COMP1650 – User Interface Design

Emergent Interfaces

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Today's main topics

- Introduction to Natural User Interfaces and 3D Interfaces
- Awareness of key design guidelines and best practices for their design
- Real-life applications of Natural User Interfaces
- Coursework support and Q&A

By the end of this session you should be able to:

1. Describe **new advances** that are enabling people to interact with technology in entirely **new ways**
2. Identify the role of **people characteristics** in interacting with emergent technologies
3. Describe and use **key guidelines** for emergent user interface design
4. Clarify elements of the **coursework** before the final submission.

The user interface…

- System users often judge a system by its interface rather than its functionality
- A poorly designed interface can cause a user to make **catastrophic** errors
- Poor user interface design is the reason why so many software systems are **never used**

User-system interaction

- **Two fundamental problems must be addressed in interactive systems design:**
  - How should information from the user be provided to the computer system?
  - How should information from the computer system be presented to the user?
- User interaction and information presentation may be integrated through **a coherent framework,** such as a user interface

Common interaction styles

Interaction style	Main advantages	Main disadvantages	Application examples
Direct manipulation	Fast and intuitive interaction Easy to learn	May be hard to implement 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 users Can become complex if many menu options	Most general-purpose systems
Form fill-in	Simple data entry Easy to learn	Takes up a lot of screen space	Stock control, Personal loan processing
Command language	Powerful and flexible	Hard to learn Poor error management	Operating systems, Library information retrieval systems
Natural language	Accessible to casual users Easily extended	Requires more typing Natural language understanding systems are unreliable	Timetable systems WWW information retrieval systems

Natural User Interfaces (NUIs)/ 3D Interfaces

Source https://www.youtube.com/watch?v=oq98_35sQko

…so, how can we interact with a NUI?

Input technologies

Visual

- Movement sensors
- Gesture/facial recognition
- Eye-tracking

Auditory

- Speech/Natural-language processing (NLP)

Touch

- Touchscreen
- Touch sensors

Output technologies

Visual

- Text
- Displays

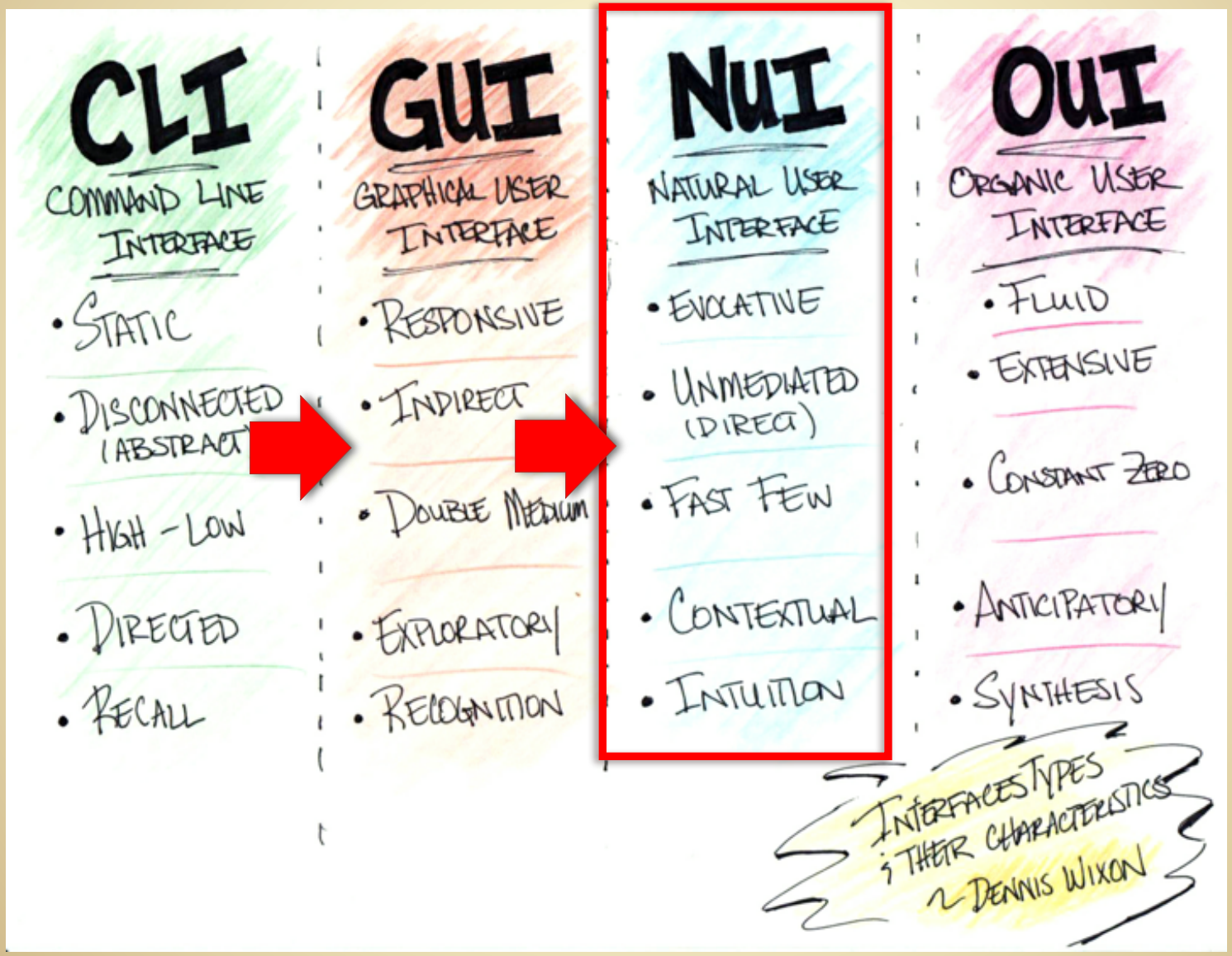
Auditory

- Music, noises
- Speech/NLP

Touch

- 3D/Virtual reality displays

We have come a long way…!



(Adapted from https://www.flickr.com/photos/rhinman/2799639297/)

What does 'Natural' really mean?

The term natural is often understood to mean **mimicry** of the "real world." (Wigdor & Wixon, 2011)

- Natural = Devices?
- Natural = Intuitive?

- ❑ **The User**
- ❑ **The Task**
- ❑ **The Device**
- ❑ **The Environment**

Adapted from http://searchengineland.com/findability-seo-and-the-searcher-experience-61038

Definition of a NUI…

"A natural user interface is a user interface…

- designed to → Planning + Process
- reuse existing skills for → Existing human skills
- interacting appropriately with content." *(Blake, 2011)* → Focus in on content

Types of human skills in NUIs…

Simple skills – e.g. tapping

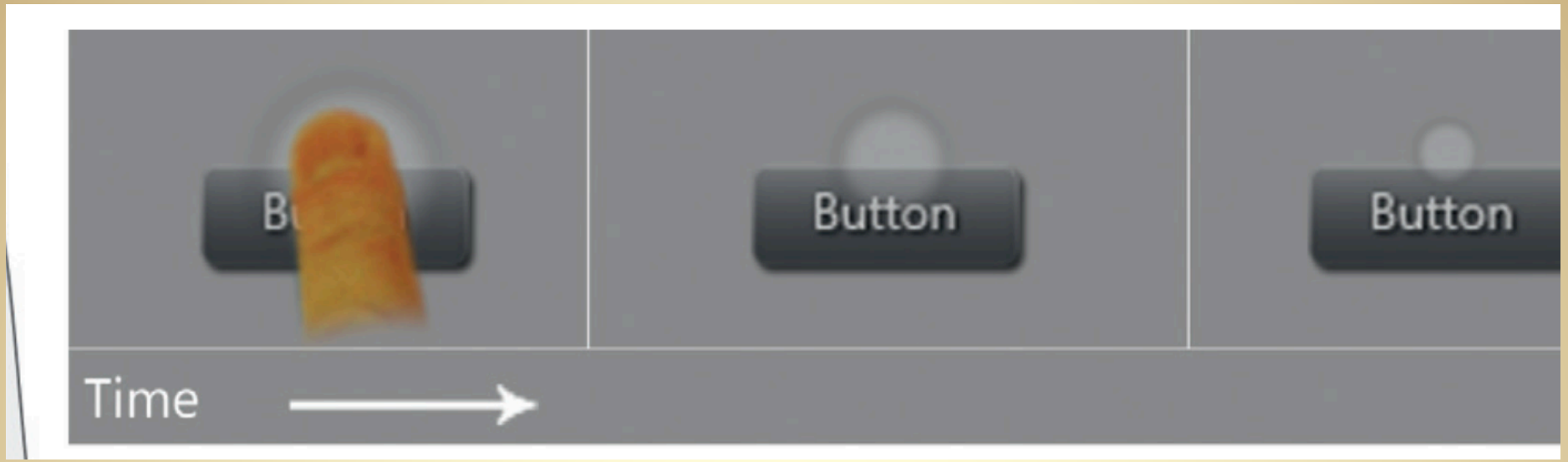
- build directly upon inherent abilities
- easy to learn
- can be reused and adapted

Composite skills – e.g. mouse clicking

- learned skills that build upon other skills
- more effort to learn
- specialized for a few and/or advanced tasks

Key interactions and technologies

From touch/manipulation…



Some key design guidelines for touch input

- Make design elements bigger
  - Large touchscreens aim for minimum of 1.6cm
  - Smaller touchscreens aim for minimum 0.9cm

- *Iceberg targets technique* - making the onscreen object that the user is asked to touch smaller than the actual area that will result in it being selected.

Microsoft Hololens

…or touchless…

Marco Silva, DevScope: *How NUIs are changing HCI*; http://marcosilva.livethoughts.net

Multi-modal input

- Gestures + hardware buttons
- Gestures + speech input
- Keyboard/mouse clicks + gestures

Speech recognition

A bit about speech recognition…

- It's very **device, task** and **context** specific
  - you shouldn't look at a screen in a car, so you might use a voice interface to control navigation.
- Consider Using Voice and Audio for…
  - Shared interfaces in smart homes e.g. products with no screens
  - Languages that are hard to type
  - Complicated input that is easier to speak than to type
- Don't Use Voice and Audio for…
  - Anything requiring negotiation or a lot of variables
  - Huge amounts of input or output, or hard to describe input

Lenovo's eye-controlled laptop

…to even using just our brain!

Natural interface design guidelines…

Instant expertise

Cognitive load

You should consider:

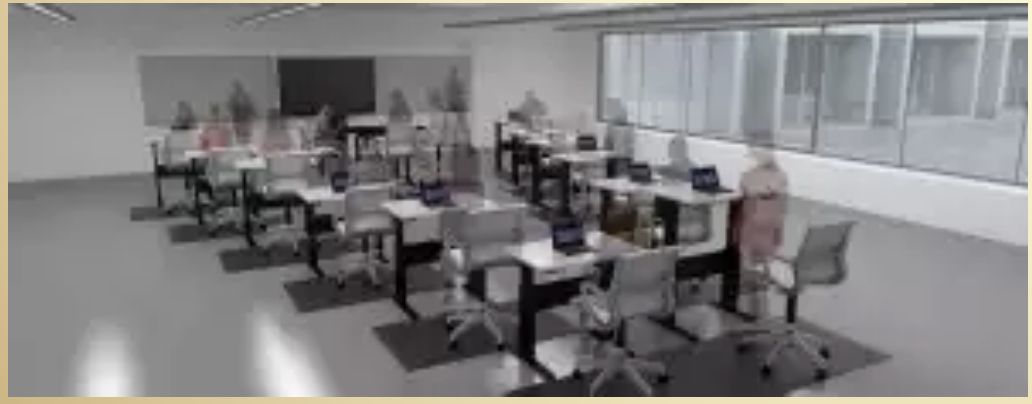
Progressive learning

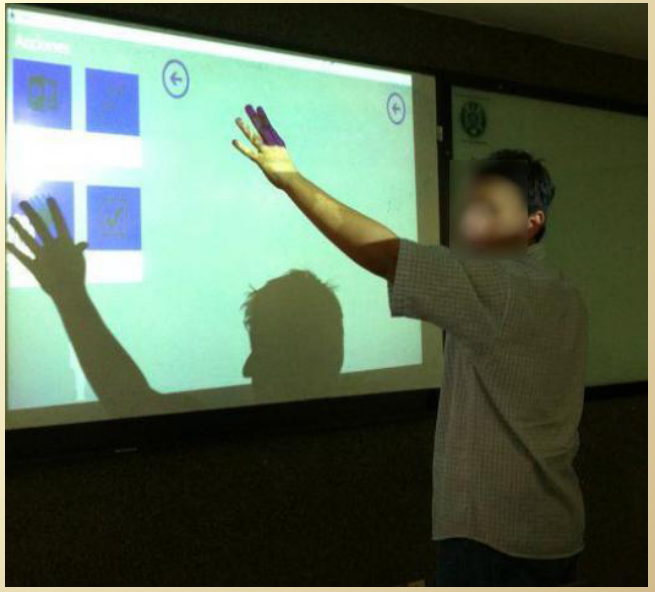
Direct interaction

Real-life applications of NUIs

NUIs as a tool FOR learning…

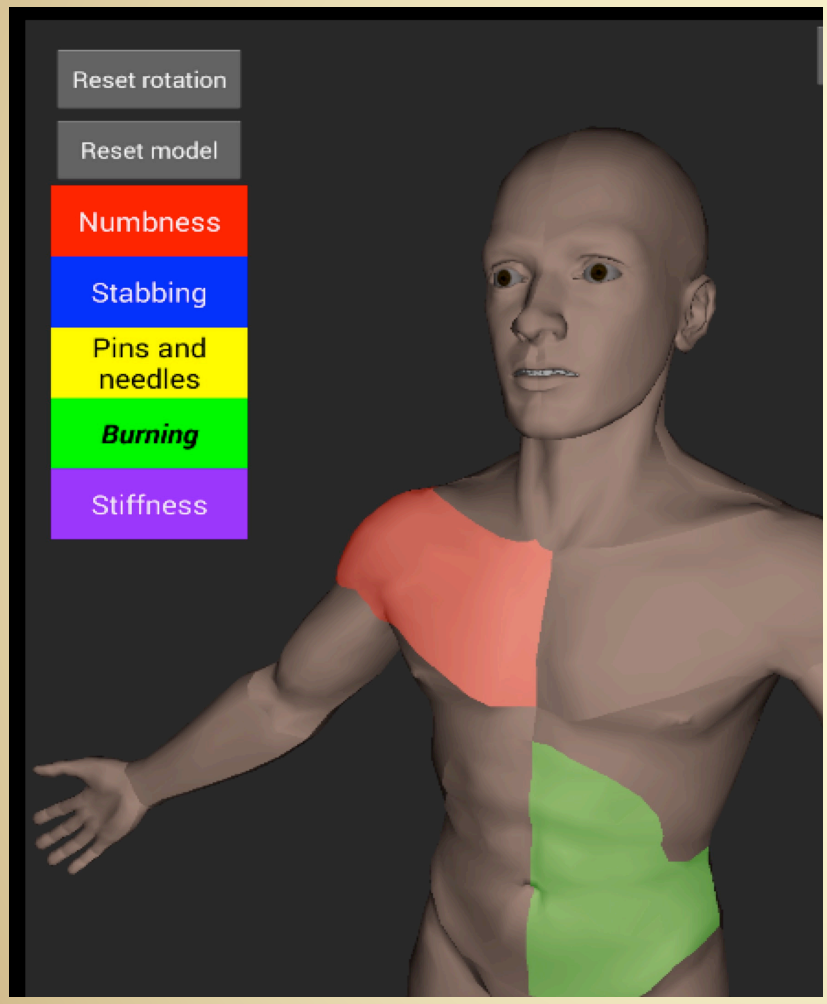
- Learning made **fun/entertaining**
- Proven as a learning tool beyond just children
- Computer-based learning is a significant part of popular culture
- Educational **video game** curriculums
  - MIT, UofCalifornia, etc.





Adapted from http://www.nuiworld.net/nui-for-pupils/

NUIs in support of healthcare…



Overview:

- My research applying NUI technology in pain management research
- Computer system: handheld device – Android OS

Key interaction technologies:

- Input: Visual, Touch
- Interaction style: 3D interface, sensors, direct manipulation
- Output: Visual

…or surgical operations!

Adapted from http://research.microsoft.com/en-us/news/features/touchlesssurgery-060712.aspx

Summary points

- Natural User Interfaces enable people to interact with technology in entirely new ways e.g. touch, gestures, speech, brain interfaces
- At the same time, people/users can interact with technology in the same ways that we interact with each other i.e. naturally
- Need to follow key principles and guidelines for emergent user interface design
- Focus has changed **from** users adapting their skills to technology **to** technology adapting to user skills


Questions