History of HCI: Recap

- Key people, events and ideas

History of HCI: Recap

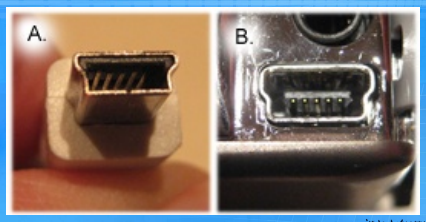
- Input/output devices
- The lesson
  - keyboards & terminals are just artifacts of today's technologies
  - new input/output devices will change the way we interact with computers

Online Resources (cont.)

- **Bad UI designs**
  - http://www.baddesigns.com/

Online Resources (cont.)

- **Bad UI designs**
  - http://www.baddesigns.com/



Up-and-Coming Areas

- **Gesture Recognition**
- **Multi-Media**
- **Mixed Reality**
- **Computer Supported Cooperative Work**
- **Natural language and speech**

The Development

- Multi-modal Interaction
- VR & 3D interaction
- Ubiquitous computing
- Smart space & Intelligent UI
- Standards

The Development

- Multi-modal Interaction
  - what is modality?

Physiology: Any of the various types of sensation, such as vision or hearing.

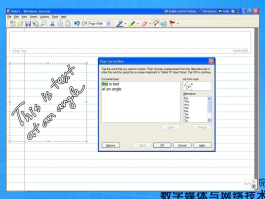
The Development

- Multi-modal Interaction
  - Pen-centric computing

The Development

- Multi-modal Interaction
  - Pen-centric computing
    - handwriting recognition
    - MSRA, Digital Ink

Combines the expressive power of human handwriting with the power of a tablet PC.



The Development

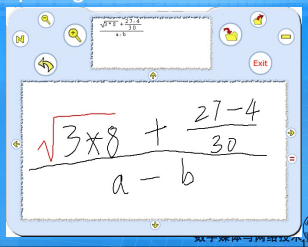
- Multi-modal Interaction
  - Pen-centric computing
    - MSRA, Digital Ink

• Focuses on: handwriting ink parsing, ink annotation and ink manipulation.
• Unstructured handwriting noted is turned into structured.
• Daily tasks such as note-taking and editing can be managed entirely in the ink domain, using a natural and friendly user interface.
• The system can recognize the following handwriting structures: 1) automatic language script recognition; 2) layout (word, line and paragraph); 3) shape, diagram and table recognition. 3) Mathematics equation.

Pen computing: digital ink and printed document
Wang, J.
Document Analysis and Recognition, 2005. Proceedings. Eighth International Conference on
Volume , Issue , 29 Aug.-1 Sept. 2005 Page(s): 334 Vol. 1 -

The Development

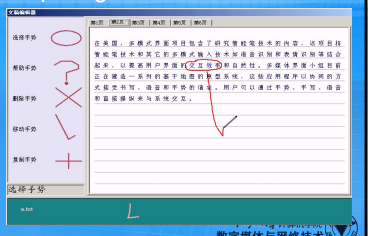
- Multi-modal Interaction
  - Pen-centric computing
    - HCI Lab, CAS



The Development

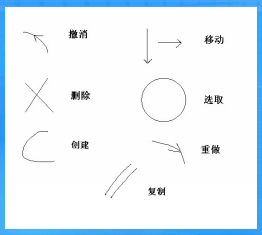
- Multi-modal Interaction
  - Pen-centric computing
    - Easy Editor

Gestures:
simple,
dissimilar
symbolic



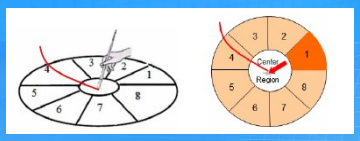
The Development

- Multi-modal Interaction
  - Pen-centric computing



The Development

- Multi-modal Interaction
  - Pen-centric computing
    - tilt menu: CHI2008



DEMO1 DEMO2

The Development

- Multi-modal Interaction
  - Pen-centric computing
    - Music Fountain

Wacom

FountainType

Design

Fountain Demo

The Development

- Multi-modal Interaction
  - Pen-centric computing
    - Brown University

SKETCH
Math Correction
MathPad
Fluid Inking
Diagrammer
ChemPad
STEMPad

http://pen.cs.brown.edu/home.html

STEM (science, technology, engineering, and math)

The Development

- Multi-modal Interaction
  - Voice Recognition
    - MS SpeechSDK
    - IBM ViaVoice
    - Nuance
    - Hardware

DEMO hardware: DEMO: Virtual Pet

The Development

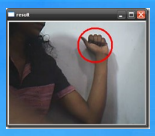
- Multi-modal Interaction
  - Gesture Language Recognition

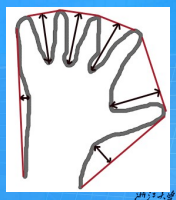
The Development

- Multi-modal Interaction
  - Gesture Language Recognition
  - 计算所, CAS

The Development

- Multi-modal Interaction
  - Gesture Language Recognition
  - CV-based
  - OpenCV





The Development

- Multi-modal Interaction
  - Gesture Language Recognition
  - CV-based
  - OpenCV

Demo

Demo: GSpeak

The Development

- Multi-modal Interaction
  - Gaze tracking

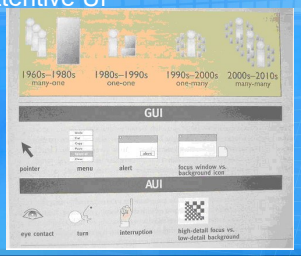
The Development

- Multi-modal Interaction
  - Gaze tracking
    - Tobii (http://www.tobii.com)
    - Infants predict other people's action goals, Nature Neuroscience, 2006.

Do infants come to understand other people's actions through a mirror neuron system that maps an observed action onto motor representations of that action? We demonstrate that a specialized system for action perception guides proactive （前摄的）goal-directed eye movements in 12-month-old but not in 6-month-old infants, providing direct support for this view. The activation of this system requires observing an interaction between the hand of the agent and an object.

The Development

- Multi-modal Interaction
  - Attentive UI



The Development

- Multi-modal Interaction
  - Biometrics
  - iris, palm lines, handwriting, gait, voice, face, DNA, etc.

The Development

- Multi-modal Interaction
  - BCI
  - Brainball: Winning by relaxing

http://smart.tii.se/smart/projects/brainball/index_en.html

The Development

- Multi-modal Interaction
  - Haptic UI

Phantom Desktop Haptic Device

The Development

- Multi-modal Interaction
  - Haptic UI

Why Haptics?

- "For every action there is an equal and opposite reaction" -- Sir Issac Newton

Why Haptics?

- **9. The year of haptic feedback**
  When playing console video games, your handheld game controller shakes and rumbles to coincide with on-screen explosions, crashes, gunshots and grenade detonations. Motion conveys subtle information to the user. That "force feedback" is called haptics.
  Haptics will show up with shocking frequency this year in cell phones and other mobile devices. In some cases, haptics will help compensate for the disappearance of buttons in cell phones. A little vibration will tell your fingers when you've successfully pressed an on-screen button as a substitute for the tactile feedback from a real button that actually moves. But haptics will also return to its roots by improving game play on cell phones.
  At the start of this year, there were only two cell phones with haptics available from major U.S. carriers -- the Motorola RAZR2 V8 and the LG Voyager. By the end of the year, there will be dozens. The feature may even show up in a new iPhone this year. (Apple patents indicate a great deal of interest in haptics by the company.)
  One way or the other, haptics will shake up the gadget industry in 2008.

Haptics – One of the Top 10 Trends for 2008, **Computerworld**, Dec. 31, 2007

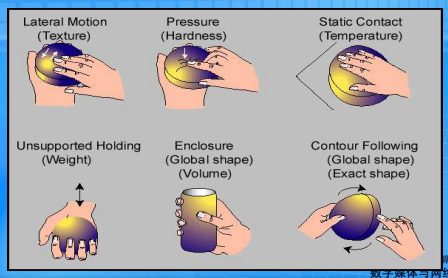
What is Haptics

- **Haptics** (hap'tiks) is the science of applying tactile sensation to human interaction with computers.

Just like color and sound, touch offers a whole new way of interacting with your computer.

You can…
…MODEL with virtual clay just like real clay
…FEEL the spaces and pathways inside machinery
…SENSE the difference between skin, muscle, and bone
…TOUCH the mechanisms that need to be calibrated
…FEEL the impact of your opponents sword in a computer game.

What is Haptics

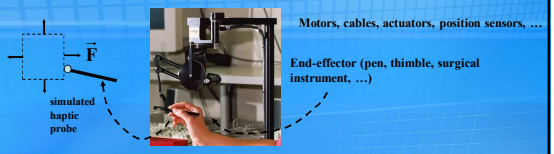


Graphics Rendering vs Haptic Rendering

Graphical Rendering:
process of displaying synthetically generated 2D/3D visual stimuli to the user

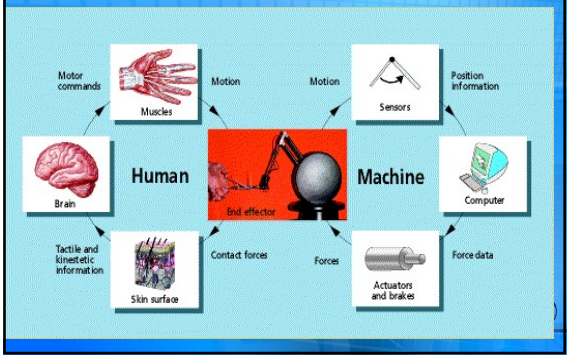
Haptic Rendering:
process of displaying synthetically generated 2D/3D haptic stimuli to the user

Haptic Interface



***Haptic Interface*: device for touch interactions in real and virtual worlds**

Human vs Machine Haptics



The Development

- Multi-modal Interaction
- Haptic UI

NANO-FEEL

NASA

DAB

RJB

The Development

- Multi-modal Interaction
  - 1995 NSFC Key program “多通道用户界面研究”
  - Beijing Univ., Hangzhou Univ., Institute of Software, CAS

The Development

- VR & 3D interaction

The Development

- VR & 3D interaction

The Development

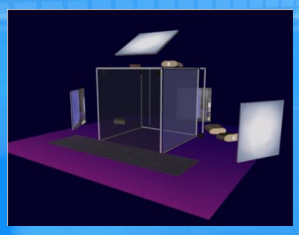
- VR & 3D interaction

Introduction to 3D UI

- What are 3D User Interfaces?
  - 3D interaction: Human-computer interaction in which the user’s tasks are performed directly in a 3D spatial context.
    - Interactive systems that display 3D graphics do not necessarily involve 3D interaction
    - 3D interaction does not necessarily mean that 3D input devices are used.
  - 3D UI: A UI that involves 3D interaction.

Introduction to 3D UI

- What are 3D User Interfaces?



CAVE is a complex collection of systems which must work together to provide a convincing virtual environment. There are four basic components which comprise the CAVE. They are
The Computers
The Graphics Systems
The Sound System
The Tracking System

Introduction to 3D UI

- What are 3D User Interfaces?

CAVE is a complex collection of systems which must work together to provide a convincing virtual environment. There are four basic components which comprise the CAVE. They are
The Computers
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The Sound System
The Tracking System

Introduction to 3D UI

- What are 3D User Interfaces?

Virtual Greece Ancient City

Introduction to 3D UI

- What are 3D User Interfaces?

Virtual Assembly 1 (MIVAS)

Virtual Assembly 2 (Haptic)

360 surround screen

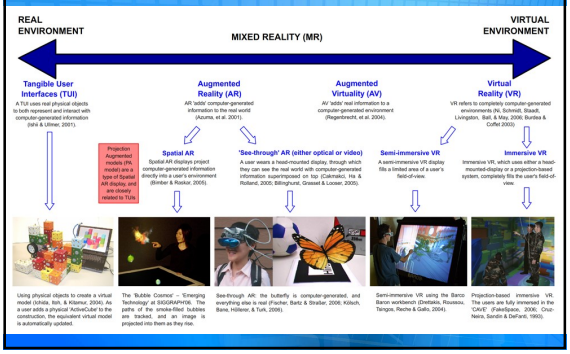
Introduction to 3D UI

- Why 3D User Interfaces?
  - 3D interaction is relevant to real-world tasks
  - The technology behind 3D Uis is becoming mature
  - 3D interaction is difficult
  - Current 3D Uis either are simple or lack usability
  - 3D UI design is an area ripe for further work

Introduction to 3D UI

- Related technological areas
  - Virtual Environment (VE)
    - A synthetic, spatial world seen from a first-person point of view. The view in a VE is under the real-time control of the user.
  - Augmented Reality (AR)
    - A real-world environment that is enhanced with synthetic objects or information.
  - Miexed Reality (MR)
    - A continuum including both VEs and AR.
    - Virtuality

Introduction to 3D UI



What does "virtual" mean?

- **"Virtual" *used to be* used as follows:**
  - Something is *virtual X* (where "X" can be anything) if it is not X, but it has an interface that is exactly like that of X.
  - For example, *virtual memory* is not memory, but it is dealt with by the processor exactly as if it is memory.
  - Similarly, there are virtual disks, virtual terminals, virtual networks, etc.

What does "virtual" mean?

- **"Virtual" is one of the more misused words in the high-tech field today.**
  - virtual bank
  - virtual heritage
  - and other monstrosities.

Virtual Reality: Definition

- **Virtual Reality *is a way for humans to visualize, manipulate and interact with computers and extremely complex data.***

Aukstakalnis, S. and D. Blatner, Silicon Mirage - The Art and Science of Virtual Reality. Peachpit Press Berkeley, CA, 1992.

Virtual Reality == 虚拟现实

- **Existing or resulting in essence or effect though not in actual fact, form, or name**
  - Example: the virtual extinction of the buffalo.
- **Existing in the mind, especially as a product of the imagination. Used in literary criticism of text.**

Virtual Reality == 虚拟现实?

- **Existing or resulting in essence or effect though not in actual fact, form, or name**
  - Example: the virtual extinction of the buffalo.
- **Existing in the mind, especially as a product of the imagination. Used in literary criticism of text.**

The Development

- Mouse 2.0

Video

The Development

- Tangible UI

Reconfigurable Tangible Device

The Development

- Ubiquitous computing

The Development

- Ubiquitous computing
  - Beijing University TGH

The Development

- Ubiquitous computing
  - Location-aware games
  - Can You See Me Now is a chase game played online and on the streets.

http://www.canyouseemenow.co.uk/murcia/en/intro.php#?

The Development

- Ubiquitous computing

DEMO

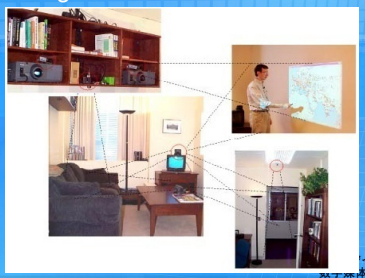
The Development

- Smart Space & Intelligent UI

MIT	Intelligent Room
Stanford	Interactive Workspace
Georgia Tech.	Aware Home
UIUC	Active Space
Microsoft	EasyLiving
IBM	Blue Space
GMD	iLand
TsingHua	Smart Classroom

The Development

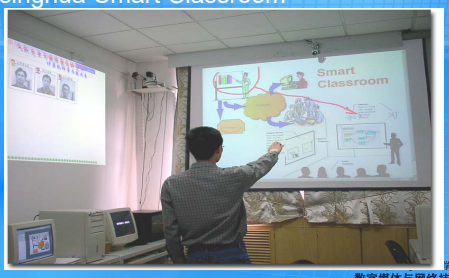
- MIT Intelligent Room



DEMO

The Development

- Tsinghua Smart Classroom



DEMO

The Development

- From Digital City to Smart City

The Development

- Facilities for aged

DEMO

The Development

- Industry App

DEMO

The Development

- Daily life

DEMO

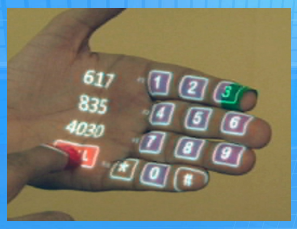
The Development

- Intelligent UI: Agents
  - Two general frameworks
    SRI OAA (Open Agent Architecture)
    OGI AAA(Adaptive Agent Architecture)

The Development

- Standards
  - ISO 10075:1991
  - ISO 6385:1981
  - ISO/IEC 10741:1995
  - ISO/IEC 11581:2000
  - ISO 13406:(1999-2001)
  - ISO 9241:(1992-2000)
  - ISO 13407:1999
  - ...

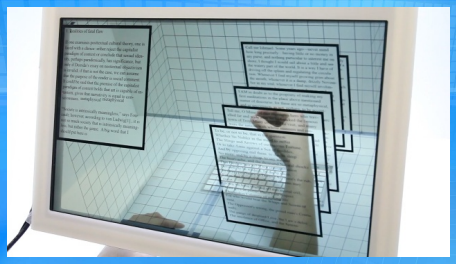
In the future



The Sixth Sense

DEMO

In the future



SpaceTop 3D

DEMO1 DEMO2

In the future

In the future

In the future

In the future

BMW DEMO

In the future

In the future

Thank you.