

Lecture #22 – User Interface 1

ESE 150 – DIGITAL AUDIO BASICS

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USER INTERFACE

- ✗ **When a user sees a product**
 - + See the interface
 - + Not the underlying design
 - ✗ ...and that's the way it should be



Brian Heater

<https://heather.tech.com/2020/11/05/better-look-at-apple-iphone-12-pro-max-internal/>

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USER INTERFACE

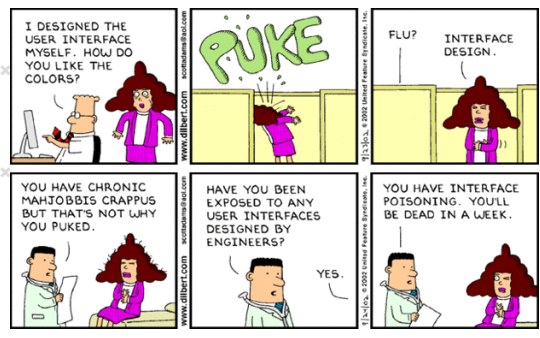
- ✗ **When a user sees a product**
 - + See the interface
 - + Not the underlying design
 - ✗ ...and that's the way it should be
- ✗ **Interface determines if the user can get job done**
 - + ...or will walk away frustrated
- ✗ **Successful interface**
 - + Make it easy, pleasant to use
 - + Hide all the complexity that makes it work



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DILBERT DIAGNOSIS



1. I DESIGNED THE USER INTERFACE MYSELF. HOW DO YOU LIKE THE COLORS?

2. PUKE

3. FLU? INTERFACE DESIGN.

4. YOU HAVE CHRONIC MAHTOBBIS CRAPPUS BUT THAT'S NOT WHY YOU PUKED.

5. HAVE YOU BEEN EXPOSED TO ANY USER INTERFACES DESIGNED BY ENGINEERS? YES.

6. YOU HAVE INTERFACE POISONING. YOU'LL BE DEAD IN A WEEK.

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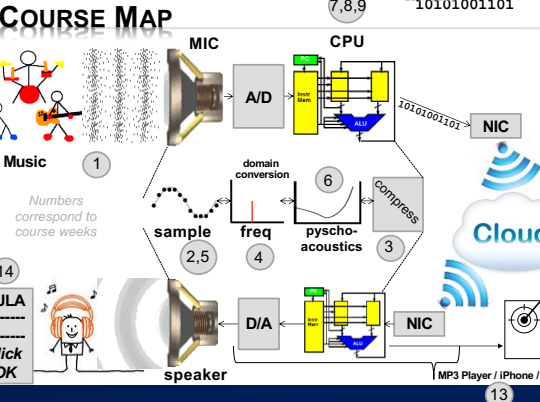
LECTURE TOPICS

- ✗ **Where are we on course map?**
- ✗ **User Interface**
 - + Motivation
 - + Issues and Principals
 - + Developer vs. User
 - + Design Choices
 - + Approaches and Prototyping
 - + Advancing/Enabling Technology

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COURSE MAP



10101001101

7,8,9

10

11

13

14

1

2,5

3

4

6

Music

sample

freq

psychoa-

compress

Cloud

EULA

click OK

speaker

MIC

A/D

CPU

D/A

NIC

MP3 Player / iPhone / Droid

Numbers correspond to course weeks

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DILBERT DIAGNOSIS

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SELF AWARENESS

- ✖ I'm an Engineer
- ✖ I have a different perspective and understanding of technology than lay public
- ✖ My view of what's obvious/non-obvious probably not representative of intended user base
- ✖ ...how do I (or team I'm in) compensate for that?
- ✖ These lectures, I'm talking about my weakness
 - + And need for help
 - + Not my strength
 - + Won't do justice with solution...but maybe in raising issues, need for help
- ✖ Nonetheless, I am frustrated by bad design from others as much as anyone else...
 - + I want "us" to do better.

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THE PROBLEM IS THAT HUMANS ARE HALF OF THE USER INTERFACE

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AND EVEN IF INTUITIVE AND CLEAR, USER INTERFACE MIGHT NOT BE SO GOOD.

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AND IT'S NOT JUST ABOUT OUR WORKSTATION INTERFACES...

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LOCAL EXAMPLE

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WHO'S TO BLAME FOR USABILITY FAILURES?

- ✦ **Most Returned Products Work Fine:** Study Says Only 5 percent of returned products are genuinely defective: Yarden Arar, *PC World*, June 2, 2008 4:00 pm
- ✦ **Only 5 percent of consumer electronics products returned to retailers are malfunctioning** --yet many people who return working products think they are broken, a new study indicates.
- ✦ The report by technology consulting and outsourcing firm Accenture pegs the costs of consumer electronics returns in 2007 at **\$13.8 billion** in the United States alone, *with return rates ranging from 11 percent to 20 percent*, depending on the type of product.

http://www.pcworld.com/article/146576/most_returned_products_work_fine_study_says.html

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UI EXAMPLES: BAD

- ✦ **Examples of infuriating / bad UIs?**

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UI EXAMPLES: GOOD

- ✦ **Examples of pleasant/good UIs?**

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PRECLASS 2

- ✦ **Which interface easier? Why?**
 - + Limit to vend \$20, \$300/day

Type in cash withdrawal amount:

1	2	3	cancel
4	5	6	clear
7	8	9	enter
0	.		delete

Select Cash Withdrawal Amount:

\$40	\$100	\$240
\$60	\$160	\$300
\$80	\$200	Cancel

- ✦ **How much do you use ATMs today?**
 - + Why not?
 - + What's replaced it? What's better?

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HOT/COLD WATER INTERFACE

- ✦ **Old: two knobs**
 - + Hot
 - + Cold



- ✦ **Newer: one knob**
 - + Tune heat
 - + (maybe also volume)




Why built this way?


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HOT/COLD WATER INTERFACE

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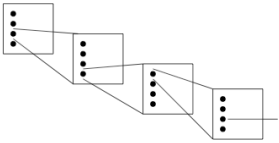


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MAKE COMMON CASE FAST

- × ...not buried deep in menus
- + Minimize mouse clicks?




- + Modern examples?

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HAWAII MISSILE WARNING JANUARY 2018

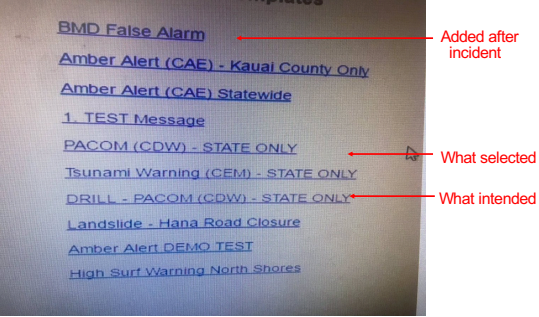


https://commons.wikimedia.org/wiki/File:2018_Hawaii_missile_alert.jpg

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HAWAII MISSILE WARNING FALSE ALARM



<https://www.theverge.com/2018/1/16/16896368/hawaii-false-missile-alert-system-confusing-interface-poor-design>

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Part 2

ISSUES

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ISSUES TO BE CONCERNED WITH? (GOALS, THINGS-TO-OPTIMIZE)

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ISSUES

- × Time to learn
- × Easy to figure out how to use
- × Time to perform task
- × Safety
- × Clarity of what happened
 - + Why something didn't happen
- × Ease of recovery
- × User stress

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DONALD NORMAN: UI GURU

Referring to Norman's book: *Design of Everyday Things*

- ✦ **Visibility** – visible functions aid user awareness; invisible functions are more difficult to find and know how to use.
- ✦ **Feedback** – return information about what action has been done and what has been accomplished.
- ✦ **Constraints** – restricting the kind of user interaction that can take place at a given moment.
- ✦ **Mapping** – the (functional, geometric, appearance) relationship between controls and their effects in the world.

<http://twobench.wordpress.com/2008/06/05/don-normans-design-principles/> 25

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MAPPING: STOVE BURNERS



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- ✦ **Feedback** – return information about what action has been done and what has been accomplished.
- ✦ **Constraints** – restricting the kind of user interaction that can take place at a given moment.
- ✦ **Mapping** – the (functional, geometric, appearance) relationship between controls and their effects in the world.
- ✦ **Consistency** – use similar operations and use similar elements for achieving similar tasks.
- ✦ **Affordance** – an attribute of an object that allows people to know how to use it.

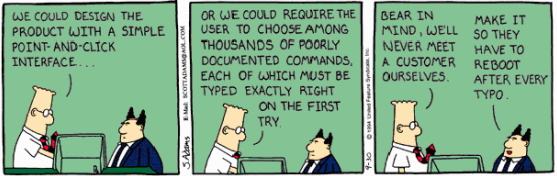
Add: Tolerance – reducing cost of mistakes, allowing recovery.

<http://twobench.wordpress.com/2008/06/05/don-normans-design-principles/> 27

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INTERFACE DESIGN



<http://twobench.wordpress.com/2008/06/05/don-normans-design-principles/> 28

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INTERACTION STYLES

Style	Main Advantages	Main Disadvantages	Applications
Direct manipulation	Fast and intuitive interaction; easy to learn	Only suitable where there is a visual metaphor for tasks and objects	Video games; CAD systems
Menu selection	Avoids user error; little typing required	Slow for experienced user; can become complex if many menu options	Most general purpose systems
Form fill-in	Simple data entry; easy to learn; checkable	Takes up much screen space; causes problems where user options do not match the form fields	Ordering
Command language	Powerful and flexible	Hard to learn; poor error management	Operating systems, command and control systems
Natural language	Accessible to casual user; easily extended	Requires typing; NL understanding systems may be unreliable <i>Becoming more reliable</i>	Information retrieval and Q/A systems
Voice with NL	Hands-free, no size constraint	Some unreliability; can't do quietly	Digital Assistants, Dialing, remote control

<http://twobench.wordpress.com/2008/06/05/don-normans-design-principles/> 30

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IMPLEMENTER VS. USER

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USER VS. IMPLEMENTER

- × **Thesis:** Engineer who implements something is seldom the right person to judge the goodness of the user interface
 - + Knows how should work
 - + Has a mental model of inner workings
 - + Motivated to reduce implementation complexity
- × **Contrast user**
 - + Doesn't know how works – shouldn't have to!
 - + Benefit from reduced use complexity
 - Reduced cognitive load

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FOOLPROOF QUOTE

- × **You cannot make something foolproof, because fools are so ingenious!**
 - + George Cox

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EXAMPLE (FOOLPROOF)

- × *Coders: The Making of a New Tribe and the Remaking of the World*
 - + Clive Thompson
 - + "It turns out a user had made a mistake. Someone out there had used the service to find their balance, as is normal. But instead of inputting their ~~card~~ [phone] number—which is what they were supposed to do—the user had accidentally sent in the number of the phonebot service itself. So the software got stuck in a loop. "The service was texting itself back and forth, back and forth, back and forth," Guarino says. It was, he admits, ultimately his mistake, a flaw in how he'd written the code for the textbot. He could have easily written a rule checking to make sure that someone didn't accidentally text the bot its own phone number. But it never occurred to him that a real live person would ever do that. "Users," he says ruefully, "will find a way." You might think you've stamped out your bugs, but they find new ones."

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ISSUE

- × **Hard to put aside what you know and see how it will look to an uninitiated user**
- × **How could anyone not know?**
 - + When program crashes, it leaves a lock file around that needs to be cleaned up...
 - × Happens to ESE150 students in Detkin!
 - + Naming a variable "foo-bar" might be interpreted as subtraction
 - + "NC" means not connected
 - × (user named their next state variables NA NB NC ND)
- × **Why would anyone**
 - + Put a ' in a name?
 - × Andre' before international characters allow: André

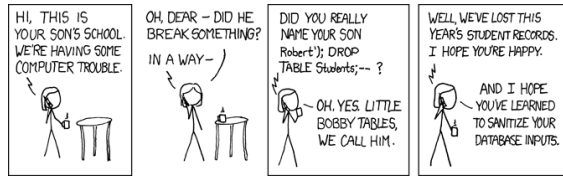
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WHY WOULD ANYONE

- × <https://xkcd.com/327/>



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BIG IDEAS

- × **User Interface essential**
 - + And worth designing carefully and deliberately
- × **View should match user goals, not internal design**
 - + Spend computing cycles to bridge
 - + Make simple, safe, intuitive
- × **Implementer seldom a good judge of interface goodness**
 - + Knows too much about how should work
 - + Conflict of goals

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READING

- × *The Design of Everyday Things*, Donald Norman -- a classic book on design for usability (broader than just hardware and software)
- × *The Inmates are Running the Asylum*, Alan Cooper -- a manifesto calling out computer/software industry for poor design
- × *Set Phasers on Stun: And Other True Tales of Design, Technology, and Human Error*, Steven M. Casey -- a series of anecdotes (case-studies) on how bad design and interfaces can go wrong, perhaps even killing people.

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REMEMBER

- × **Feedback include Lab**
- × **Lab 10 due today**
- × **Lab 11 is posted**
 - + Does have some prelab
 - + Suggestion to work Section 1

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