### Chapter 4 - Basic Rules for UI Design

- Affordances
- Constraints
- Mappings
- Consistency and predictability
- Feedback
- Error tolerance and error avoidance
- Eight Golden Rules
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### Affordance

"A situation X affords action Y to an animal Z on occasion O if certain relevant compatibilities between X and Z obtain" (Shaw et al. 1982)



### Affordance

"A situation X affords action Y to an animal Z on occasion O if certain relevant compatibilities between X and Z obtain" (Shaw et al. 1982)



Don Norman 1994 https://www.youtube.com/ watch?v=NK1Zb\_5VxuM&t=6s



I should have used the term "perceived affordance," for in design, we care much more about what the user perceives than what is actually true. Donald Norman, <u>www.jnd.org</u>

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### Find the Affordance!



### Don Norman: a brief quote on affordances



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### Signs as Indicators of Bad Design?



 (Group) task: What would be a good way to convey the fact that a motion sensor is used?

## What is Wrong?



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### Affordances in GUIs

(C:) Properties	? ×
General Tools Sharing Norton	
C Not Shared	
<u>S</u> hared As:	
Share <u>N</u> ame: C	
Comment:	
Access Type:	_
C Bead-Only	
C Eul	
Depends on Password	
Passwords:	- 11
Read-Only Password:	
Full Access Password:	
OK Cancel Ap	ply

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### **Physical Constraints**





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### Logical Constraints



### **Cultural Constraints**



http://mietenstopp.blogsport.de/images/stop\_zwangsraeumungen\_ar\_2010px.png



http://3.bp.blogspot.com/--rvZLZDzpik/T2C6VgYVq8I/AAAAAAAAAAAAAAAF



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### Which Valve Controls Which Flame?



### Origins of the Button Arrangement?









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### Mappings & Gulf of Execution

- ISO 2575
  - -4.21 Fog Light
  - -4.22 Rear Fog Light

) ± ¥)



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## **Types of Consistency**

- Syntactic consistency
- Semantic consistency
- Lexical/terminological consistency
- Internal consistency
- External consistency



### Current Example: Google Material Design

# Material Design

https://www.youtube.com/watch?v=Q8TXgCzxEnw

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### A Surprising Inconsistency...











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### Historic Excursion: Phone Keypads



Bell System Technical Journal 1960: Human Factor Engineering Studies of the Design and Use of Pushbutton Telephone Sets

http://www.vcalc.net/Keyboard.htm



### Historic Excursion: Calculator Keypads



David Sundstrand 1914



IBM Keypunch Machine for card-based computer input (approx. 1970)

http://www.vcalc.net/Keyboard.htm

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### Please Wait!



	Offnen	
Mixing the Physical and the Digital sectors Rev. Don at Austra	"Große-Datei.key"	
destroa Bato, Drix of Naridh		

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### Who Is Responsible for Error Correction?

Mobile phone number

### 0171-01710171

Example: 0612345678

The telephone number is invalid or incomplete. Please re-enter your

telephone number.

www.klm.com (2014!)

### **Avoidable Errors**

Artikel Warenkorb Bo NÄHLEN SIE DIE ANZAH	L AUS	stätigung	Übersicht Warenkorb 1-Tages Familienkarte (5 Personen)
Parkplatz Ticket   Image: Description of the second	estimmte Anzahl	P	1-Tages Familienkarte (5 Personen) Gesamt €153,09 Warenkorb anseher
Art	Online-Preis ab	Anzahl	
Parkplatz Ticket	€ 6,00	0 \$	
	IN DEN WAI	RENKORB	

### Expressive Error Messages...

- describe the problem as specifically as possible
- contain a suggestion to solve the problem
- are polite

Whoops, looks like something went wrong.

1/1 <u>ContextErrorException</u>: Warning: date\_default\_timezone\_get(): It is not safe to rely on the system's timezone settings. You are \*required\* to use the date.timezone setting or the date\_default\_timezone\_set() function. In case you used any of those methods and you are still getting this warning, you most likely misspelled the timezone identifier. We selected the timezone 'UTC' for now, but please set date.timezone to select your timezone. in /Library/WebServer/Documents/elearning/app/cache/dev/classes.php line 5048

Error message from the "symfony" Web framework

### (Not Only) Making Errors Undone: Undo



http://static3.businessinsider.com/image/529e7e42ecad04c15ddfbba2/heres-how-to-undo-a-sent-email-in-gmail.jpg

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### Classical List of Rules (Mostly Covered...)

Ben Shneiderman: Designing the User Interface See: www.cs.umd.edu/users/ben/goldenrules.html

- 1. Strive for consistency.
- 2. Cater to universal usability.
- 3. Offer informative feedback.
- 4. Design dialogs to yield closure.
- 5. Prevent errors.
- 6. Permit easy reversal of actions.
- 7. Support internal locus of control.
- 8. Reduce short-term memory load.

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### Interface Animations in OSX

# New Gestues and animations

https://www.youtube.com/watch?v=KHYEbcqWtz4

### Interface Animations in a Game



https://www.youtube.com/watch?v=HTQbbrqNre0

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### **UI Elements with Physical Analogy**

(C:) Properties	? ×
General Tools Sharing Norton	
C Not Shared	
G Shared As:	
Share Name: C	
Comment:	
Access Type:	
C Bead-Only	
C <u>E</u> ul	
Depends on Password	
Passwords:	
Rgad-Only Password:	
Full Access Password:	
OK Cance	A Apply

F	Q
Oracle Entrand	A
Sarah Fahrzad	В
	С
Deckerel Februards	D
Rachael Falworth	E
	F
	G
Jose Fargo	н
	J
Jim Ferris	
	M
	PVI B.I
Kimmie Fong	0
	P
	0
Lynn Foote	R
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Pete Gardner	v
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Monique Gaspard	Y
Monique Gaspara	z
	#

Sat Nov 3	6	50	
Sun Nov 4	7	55	
Mon Nov 5	8	00	AM
Tue Nov 6	9	05	PM
Wed Nov 7	10	10	





### Physics Analogy in the Extreme: Bumptop



### Chapter 7 - Basic Rules for UI Design

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### Metaphor ???





http://www.logomarket.de/images/P/17223.jpg



### **Teletype Terminal as Metaphor**





USASCII code chart

07 D6 D	5 -			_		°°,	°°,	° ' o	° ' ,	' ° <sub>0</sub>	'°,	' 'o	' ' <sub>'</sub>
1	b4	Þ 3	Þ 2	Þ,	Row	0	I	2	3	4	5	6	7
	0	0	0	0	0	NUL .	DLE	SP	0	0	Р	`	P
	0	0	0	1	1	SOH	DC1	!	1	A	Q	0	P
	0	0	1	0	2	STX	DC2		2	В	R	b	r
	0	0	1	1	3	ETX	DC 3	#	3	C	S	c	5
	0	1	0	0	4	EOT	DC4	1	4	D	т	d	1
1	0	1	0	1	5	ENQ	NAK	%	5	E	U	e	U
	0	1	1	0	6	ACK	SYN	8	6	F	v	f	v
	0	T	1	1	7	BEL	ETB	,	7	G	w	9	*
	1	0	0	0	8	BS	CAN	(	8	н	×	h	×
	1	0	0	1	9	нт	EM	)	9	1	Y	i	У
	1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
	1	0	1	1	11	VT	ESC	+	:	к	C	k	{
	1	1	0	0	12	FF	FS		<	L	1	1	1
	1	1	0	I	13	CR	GS	-	=	м	3	m	}
	1	1	1	0	14	SO	RS		>	N	^	n	$\sim$
	1	1	1	1	15	S1	US	1	?	0	-	0	DEL

http://s7.computerhistory.org/is/image/CHM/102647895p-03-02?\$re-zoomed\$

Source: Wikipedia

### Desktop as Metaphor

Sample document	Sample
XEROX 8010 Star Information System	ent
Star provides integrated text and graphics, A variety of type sizes and styles may be used,	Letters
$\frown \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \frown \bigcirc \bigcirc$	Report
Description Price Peas \$0.39 Beans \$0.50	Caic Program
Sample Close Î↓ I ↔ E This is some text in a text frame. Form field Button	Printer Dut
Blank Docum ent Graphi S Note Folder File Blank Note Spread Sheet	A B M C C Directory

### **Specialised Metaphors I**

Size:					65 px	۲	• •
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*	*	*	*	1	V		100.0
33	42	55	70	112	134		0.9
*	血	\$7	*	500	-		2
74	95	29	192	36	36		
50	-	部	浙	30	-		
33	63	66	39	63	11		100

### **Specialised Metaphors II**



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### Microsoft: At home with Bob



### Example: "Pile" Metaphor (Mander et al., CHI'92, Apple)



Figure 1. <u>Piles on the desktop</u>. In general, piles can contain various media, such as folders and individual documents. The pile in (a) was created by the user, and is consequently disheveled in appearance. In addition, the system can create piles for the user, based on rules explicitly stated by the user or developed through user-system collaboration. These piles have a neat appearance, as shown in (b), to indicate that there is a script, or set of rules, behind them.



Figure 2. Adding a document to a pile. If a document is positioned over an existing pile, the pile highlights to show that it can accept the new document. When the mouse button is released the document 'drops' onto the pile.



Figure 4. <u>Browsing by spreading out a pile</u>. Gesturing sideways with the mouse pointer, or with a finger in the case of a touch screen, causes the pile contents to spread out. Individual items can now be directly manipulated.



Figure 5. <u>Browsing while maintaining the pile's structure</u>. Gesturing vertically with the mouse pointer as shown in (a), or with a finger in the case of a touch screen, generates a 'viewing cone' (b) that contains a minature version of the first page of the item under the pointer. This viewing cone will follow the vertical position of the pointer; the miniature changes as the pointer moves over each item. The user can move through the pages of an item in the viewing cone by using the left and right cursor keys on the keyboard. When an item is visible in the viewing cone, it can be selected by clicking the mouse button. The item then appears next to the pile on the desktop, as shown in (c).

### 15 Years Later: "Flip 3D", "Cover Flow", "Stacks"

