


Lecture #22 – User Interface 1

ESE 1500 – DIGITAL AUDIO BASICS

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Based on slides © 2009–2017 Badler



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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-kind-of-apple-iphone-12-pro-max-iphone-12/>

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USER INTERFACE

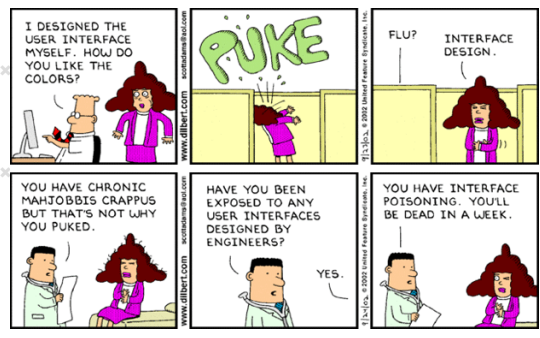
- ✖ When a user sees a product
 - + See the interface
 - + Not the underlying design
 - ✖ ...and that's the way it should be
- ✖ Interface determines if the user can get job done
 - + ...or will walk away frustrated
- ✖ Successful interface
 - + Make it easy, pleasant to use
 - + Hide all the complexity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



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DILBERT DIAGNOSIS



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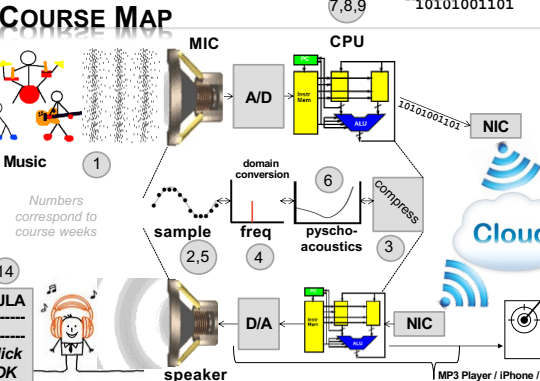
LECTURE TOPICS

- ✖ Where are we on course map?
- ✖ User Interface
 - + Motivation
 - + Issues and Principles (Part 2)
 - + Design Choices
 - + Developer vs. User (Part 3)
 - + Approaches and Prototyping
 - + Advancing/Enabling Technology

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COURSE MAP



10101001101

Cloud

MP3 Player / iPhone / Droid

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DILBERT DIAGNOSIS

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SELF AWARENESS

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- ✖ 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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<http://www.nexttron.si/borderline/archive2/intuifn.gif>

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

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<http://www.nexttron.si/borderline/delbte.gif>

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

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<http://www.uselog.com/2008/11/users-fix-parking-ticket-machine-ui.html>

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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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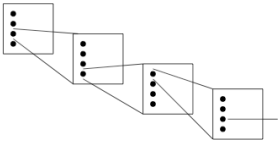




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MAKE COMMON CASE FAST

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




- + Modern examples?

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HAWAII MISSILE WARNING JANUARY 2018

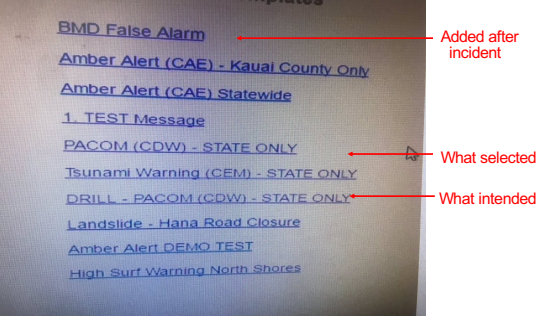


https://commons.wikimedia.org/wiki/File:2018_Hawaii_missile_alert.jpg

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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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Penn Engineering ESE

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



<http://twobench.wordpress.com/2008/06/05/don-normans-design-principles/> 26

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- ✦ **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.

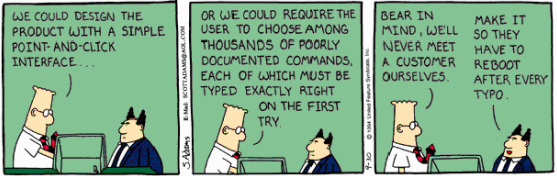
Add: Tolerance – reducing cost of mistakes, allowing recovery.

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

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INTERFACE DESIGN



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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 e.g. ATM, Word
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; e.g. Linux
Natural language	Accessible to casual user; easily extended	Requires typing; NL understanding was <i>unreliable</i> , <i>improving</i>	Information retrieval and Q/A systems; e.g. Google, ChatGPT
Voice with NL	Hands-free, no size constraint	Some unreliability; can't do quietly	Digital Assistants, Dialing, remote control e.g. Alexa, Siri

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

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Part 3

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

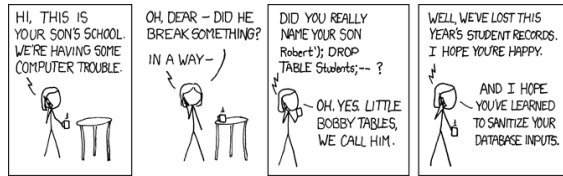
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WHY WOULD ANYONE

- × <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**
- × **Lab 10 due today**
- × **Lab 11 this afternoon**
 - + Does have some prelab
 - + Bring lab kits

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