

Designing Interactive Systems I

*Prof. Dr. Jan Borchers
Media Computing Group
RWTH Aachen University*

Winter term 2011/2012

<http://hci.rwth-aachen.de/dis>



Who Am I?

- Studied CS at Karlsruhe (& Imperial)
 - Human-Computer Interaction
- PhD CS, TU Darmstadt (& Linz, Ulm)
 - Interaction with multimedia
 - HCI design patterns
- Assistant professor at Stanford & ETH
 - Interactive rooms
 - Ubicomp user interfaces
- Full professor at RWTH since Oct. 2003
 - Interaction with audio & video
 - Tangible UIs
 - Physical computing



Our Team

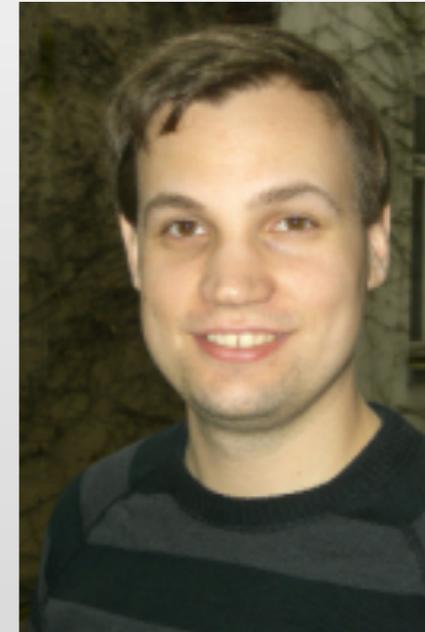


Chat Wacharamanotham

Touchscreen usability

Gestural Interface

chat@cs.rwth-aachen.de



Simon Völker

Interactive surfaces

Curved surface

voelker@cs.rwth-aachen.de

Questions go to them!



Order # 99004234
Ship To Hi Fo Holdings, Ltd. - HFO
Address 1125 STREET SUITE 1200
City VANCOUVER BC V6Z2K8
Phone [Redacted] **Fax** [Redacted]
Appointment D 06-18-02

Order # 99031927
Ship To CANADIAN HARDWARE & H - [Redacted]
Address AVENUE SUITE 101
City SCARBOROUGH ON M1B5M4
Phone [Redacted] **Fax** (416) [Redacted]
Appointment D [Redacted]

Mode From SC To SC
Service AIR
Tariff CAIR9-00-01
From YVR
To YYZ
Deliver By 06-12-02 17:00
Carrier [Redacted]

Charges 761.50
Discount 0%
SubTotal 761.50
Accessorial 40.00
DV 0 0.00
FSC - CAX 2.50% 38.00
Total 839.58
Balance 839.58

MasterID 0
MAWB
Statement 0
Hold P/L
Non Freight
Mandate Hold
Print Hold **Rate**

Broker [Redacted]
Value 0.00 **Unit** [Redacted]
Modified
Verbal Prod
Verify on POB
Harmon

Units	Type	Description	Stated	ASWT	Dimensions	WT	Rate	Charge
1	CRATE	CRATE	91	94	25x25x30	97	50.00	40.50
1	2MAN	2 MAN P&D					40.00	40.00
2	CRATE	CRATE	500		50x48x48	1,426	50.00	713.00
0							0.00	0.00



Usability Sells



DVD Player (1996)

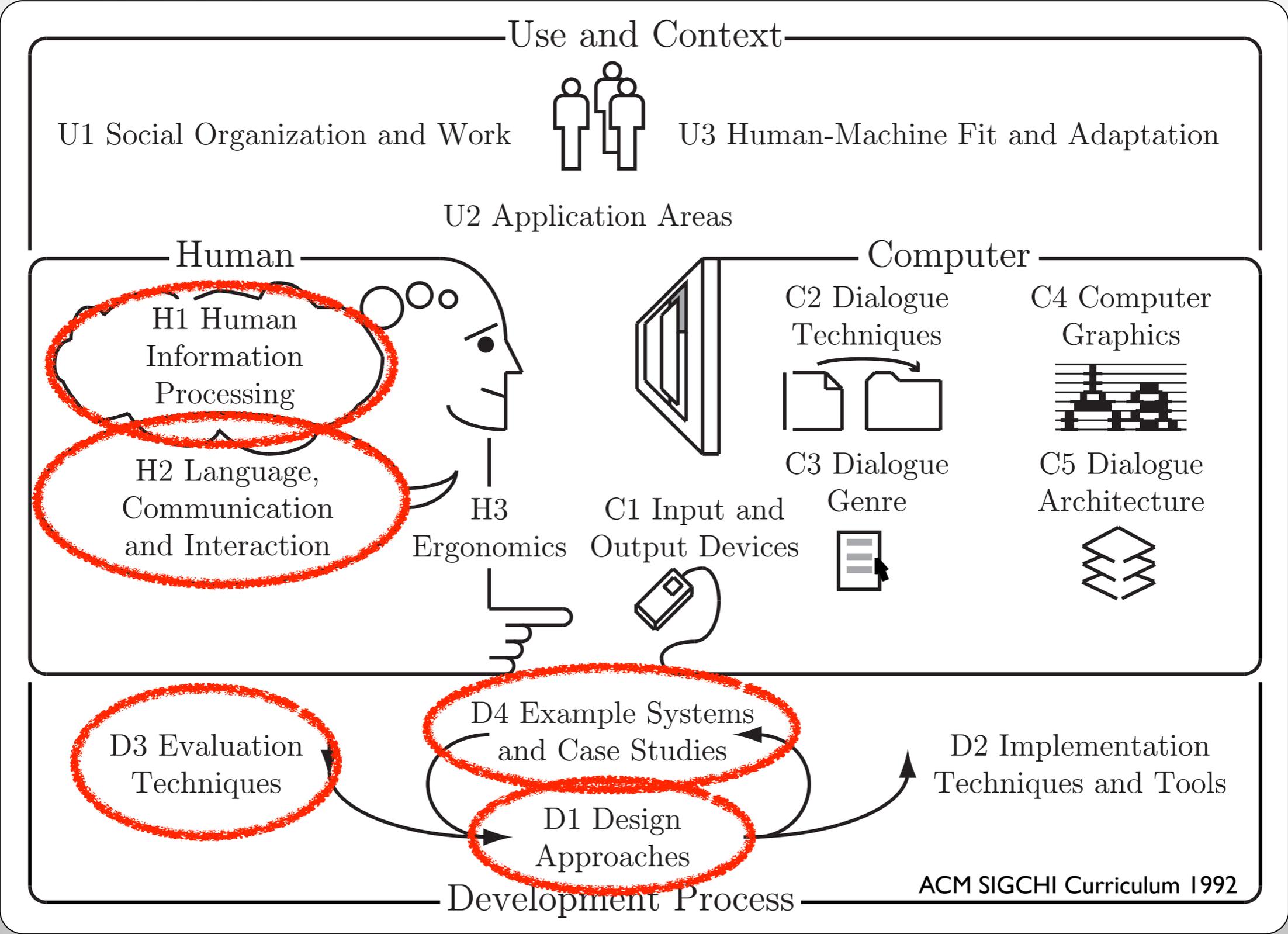


iPhone (1st Q'07)



iPad (1st 80d '10)

What's Human-Computer Interaction?



Class Topics

Theory

- Models of interaction
 - Affordances, mappings, constraints
- Human cognition and performance
- History and vision of HCI

Practice

- Sketching, ideation
- Iterative design
- Prototyping
- User study and evaluation



Format

- Group oriented, project centered
- Credits (6 ECTS): Graded ‘Schein’
 - 40% assignments, projects, and idea logs
 - 25% written exam part 1 (midterm)
 - 35% written exam part 2 (final)
- Passing the course
 - You need a passing grade in the assignments (average of 4.0) to write the exams
 - You need to pass the final exam to pass the course
 - You need to participate in at least one user study at our chair or the Psychology chair



Details

- BSc/MSc/Diplom regulations
- Work time @uni vs. @home is roughly 1:2!
- Each lecture: theory + practice
- Limited to 100 seats
 - Register via [Campus Office](#) by **October 24, 18:00**
 - Registration result: October 25, 18:00
 - Priority: compulsory > past grades > BSc



Media Computing and HCI

— English • annual —

SS,WS	P	The Media Computing Project
WS	S	Post-Desktop User Interfaces
SS	V3Ü2	Current Topics in HCI
WS	V3(Ü2)	iPhone Application Programming
SS	V3Ü2	Designing Interactive Systems II
WS	V3Ü2	Designing Interactive Systems I
SS	PS	Human-Computer Interaction
SS	SW-Pr	M3: Multimodal Media Madness



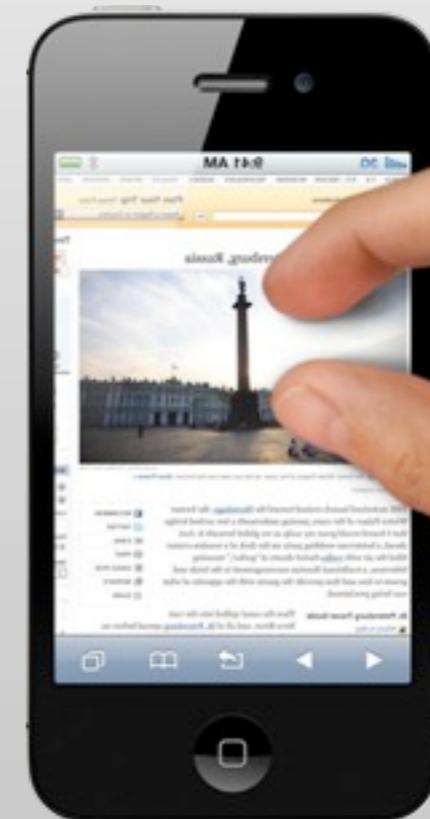
Lecture: iPhone Programming

- Dates
 - Lecture: Tue. 09:00 – 11:30 (2010)
 - Lab: Mon. 16:00 – 17:30 (4UI5;max. 16 students)
- Credits:
 - Lecture + Lab: 6
 - Lecture: 3
- Assignments + Exam + Final Project
- Sign up by Thursday (October 13, 12:00)
 - <http://hci.rwth-aachen.de/iphone>



iPhone Programming Topics

- Mobile application design principles
- iOS development basics
- View Controllers & Dialogs
- Input techniques
- Networking
- Multimedia
- Performance tweaking
- iPad programming

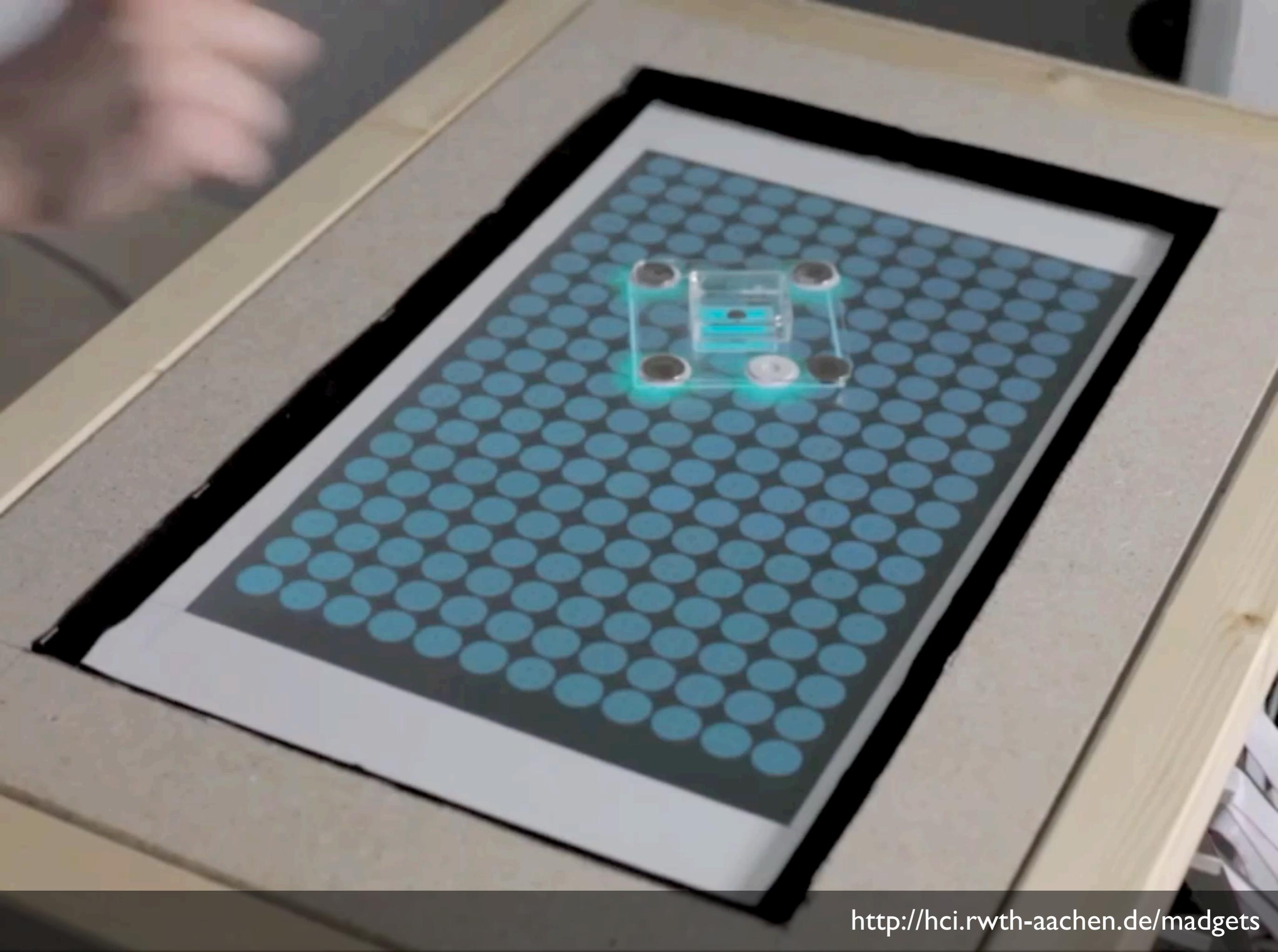


All slides and lecture videos for both DISI and iPhone Programming will be available on [iTunes U](#)



<http://hci.rwth-aachen.de/dis>



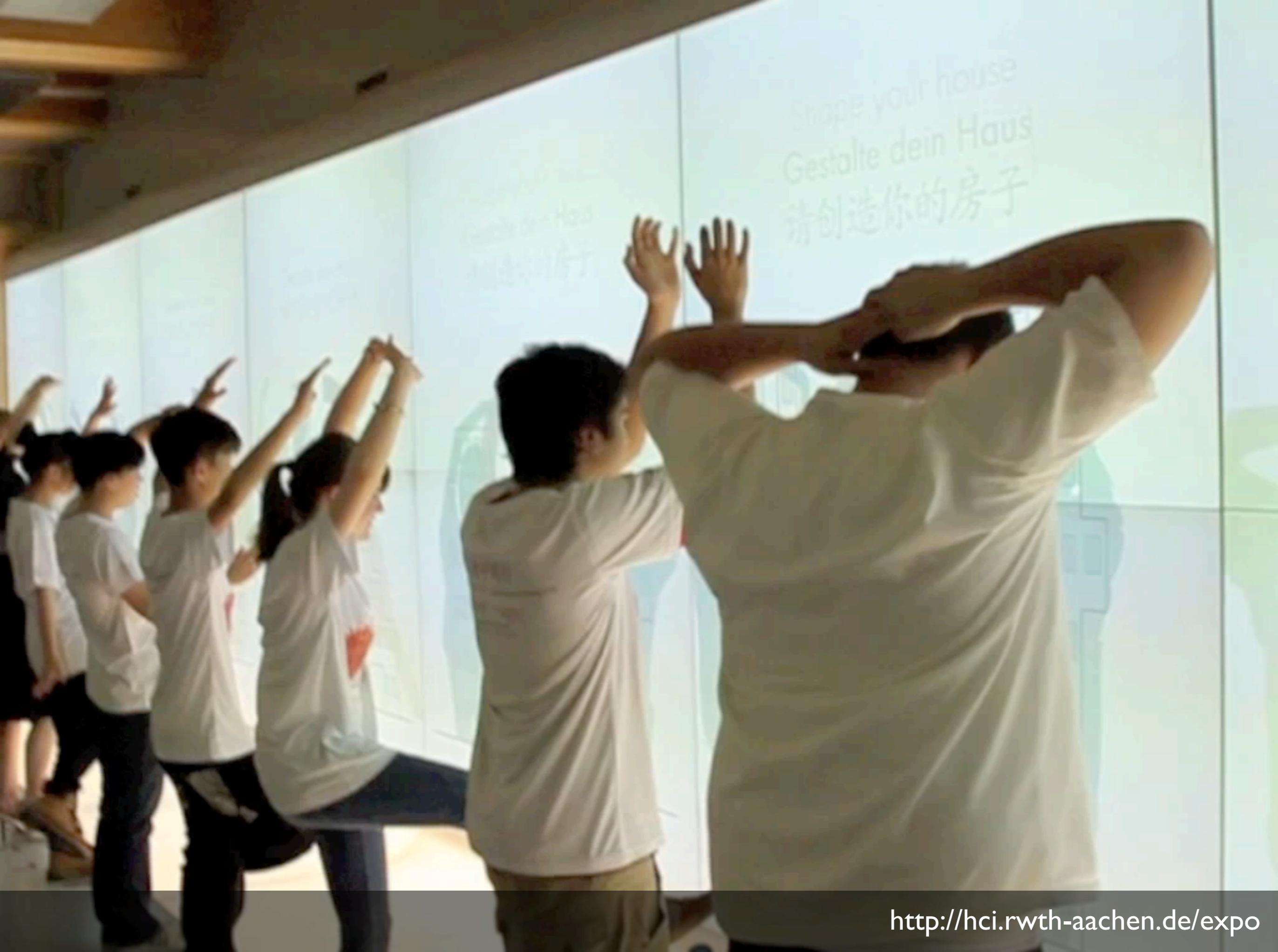






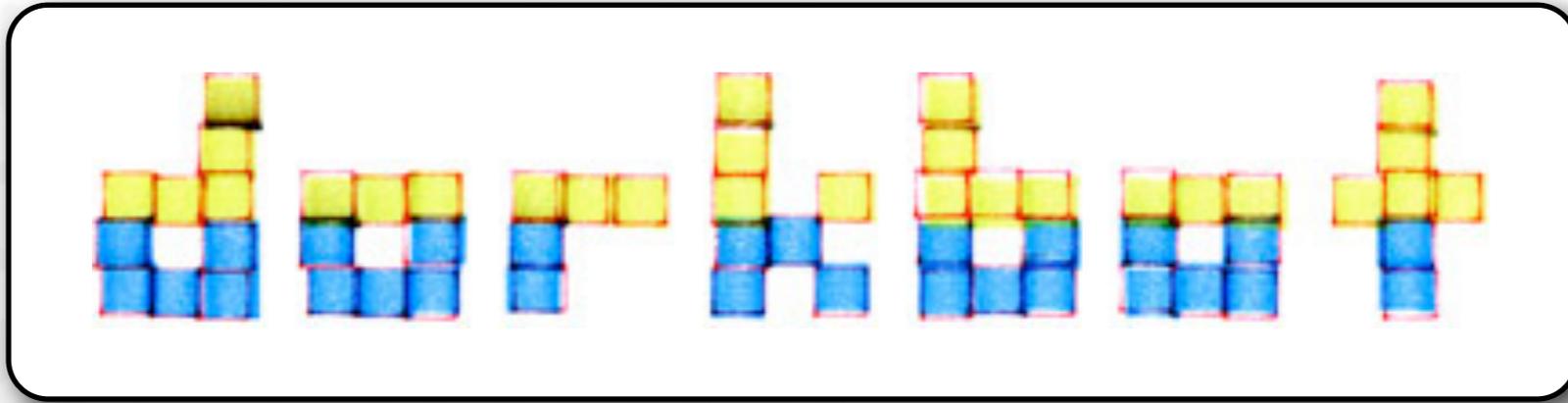
The screenshot shows the Xcode IDE with the following components:

- Top Bar:** Xcode menu, File, Edit, View, Project, Build, Run, Design, SCM, Window, Help, Plugins, and system status (Fr, 19:40).
- Toolbar:** Debug | x86_64, Action, Breakpoints, Build and Run, Tasks, Info, and String Matching search bar.
- Groups & Files:**
 - Converter
 - Classes
 - ConverterAppDelegate
 - ConverterAppDelegate
 - MainController.h
 - MainController.m
 - Converter.h
 - Converter.m
 - Other Sources
 - Resources
 - Converter-Info.plist
 - InfoPlist.strings
 - MainMenu.xib
 - Frameworks
 - Linked Frameworks
 - Other Frameworks
 - Products
 - Targets
 - Converter
 - Executables
 - Find Results
 - Bookmarks
 - SCM
 - Project Symbols
 - Implementation Files
 - NIB Files
- Source Editor:**
 - File: MainController.m = Converter
 - Line 50: `-convertC2f` (tagged)
 - Line 49: `float f = [self.converter c2f:c];` (circled in red)
 - Line 48: `float c = [self.celsius intValue];`
- Call Stack:**
 - MainController: celsius
 - MainController: converter
 - Converter: c2f
 - MainController: updateF

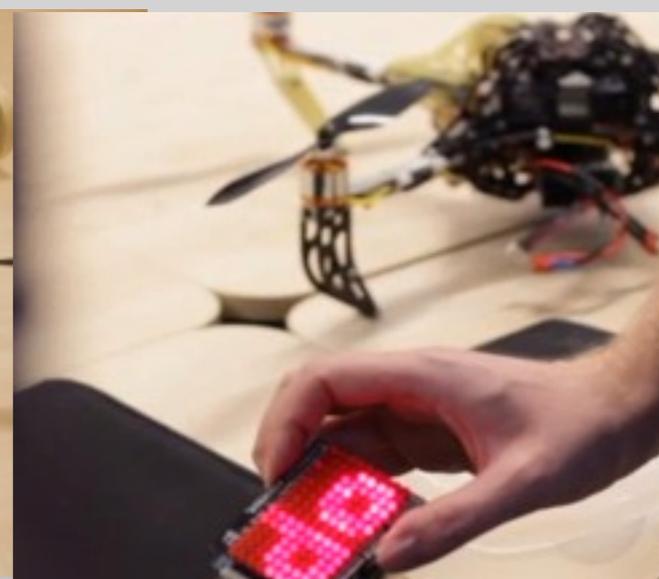


Shape your house
Gestalte dein Haus
请创造你的房子

Gestalte dein Haus
请创造你的房子



- People doing strange things with electricity in Aachen
- Next meeting: October 19, 18:30 (Room 2010)
- <http://www.dorkbot.de>



WDR

Lokalzeit
aus Aachen



CocoaHeads Aachen



- International group devoted to discussion of Apple's Cocoa Framework for Mac OS X and iOS
- Next meeting: October 27, 19:00 (Room 2010)
 - Talk/Demo: OpenCL & AppCode
- <http://www.cocoaheads.de>



In-class Exercise: Your First Design



- Sketch a universal remote control for radio, TV, DVD player, and VCR player
- You have five minutes.

Get set, ready, go!

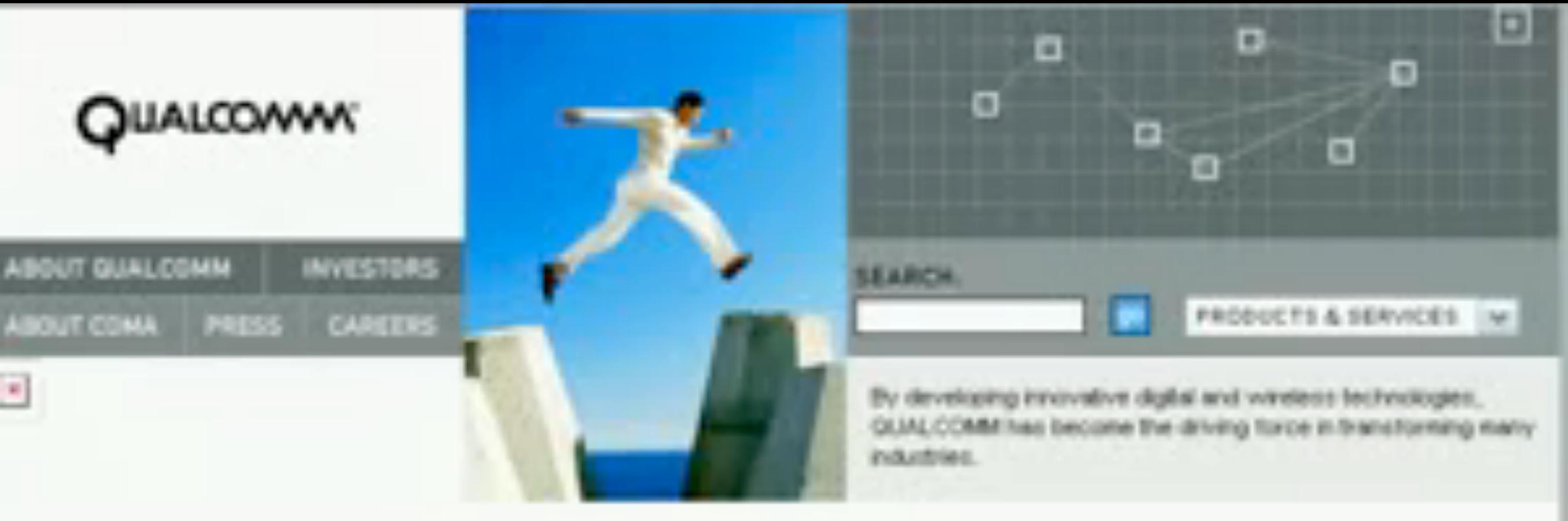


User Errors Are Design Errors

- A Big Message of DISI
- We tend to blame users for mistakes
- But usually it's the product / user interface design that is to blame
- Computers are nothing special—they have many of the same problems as everyday things (and others because of their flexibility)



“Mystery Meat Navigation”



- What is wrong here?

Visibility

- The mind is excellent at noticing and interpreting clues in the world, rationalizing, explaining cause and effect
 - Much everyday knowledge is in the world, not in the head
 - So **visibility** is one of the most important aspects in design
 - Ideally, **natural** clues are made visible, requiring no conscious thought: **natural design**
 - Just the right things have to be visible: excess is as bad as lack of visible clues





Swedish Hair Dryer





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|



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Improving the Swedish Hair Dryer

- Detach scale (labels) and control
- Provide at-a-glance overview of possible settings (What Can I Do?)
- Design control knob to show how it can be operated (e.g., pushed)
- Make current setting of control against scale easy to determine (Where Am I?)
- Use natural ordering of settings ($0 < I < II$)
- These all work for a new product—but design for use
 - One-handed operation, labels must not wear off, water-resistant controls, voltage settings,...
- Apply the First Rule of UI Design: **Keep It Simple**



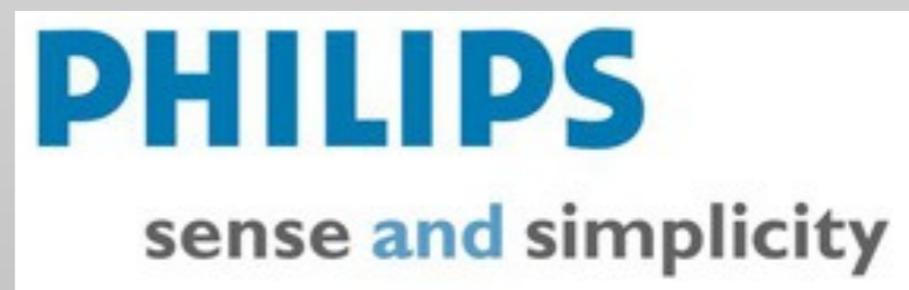
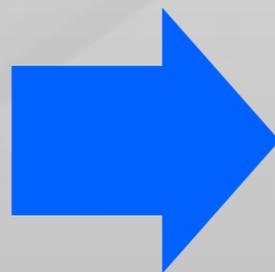
Visibility & Superstitions

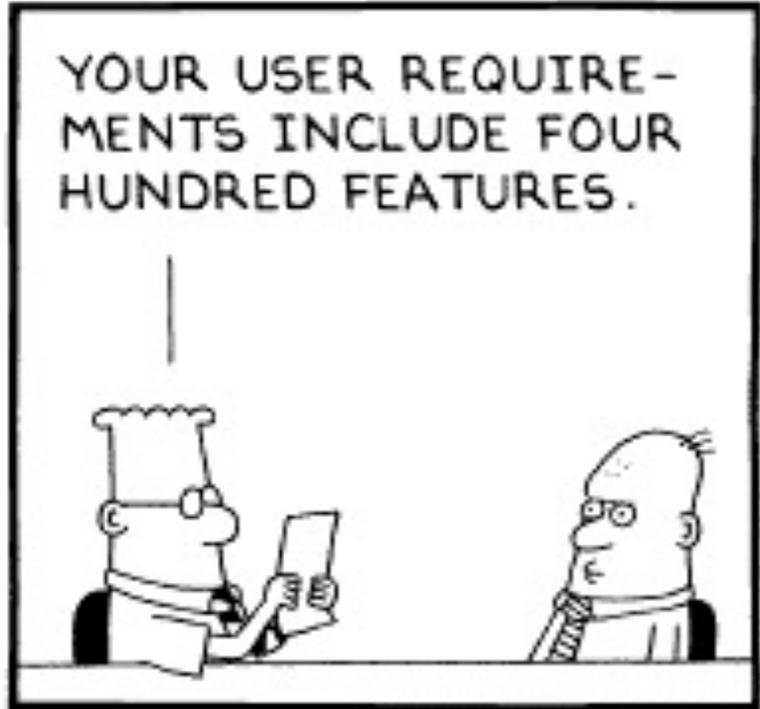
- Coincidence and lack of visibility can cause **false causalities** (thinking your action had a bad or no effect).
- They lead to superstition and loss of control.
- Example: Multiple clicks because system doesn't respond—and then the chaos when it does...



Market Constraints

- Better UIs are not automatically business goals
- Consumers have to prioritize usability before industry changes (it's happening gradually)
- Goal of this class: Turn you into nitpickers that notice bad (and good) UIs everywhere.





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How do you check your voicemail?



ALCATEL

Bitte wählen:

1	2 ABC	3 DEF
4 GHI	5 JKL	6 MNO
7 PQRS	8 TUV	9 WXYZ
*	0	#

Menu

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☐	☐	☐
☐	☐	☐
☐	☐	☐
Rückfrage		Maken
RUL sofort		ISDN
☐		Notz

☐ OK ☐
☐ ☐ ☐

☎	✉	☎ ?
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Q	W	E	R	T	Z	U	I	O	P	CH	→
A	S	D	F	G	H	J	K	L	Ö	→	→
Y	X	C	V	B	N	M	T	SPACE	→	→	→



ALCATEL

Bitte wählen:

1	2 ABC	3 DEF
4 GHI	5 JKL	6 MNO
7 PQRS	8 TUV	9 WXYZ
*	0	#

Menu

☐

☎

Rückfrage		Maxim
RUL sofort		ISDN
☐		Notz

OK

◀ ▶

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☎ ☐ ☎

0	1	W	E	R	T	Z	U	I	O	P	CH	→
A	S	D	F	G	H	J	K	L	Ö	→	→	→
Y	X	C	V	B	N	M	T	SP	→	→	→	→

Dial *71

RWTH University Phones

- More phone issues
 - Tone dialing doesn't work, have to dial “* * 8” to activate
 - Missed calls are hard to retrieve, and numbers disappear after looking at them once
 - Etc. ...
- Mobile phones (“network features”) are not much better (e.g., blocking caller ID)



Affordances

- Model by Norman, after Gibson
 - “...**affordances** of the environment are what it offers the animal...” [Gibson77]
- Affordances are the actions that the design of an object suggests to the user
 - “...the term **affordance** refers to the perceived and actual **properties** of the thing, primarily those fundamental properties that determine just **how** the thing could possibly be used...” [Norman88]



Utility of Affordances

- Affordances provide strong clues
 - No instructions/labels needed
 - A design with labels is often a bad design!
 - Also true for many software UIs
 - Exceptions: complex, abstract functions that do not support simple “physical” affordances
- Product design can support usability when using affordances well



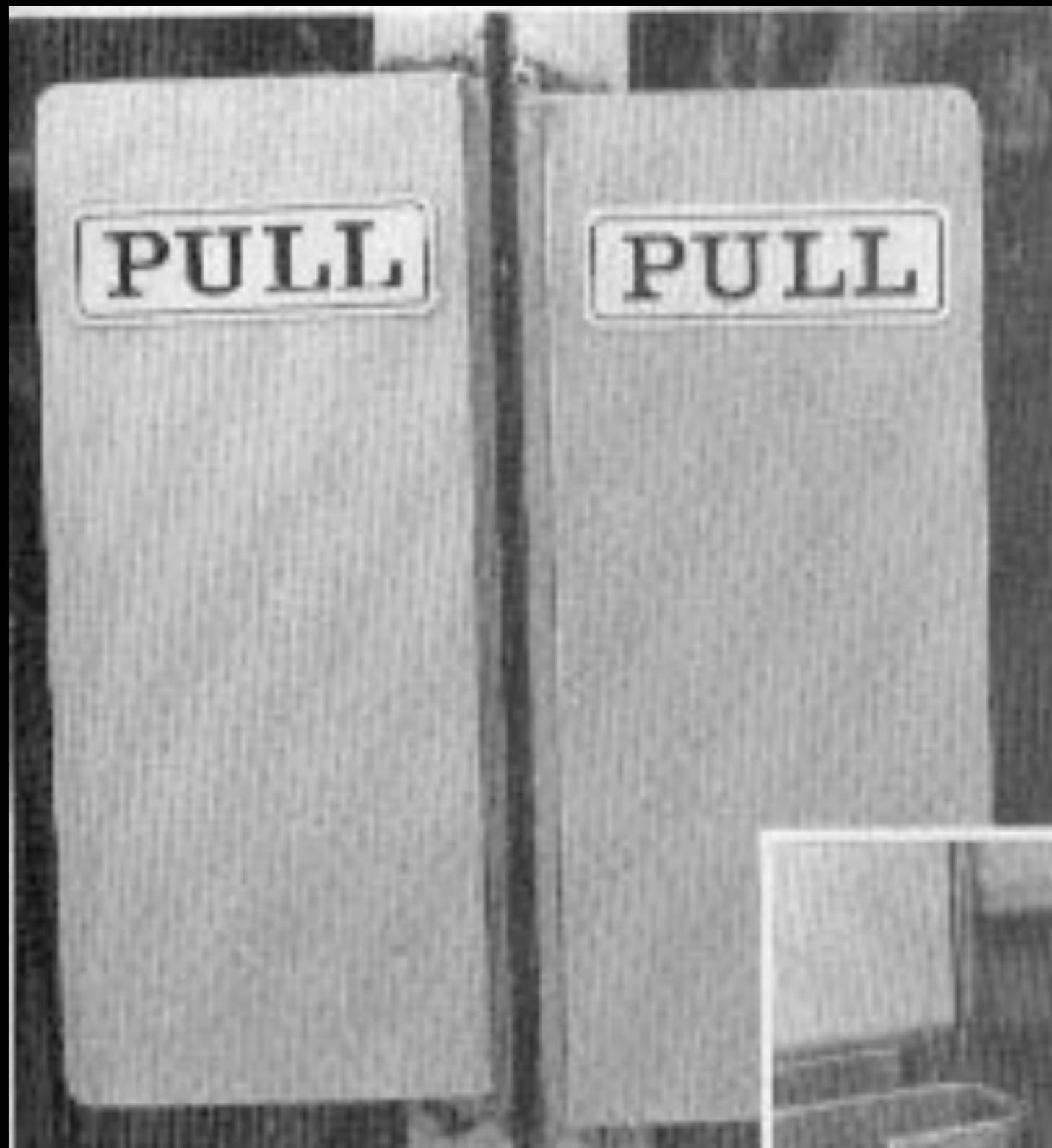
British Rail Shelters

- British Rail shelters with glass walls were being vandalized routinely
 - Glass suggests (“affords”) being broken
- After replacing them with equally strong plywood, the demolishing stopped
 - Wood suggests/affords stability and support
- However, now they were being scribbled upon...
 - Smooth, even surfaces “afford” drawing!



Example: Headlamp





Flat surfaces suggest pushing,
so a label “PULL” is needed.

False Affordances

- False affordances suggest actions that are not actually possible or the right ones
- Example: Winchester Mystery House
 - Staircases leading nowhere
 - Cupboards with nothing behind their door

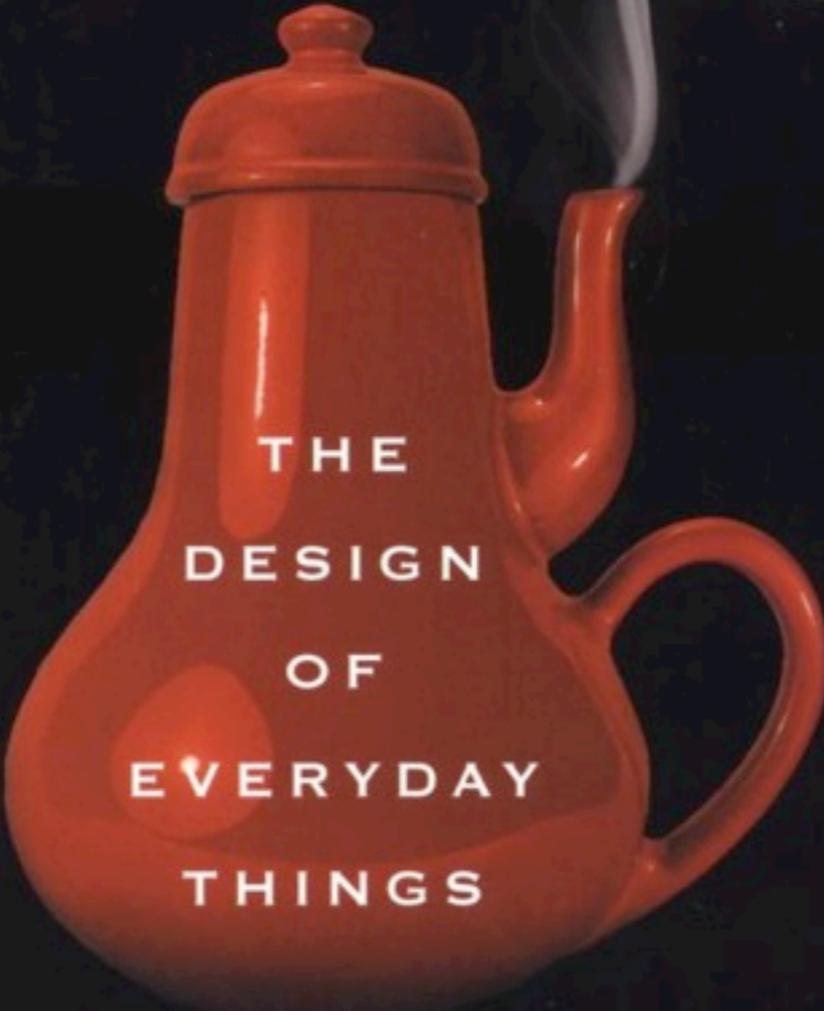


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MORE THAN 100,000 COPIES SOLD

"Design may be our top competitive edge. This book is a joy—fun and of the utmost importance."

TOM PETERS



**THE
DESIGN
OF
EVERYDAY
THINGS**

Previously published as THE PSYCHOLOGY OF EVERYDAY THINGS

DONALD A. NORMAN

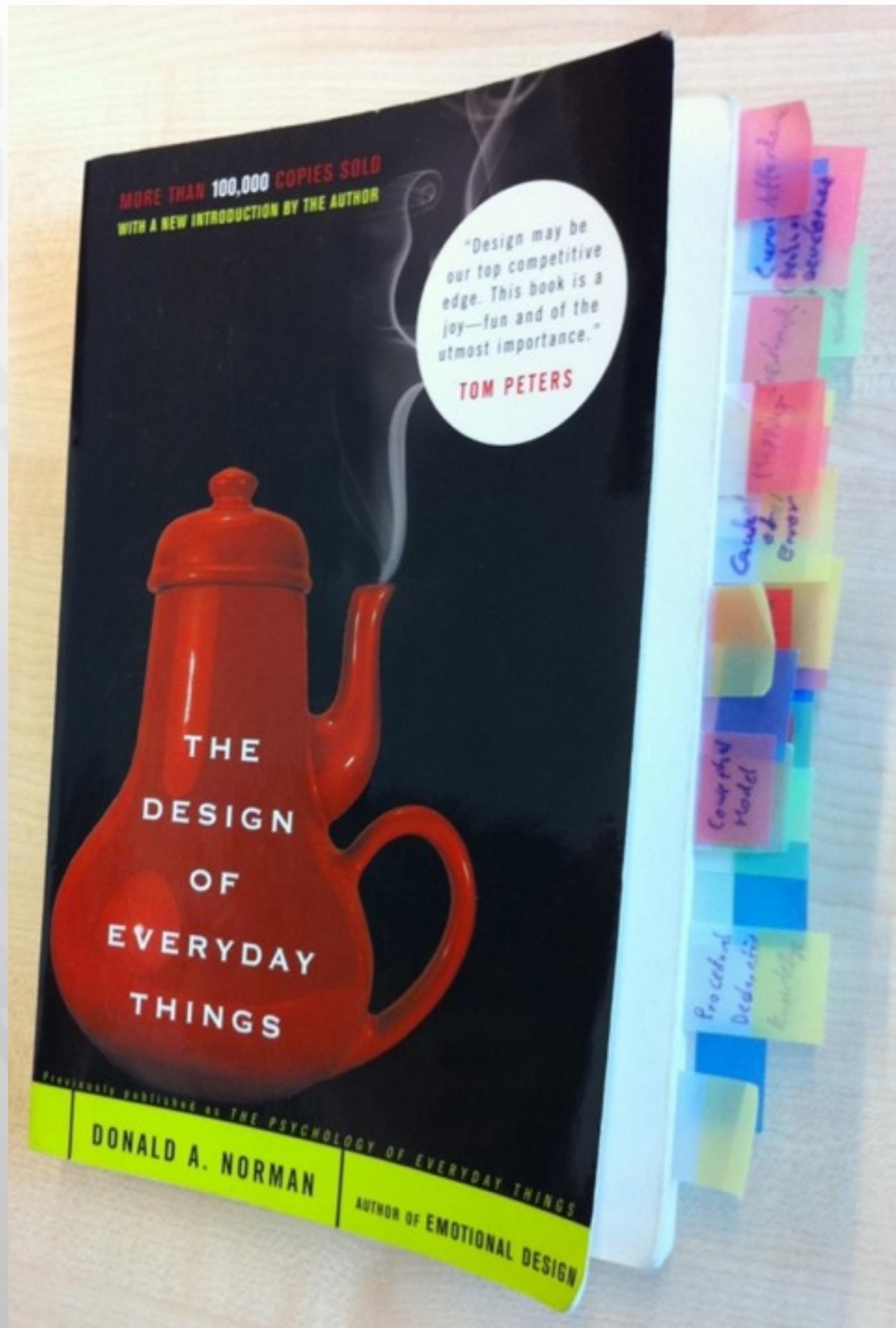
WITH A NEW INTRODUCTION BY THE AUTHOR

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A Note on Active Reading

- Highlight 1–2 key points per page
- Scribble brief summaries, ‘!’ marks, crazy associations, project ideas, ... in margins
- Put sticky notes with keywords onto pages you keep referring back to
- Type short bullet-point summaries of each chapter
- Make sure you can tell your copy of the book apart from 10ft
- Increases value of the book for you many times





Idea Logs

- One place to store your ideas as you have them.
- A place to develop your idea.
- Graphical record in a physical medium
- “Just for you”
 - Submit snapshots during projects and annotated log at the end of the semester
- Gayle Curtis on idea log:
 - <http://hci.stanford.edu/courses/cs247/2011/readings/WhatsAnIdeaLog.pdf>



Nov 10/09

Idea: "The Clap" T-shirt

Quick Rundown:

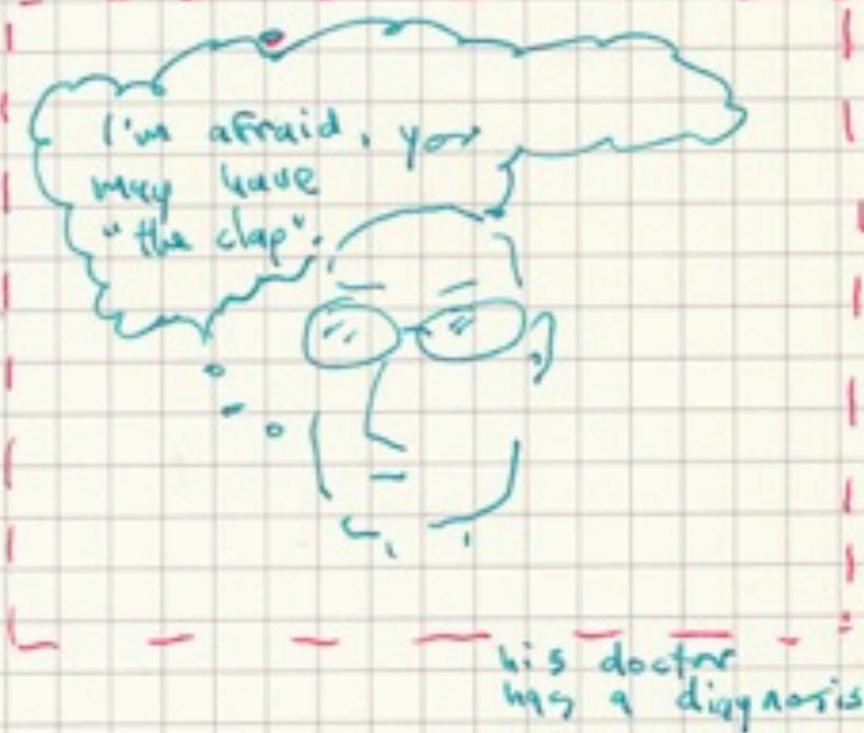
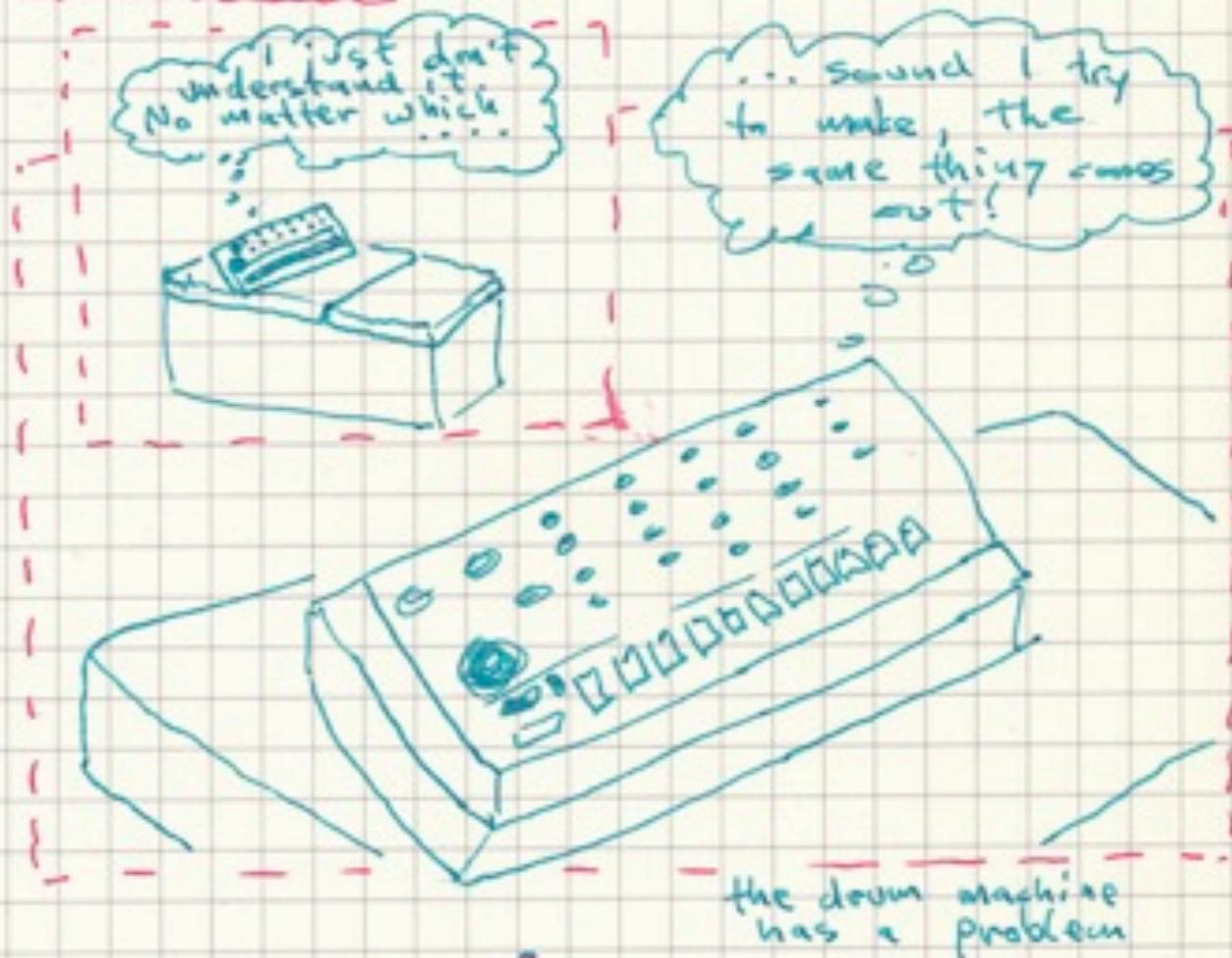
- a t-shirt design which features an electronic drum machine (like the Roland TR-808) at the doctor's office
- drum machine is explaining about how there's only ~~one~~ sound that it's able to produce, regardless of what it attempts to do (it can only clap)
- doctor explains (upon consideration and examination) that he's afraid that it may be "the clap"

Inspiration:

- November 9, just before going to bed, I checked Facebook, Twitter, LinkedIn, etc...
- a friend on Facebook (Lisa Knowles, aka: LisaBot - <http://www.facebook.com/LisaBot>) had posted a status update that I found rather humorous:
 - Nov 9 at 18:50: *clap clapclap clap clapclap*
 - (followup) • Nov 9 at 18:51: *drum machine*
- this caused an idea of a drum machine with the inability to do anything but produce hand claps to pop into my head
- the machine visits doctor... doctor explains "you've got the clap"
- mental chuckles ensue

Nov 10/09

Quick Sketch:



more towards makes them harder to remember, alternatively MLP and all that
 entails (i.e. does it understand desirable everything and how does it know the
 protocols or what it can physically do)

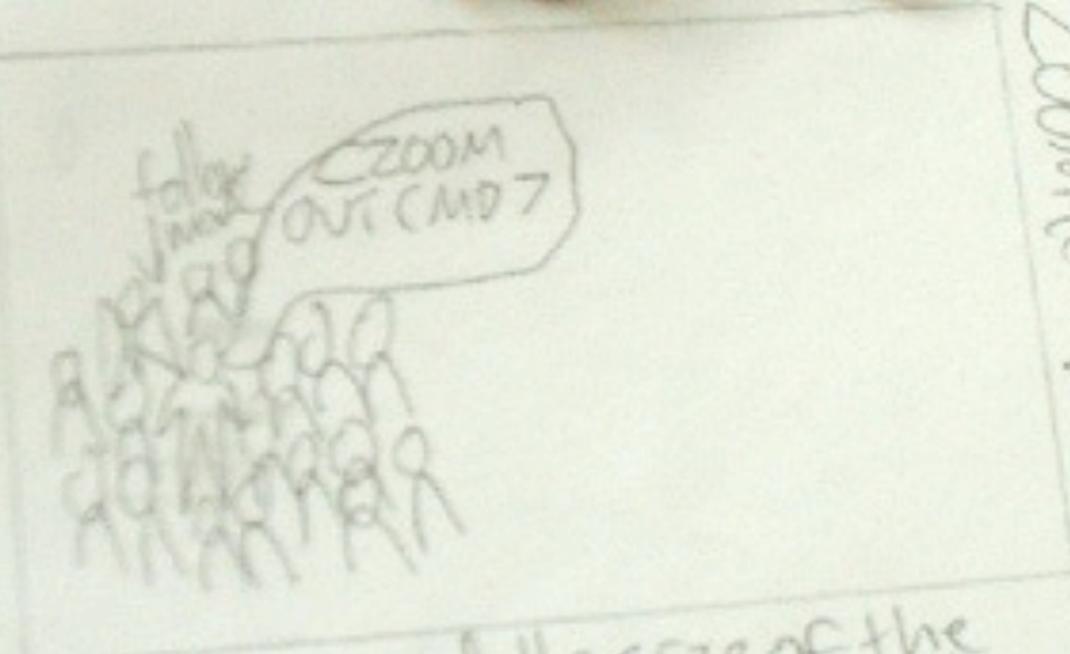
Introducing a level of control for the butterfly

covered in other group story boards

Need to focus on limiting the number of possible

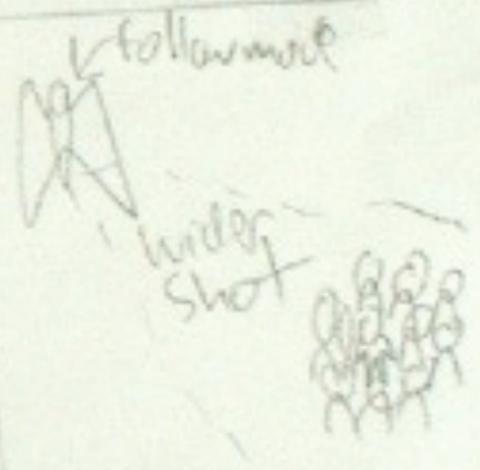
interactivity commands so we don't get too ridiculous

Andy Martin



Wanting to record the size of the crowd, George tells the butterfly to zoom out

ZOOM (example of interactivity)



X

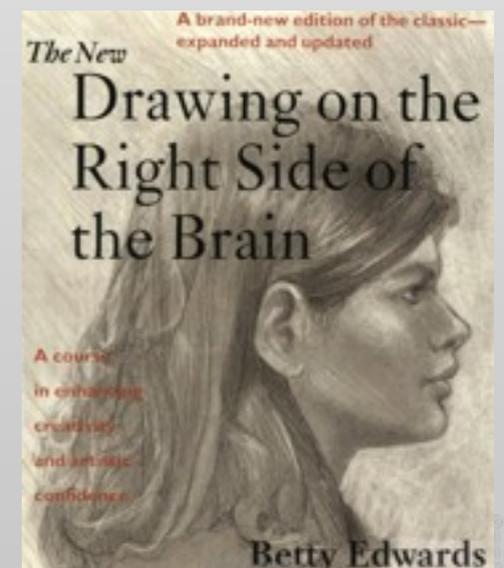
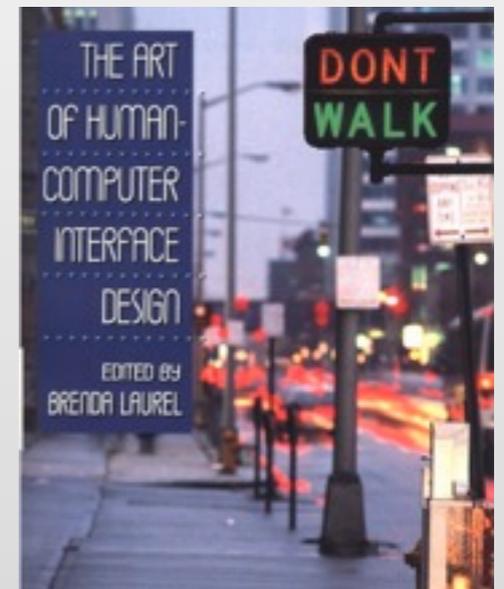
How to Draw Users

- Star Man and friends
 - Stick Man (bad)
 - Star Man
 - Sad, happy Star Man
 - Star Man pressing a button
 - A hand
 - Star Trek Man, Simple Star Trek Man
 - Family, users around an exhibit
 - Architect Man, Suits



References on How to Draw Users

- The full version of Sketching lecture by Bill Verplank:
<http://hci.rwth-aachen.de/verplank>
- More examples: Brenda Laurel, “The Art of Human-Computer Interface Design”
- Learn to draw: Betty Edwards, “The New Drawing on the Right Side of the Brain”



Revisiting the Remote Control



- In your idea log, refine your remote control using what you have learned today
- Reflection:
 - What did you change? Why?
 - What stayed the same? Why?



Assignment

- **Get an idea log and a suitable pen**
 - Recommended: A4 size, heavy papers that feels good when you sketch on it
 - Put date on every page as you go through
- **Universal remote control**
 - Put your first remote control sketch in the idea log
 - Reflect and develop your idea further from what you have learned
- **Get Norman's book and start reading**
 - You have four weeks to finish the book
 - You should get through half of the book by the next lecture



Summary

- The Media Computing Group does cool stuff.
- HCI is about humans, computers, the design process, and the social context
- Visibility and affordance provide clues how the system can be used
- Idea logs are great way to collect and develop your ideas
- **Register** if you have not done so yet.
 - (Step-by-step guide: <http://hci.rwth-aachen.de/dis>)

No lecture & lab next week

