groups and items

- **think! - what is natural order**
- **should match screen order!**
 - use boxes, space etc.
 - set up tabbing right!
- **instructions**
 - beware the cake recipe syndrome!
... mix milk and flour, add the fruit
after beating them

1.2.1 Visibility decoration

- use boxes to group logical items
- use fonts for emphasis, headings
- but not too many!!



1.2.1 Visibility

decoration *Fonts and Formatting*

- Don't use too many fonts, in terms of ***typeface*** and in size. The general feeling is to limit yourself to 3 different ***type settings***.

Also variable width fonts such as Times New Roman are easier to read than **fixed width fonts** such as **courier**. STUDIES SHOW THAT TEXT IN ALL CAPS SLOWS READING BY 12% SO YOU SHOULD MIX CASE.

The same goes for justified text, so that is something of which to be aware. Also short justified lines are to be avoided, but that should be common sense.

1.2.1 Visibility

alignment - text

- you read from left to right
⇒ align left hand side

Willy Wonka and the Chocolate Factory

Winston Churchill - A Biography

Wizard of Oz

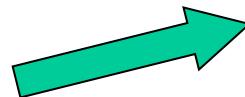
Xena - Warrior Princess

boring but
readable!



fine for special effects
but hard to scan

Willy Wonka and the Chocolate Factory
Winston Churchill - A Biography
Wizard of Oz
Xena - Warrior Princess



1.2.1 Visibility

alignment - names

- Usually scanning for surnames
⇒ make it easy!

Alan Dix

Janet Finlay

Gregory Abowd

Russell Beale



Dix , Alan
Finlay, Janet
Abowd, Gregory
Beale, Russell



Alan Dix

Janet Finlay

Gregory Abowd

Russell Beale

1.2.1 Visibility

alignment - numbers

think purpose!

which is biggest?

17.3
17173
15
73.948
1035
1.2142
497.6256

1.2.1 Visibility

alignment - numbers

visually:

long number = big number

align decimal points

or right align integers

17.3
17173
15
73.948
1035
1.2142
497.6256

1.2.1 Visibility

multiple columns

- scanning across gaps hard:
(often hard to avoid with large data base fields)

sherbert	75
toffee	120
chocolate	35
fruit gums	27
coconut dreams	85

1.2.1 Visibility

multiple columns

- use leaders

sherbert	75
toffee	120
chocolate	35
fruit gums	27
coconut dreams	85

1.2.1 Visibility

multiple columns

- or greying (vertical too)

sherbert	75
toffee	120
chocolate	35
fruit gums	27
coconut dreams	85

1.2.1 Visibility

multiple columns

- or even (with care!) ‘bad’ alignment

sherbert	75
toffee	120
chocolate	35
fruit gums	27
coconut dreams	85

1.2.1 Visibility

space to separate



1.2.1 Visibility

space to structure



1.2.1 Visibility

space to highlight



1.2.1 Visibility

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Google

Advanced search Language tools

Google Search I'm Feeling Lucky

Advertising Programs Business Solutions +Google About Google

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2010年9月26日 星期日 北京 24°C~11°C 更多

邮箱 彩票 机票酒店 日报订阅

邮箱地址: 登录 忘记密码?

母爱,我们永远无法报答

无论何时何地,我们都应该想一想,该为母亲做点什么。

白血病母亲含泪决定:断自己药救重病儿子

这个决定看上去如此不合理,却已经得到了家族里不少人的默许... [详细]

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重庆万人冒雨齐唱抗灾歌曲

智利救生胶囊运抵矿难现场

中国孩子培养成本:18年花30万

要闻 理财 话题 每日贴士 爱心:脊柱儿童义卖活动

· [热点] 送子弹拆迁通知实在欺人太甚,勿让子弹“飞”入寻常百姓家

· [聚焦] 加薪五一:撞船风波是没有赢家的比赛,从撞船风波中学什么

· [拷问] 保护我们安全的身份证真的不安全? 身份证能不能设密码

· [呼声] 权力对公民谦卑才不会被骂娘,不删鸟象帖为何成炫耀的政绩

· [观察] 奥巴马经济团队真空 白宫“变脸”,美鼓励同性恋隐瞒身份

· [说事] 上京都“被旅行”,菜价焉能不贵 菜篮子工程更需要制度保障

· [争议] 优质女婿恋门当户对 不一定对 “我靠”正是“叫春”翻版

· [论政] 钓鱼岛撞船事件让日本司法颜面尽失 日本放人并不等于中国放人

· [杂谈] 韩寒就只会嘲讽和剽窃 《山楂恋之恋》是一个时代的爱情隐喻

bing

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1.2.1 Visibility

physical controls

- grouping of items

defrost settings

type of food

time to cook



1.2.1 Visibility

physical controls

- grouping of items
- order of items
 - 1) type of heating
 - 2) temperature
 - 3) time to cook
 - 4) start



1.2.1 Visibility

physical controls

- grouping of items
- order of items
- decoration

different colours for
different functions

lines around related
buttons (temp up/down)



1.2.1 Visibility

physical controls

- grouping of items
- order of items
- decoration
- alignment

centred text in buttons

? easy to scan ?



1.2.1 Visibility

physical controls

- grouping of items
- order of items
- decoration
- alignment
- white space

gaps to aid grouping



1.2.1 Visibility

appropriate appearance

- aesthetics and utility
- colour and 3D
- animation

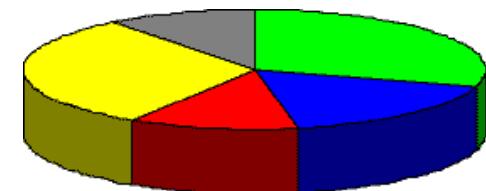
1.2.1 Visibility aesthetics and utility

- **aesthetically pleasing designs**
 - increase user satisfaction and improve productivity
- **beauty and utility may conflict**
 - mixed up visual styles \Rightarrow easy to distinguish
 - clean design – little differentiation \Rightarrow confusing
 - backgrounds behind text
 - ... good to look at, but hard to read
- **but can work together**

1.2.1 Visibility

colour and 3D

- both often used very badly!
- colour
 - older monitors limited palette
 - colour over used because 'it is there'
 - beware colour blind! (Symbolism of Color)
 - use sparingly to reinforce other information
- 3D effects
 - good for physical information and some graphs
 - but if over used ...
 - e.g. text in perspective!! 3D pie charts



1.2.1 Visibility

bad use of colour

- over use - without very good reason (e.g. kids' site)
- colour blindness
- poor use of contrast
- do adjust your set!
 - adjust your monitor to greys only
 - can you still read your screen?

1.2.1 Visibility

Animation has a strong power to grab attention
– use sparingly!



Urgent



Your input needed

Answer 3 simple questions to get your gifts

OK

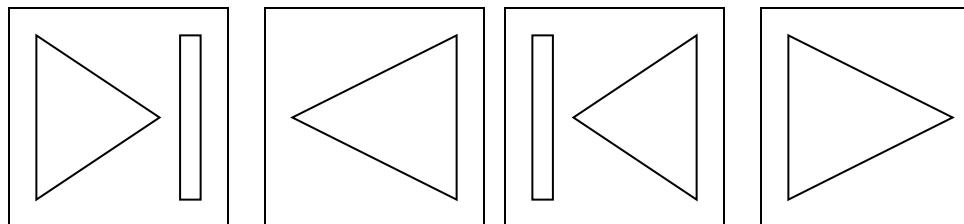
1.2.2 Feedback

Sending information back to the user about what has been done



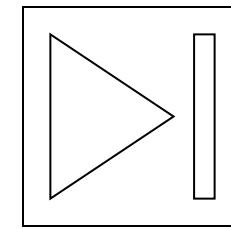
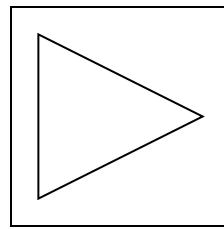
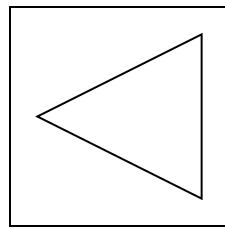
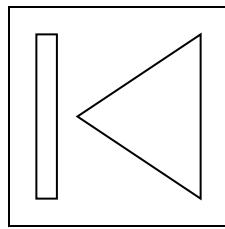
1.2.3 Mapping

- Relationship between controls and their movements and the results in the world
- Why is this a poor mapping of control buttons?



1.2.3 Mapping

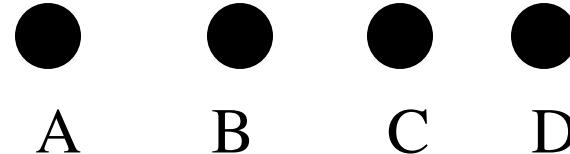
- Why is this a better mapping?



- The control buttons are mapped better onto the sequence of actions of fast rewind, rewind, play and fast forward

1.2.3 Mapping

- Which controls go with which rings (burners)?



1.2.3 Mapping

Why is this a better design?



1.2.4 Affordances

Affordances: to give a clue

- Refers to an attribute of an object that allows people to know how to use it
 - e.g. a mouse button invites pushing, a door handle affords pulling
- Norman (1988) used the term to discuss the design of everyday objects
- Since has been much popularised in interaction design to discuss how to design interface objects
 - e.g. scrollbars to afford moving up and down, icons to afford clicking on

1.2.4 Affordances

What does ‘affordance’ have to offer interaction design?

- Interfaces are virtual and do not have affordances like physical objects
- Instead interfaces are better conceptualised as ‘perceived’ affordances
 - Learned conventions of arbitrary mappings between action and effect at the interface
 - Some mappings are better than others

1.2.4 Affordances

– Physical affordances:

How do the following physical objects afford?

Are they obvious?



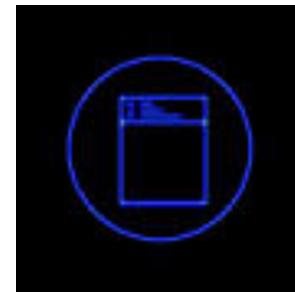
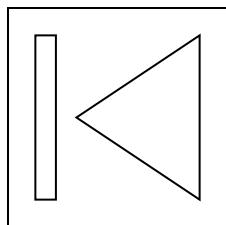
1.2.4 Affordances

– Virtual affordances

How do the following screen objects afford?

What if you were a novice user?

Would you know what to do with them?



1.2.4 Affordances

- Virtual affordances
 - Icon design



International pictograms from

1.2.5 Consistency

- **Design interfaces to have similar operations and use similar elements for similar tasks**
- **For example:**
 - always use ctrl key plus first initial of the command for an operation – **ctrl+C, ctrl+S, ctrl+O**
- **Main benefit is consistent interfaces are easier to learn and use**

1.2.5 Consistency

When consistency breaks down

- **What happens if there is more than one command starting with the same letter?**
 - e.g. save, spelling, select, style
- **Have to find other initials or combinations of keys, thereby breaking the consistency rule**
 - E.g. ctrl+S, ctrl+Sp, ctrl+shift+L
- **Increases learning burden on user, making them more prone to errors**

1.2.5 Consistency

Internal and external consistency

- Internal consistency refers to designing operations to behave the same within an application
 - Difficult to achieve with complex interfaces
- External consistency refers to designing operations, interfaces, etc., to be the same across applications and devices
 - Very rarely the case, based on different designer's preference

1.2.5 Consistency

- A case of external inconsistency

(a) phones, remote controls

1	2	3
4	5	6
7	8	9
0		

(b) calculators, computer keypads

7	8	9
4	5	6
1	2	3
0		

1.2.5 Consistency



1.2 GUI Design Principles

1.2.1 Visibility

1.2.2 Feedback

1.2.3 Mapping

1.2.4 Affordances

1.2.5 Consistency

Marcus, Aaron, "*Principles of Effective Visual Communication for Graphical User Interface Design*" Readings in Human-Computer Interaction, 2nd Edition, Ed. Baecker, Grudin, Buxton, and Greenberg, Morgan Kaufman, Palo Alto, 1995, pp. 425-441

A Project

Designing a Temperature Convertor

Hand in your report (including the interface of the application and the design annotation) before next class

2.2.1 Fitts' Law and Hick's Law

- **Fitts' Law demonstration**
 - [Fitts' Law - Vrije Universiteit Amsterdam](#)
- **Visit Tog's website and do Tog's quiz, designed to give you Fitts!**
 - [http://www.asktog.com/columns/022DesignedToGiveFitts.html](#)