

Human-Computer Interaction Course Presentation

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departamento de electrónica telecomunicações e informática



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Sumário

- Introduction
- Course Information
- Lectures and lab classes organization
- Lectures and lab classes schedule
- Evaluation
- HCI - origins
- Bibliography

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Introduction

- "HCI discipline investigates and tackles **all issues related to the design and implementation of the interface** between humans and computers."

P Montuschi, P., Sanna, A., Lamberti, L., and Paravati, G., "Human-Computer Interaction: Present and Future Trends," *Computing Now*, vol. 7, no. 9, September 2014 <http://www.computer.org/web/computingnow/archive/september2014>

- "It expanded from **early graphical user interfaces** to include **myriad interaction techniques and devices**, multi-modal interactions, ..., and a host of emerging ubiquitous, handheld and context-aware interactions"

Carroll, John M., "Human Computer Interaction - brief intro". In: Soegaard, Mads and Dam, Rikke Friis (eds.). "The Encyclopedia of Human-Computer Interaction, 2nd Ed.". Aarhus, Denmark: The Interaction Design Foundation. https://www.interaction.design.org/encyclopedia/human_computer_interaction_hci.html

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Introduction

"The interface between humans and computers is harder than ever to define, we can interact with computers just by walking through a public space."

Sellen, A., Rogers, Y., Harper, R., & Rodden, T., "Human Values in the Digital Age", *Communications of the ACM*, 52(3), March 2009, pp. 58-66



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Introduction

- "As popular computing has grown, the role of HCI (human-computer interaction) has increased. Most software today is interactive, **and code related to the interface is more than half of all code.**"
- "HCI also has a key role in application design. In a consumer market, a product's success depends on each user's experience with it. Unfortunately, **great engineering on the back end will be undone by a poor interface**, and a good UI can carry a product in spite of weaknesses inside."

- "Innovation in the product is a nice virtue, but it's an **option** in terms of marketability. **Usability is not.**"

Canny, J., The Future of HCI, ACM Queue, Jul.-Aug., 2006, pp.25-32

- "Those of us who deal with user interfaces tend to think primarily in terms of computer programs. But user **interface problems in the real world** are often **worse** since the real world is not nearly as malleable as the computer world. An ideal solution, even if we know what it is, might not be practical to implement."

Blinn, J., "User Interface Stories from the Real World", IEEE Computer Graphics and Applications, Jan./Feb., 2005, pp.92-93

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Course information

- Course code:
 - 41549 – 6 ECTS
- Web
 - elearning.ua.pt
- Team:
 - Paulo Dias
 - IEETA – Gab 005
 - paulo.dias@ua.pt
 - Samuel Silva
 - IEETA
 - sss@ua.pt
 - Bernardo Marques
 - IEETA
 - bernardo.marques@ua.pt
 - Beatriz Sousa Santos (slides and support)

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Lectures (subject to changes)



- Lectures:
 - **Introduction:** History, Definition, Usability principles and paradigms.
 - **User:** Human Information Processing System (HIPS), Mental and conceptual models, other characteristics
 - **System:** Dialog Styles, Screen Layout, Use of colour, Input and Output devices.
- Labs:
 - **Evaluation** of Interfaces
 - **Design** of User Interfaces

20% faltas = RP

[Mondays - 14 classes – must attend 12]
 [Tuesdays - 14 classes – must attend 12]
 [Thursdays - 14 classes – must attend 12]

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Lectures (subject to changes)



- #1 - Introduction to the course
- #2 - Introduction and definition of HCI, Usability principles and paradigms
- #3 - The user: Human Information Processing System (HIPS)
- #4 - The user: Mental models and conceptual models - User Centered design
- #5 - Models for UI design.
- #6 - Models for UI design (cont)
- #7 - Paper prototyping - UI Software architecture
- #8 - Dialog Styles: Menus and direct manipulation
- #9 - Other dialog styles
- #10- Screen Layout. Colour models and colour usage
- #11- Mobile UI
- #12- Input devices
- #13- Output devices
- #13b- Introduction to Virtual and Augmented Reality **[only Wednesday]**
- #14- Usability evaluation

Two paper presentations each week - starting lecture 03

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Labs (subject to changes)



- #1 - Introduction to Lab classes and Assignemnts
- #2 - Heuristic Evaluation
- #3 - Empirical methods – Usability tests
- #4 - First assignment presentation: Heuristic evaluation
- #5 - Requirement analysis – Personas
- #6 - Introduction to Android – Discussion on requirement analysis
- #7 - In class Paper prototype test
- #8 - Project development
- #9 - Project development
- #10- Project development
- #11- Project development
- #12- In class Usability test
- #13- Project presentation
- #14- Project presentation

20% faltas = RP

[Mondays - 14 classes – must attend 12]
 [Tuesdays - 14 classes – must attend 12]
 [Thursdays - 14 classes – must attend 12]

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Labs (subject to changes)



- #1 - Introduction to Lab classes and Assignemnts
- #2 - Heuristic Evaluation
- #3 - Empirical methods – Usability tests
- #4 - **First assignment presentation: Heuristic evaluation** 04-07 March
- #5 - Requirement analysis – Personas
- #6 - Introduction to Android – **Discussion on requirement analysis** 18-21 March
- #7 - **In class Paper prototype test** 25-29 March
- #8 - Project development
- #9 - Project development
- #10- Project development
- #11- Project development
- #12- **In class Usability test** 20-23 May
- #13- **Project presentation** 27-30 May
- #14- **Project presentation** 03-06 June

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Evaluation



- Final = Exam (50%) + Groups assignments (50%)
- Minimum mark in each : **7.5**
- Groups assignments
 - **10%** paper presentation
 - Paper must be selected until 3rd class
 - **5%** Assignment n°1 (group 4)
 - heuristic **evaluation** -> presentation, demo and discussion
 - **35%** Assignment n°2 (group 2)
 - design, implementation and test of a UI following **User Centered Design** -> presentation, demo, discussion, code
- **No 2nd chance on group assignment: new assignment from scratch**
- TE : 2 weeks to contact prof: to establish groups and assignments evaluation

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Paper presentation assignment (groups of two students)



- 15 minute presentation
- Each 2 students group must indicate paper until 2nd class **20/02/2019**
- Presentation starts in 2nd class **20/02/2019**
- Presentation advices in document in e-learning

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Conferences to select papers from



<http://humanrobotinteraction.org/2018/>



<https://mobilehci.acm.org/2018/>



<https://chi2018.acm.org/>



<http://ieeervr.org/2018/>



<https://www.ismar2018.org/>

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Paper presentation assignment



- Wednesday 9h-11h - 26 paper presentations
- Thursday 9h -11h - 26 paper presentations

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Paper presentation assignment



- Volunteers to present a paper next week?



Note that:

- Volunteers have absolute priority in selecting the paper
- And will have this assignment done (10% of final mark) soon in the semester

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Paper presentation assignment



Until February 20

Each group (two students) should:

- select paper (with ≥ 8 pages) from the conference proceedings (HRI2017, MobileCHI2018, ISMAR2018 or IEEE VR 2018)
- indicate the preferred paper via a form and select the date via doodle
- wait for approval of the paper and date (posted on elearning)
- read the paper presentation guidelines (available at elearning)
- prepare a 15 min presentation (~15 slides)
- submit the slides to paulo.dias@ua.pt before the lecture at the defined date

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Course Objectives



- Understanding the importance of the User Interface (UI) of an interactive system;
- Knowledge of the fundamental concepts, methods and techniques for the:
 - Design
 - Implementation
 - Evaluation of Interactive Computer Systems

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Course Objectives



- What we want to avoid ☹️



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Human-Computer Interaction

Some history

Paulo Dias



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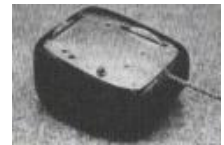
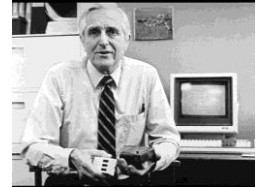


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Some history: Engelbart

- Mouse invention by Engelbart 1965.



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Some history: Sutherland Sketchpad

- Sutherland: Pioneer in
 - Visualization
 - Graphics
 - Interaction
- PhD Thesis (MIT, 1963)
 - "Sketchpad, A Man-Machine Graphical Communication System"

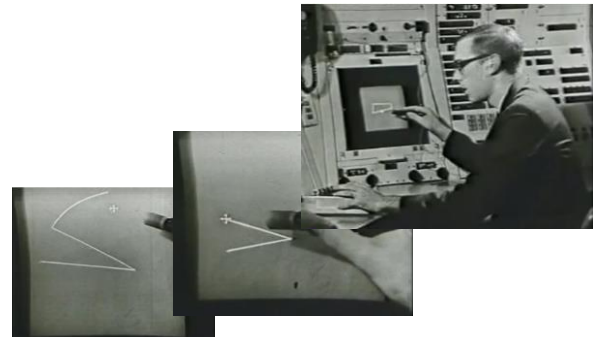


Ivan Sutherland using Sketchpad in 1963
CRT monitor, light pen and function-key panel

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Some history: Sutherland Sketchpad (1963)

<https://www.youtube.com/watch?v=zFWBQKrvz24>



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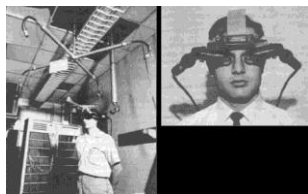
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Some history: Virtual Reality – Sutherland 1965



"Don't think of that thing as a screen, think of it as a window, a window through which one looks into a virtual world. The challenge to computer graphics is to make that virtual world looks real, sounds real, moves and responds to interaction on real time, and even feels real." (Ivan Sutherland)

Sutherland 1965



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Origin

- Not new, interest appears after WWII:
 - Ergonomy – physical aspects.
 - Human factors – also include cognitive aspects
 - Human Machine Interaction



- Human Computer Interaction

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Origin



- Origins?

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Origins



- HCI adopts many methods used in aviation:
 - Pilots and users involved in design
 - Goals and Tasks are analysed and considered during design
 - Building of prototypes to test concepts and discover problems before final delivery
 - Pilots and users test prototypes in frequent or critical tasks
 - Product acceptance depend in the results of objective tests.

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Example: Strange story of Draken Sierra 44



- Two buttons very similar – small letters
 - Release fuel
 - "WING TANKS"
 - To release canopy
 - "CANOPY EMERGENCY RELEASE"
- During an emergency, (fuel leak from tank), mistake from pilot

<http://www.hcibook.com/e3/online/draken-tanks/>

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Origins: Pilot errors after WWII



- Fitts analysis 460 pilot-errors after WWII:
 - Technology increase results in complex cockpits.
 - Pilots had difficulties to cope with internal system and information processing.
- Conclusion: pilots error due to cockpit design.

Fitts, P., Jones, R., Analysis of Factors Contributing to 460 "pilot-error" Experiences in Operating Aircraft Controls., July 1947.

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The Cost of Getting It Wrong



- Time is money
- Design correctly now, or pay later
- Bad UI may result in disasters
 - Draken Sierra 44
 - Therac-25 radiation therapy machine
 - Aegis radar system in USS Vincennes
 - Supertanker accident off England
 - Predator UAV accident in Arizona

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Exemple: Therac 25 - radiation overdoses



- Radiotherapy equipment used between 1985 e 1987
- Two working modes:
 - Electron mode: high-current electron beam delivered directly to patients for short time.
 - X-Ray Mode: higher current beam delivered on a tungsten target.
- Software error and bad interface results in high energy beam without target in place.
- 6 documented accidents, 2 died.



Nancy Levenson Safeware: System Safety and Computers, Addison-Wesley, 1995

Exemplo da interface:

[The technician got the patient] set up on the table, and went down the hall to start the treatment. She sat down at the terminal, and hit "x" to start the process. She immediately realized she made a mistake, since she needed to treat [the patient] with the electron beam, not the X-ray beam. She hit the "Up" arrow, selected the "Edit" command, hit "e" for electron beam, and hit "Enter", signifying she was done configuring the system and was ready to start treatment. The system presented the technician with a "Beam Ready" prompt, indicating it was ready to proceed; she hit "b" to turn the beam therapy on...

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Real world usability problems



- “Those of us who deal with user interfaces tend to think primarily in terms of computer programs. But **user interface problems in the real world are often worse** since the real world is not nearly as malleable as the computer world. An ideal solution, even if we know what it is, might not be practical to implement.”
- “The real world is just as much a nuisance to design for as the computer world, and maybe more.”

Blinn, J, “User Interface Stories from the Real World”, *IEEE Computer Graphics and Applications*, Jan./Feb, 2005, pp.92-93

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Old usability problems @ DETI (already solved!)



I always got confused;
Wouldn't you?



Up



Down



Back light

Front light

Middle light

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Solved just recently: lights control @ room 4.1.02



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Real world



Como é que abre?

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Real world



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Real world



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Real world



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Challenge



- Send me some real world examples to share with your colleagues!

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For next week



- Select the presentation dates you prefer via doodle
- And the papers you prefer via google form

Good luck with your work !

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Main Bibliography



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- <http://web.mit.edu/6.813/www/sp16/>

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