NUR - Introduction to HCI

UI design process (UCD), UI issues, formal description (scenarios, use-cases, storyboards)
Contacts

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- consultation hours: at practices
- course web page: https://moodle.fel.cvut.cz/courses/B4M39NUR
Classification

- **Credits**
  - max. 2 missed practices
  - min. 40 points
  - submitted semester project
    - D1-D4
    - min. 5 points per deliverable

- **Exam**
  - mandatory
  - written test (min. 10 points)
  - oral exam

- **Points**
  - D1-D4 70 points
  - exam 30 points
  - extra points: 3 points

- D1: User requirements, scenarios, HCI issues
  - 10 points
- D2: HTA, sketches, paper mockup
  - 15 points
- D3: Electronic LoFi prototype
  - 20 points
- D4: Hi-Fi prototype, design document
  - 20 points D4
  - 5 points presentation

- max. delay 24 hours
- any troubles: 4 days before

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NUR lectures

- Lectures – theoretical and practical
- Theoretical lectures
  - formalisms used for UI design
- Practical lectures
  - goal: to acquire knowledge necessary for successful completion of semester projects
  - experience with industrial or EC funded projects
  - experts from industry
    - User research
    - Prototyping
HCI definition

- Design, Implementation, and Evaluation of the interactive systems from the perspective of use by the human.
Human-Computer Interaction (HCI)

- **Human**
  - End-user of an application
  - Collaborative environment

- **Computer**
  - The device running the application
  - Execution often distributed among client and server machines

- **Interaction** – two-way communication
  - User tells the Computer what to do (commands)
  - Computer tells the User what happened (results)
Why study the HCI?

- User interface takes majority of the source code
  - Over 50% (Some authors report as much as 80%)
  - More than 50% of the implementation effort goes to the UI

- Risks of the bad UI
  - Financial (your product won’t sell)
  - Lives (air or factory disasters, …)

- Successful UI requires
  - Good knowledge of the human’s abilities
  - Good knowledge of the principles of the UI design
  - Meaningful use case
Idea of HCI

„The old computing is about what computer can do, the new computing is about what people can do.“

(Ben Shneiderman)
Example question for examination

- What is UCD good for?
- What techniques prevent errors in UI design?
- How many visual objects can human brain process in parallel?
- What color combinations are not suitable?
- What is the “pop-out“ effect and how it works?
- Describe KLM model.
- Explain Hicks law and its consequences for UI design.
User Interface (UI)

- The part of the technology, allowing people to:
  - Perform their own tasks
  - Interact with the technology
  - Both are indivisible
UI of pure physical nature

Hydroelectric power station Orlik

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UI mimics real world

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UI of complex systems

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Blending physical and electronic world
DESIGN PROCESS
UI design

- **User Centered Design (UCD)**
  - Find what are user needs and take them into account
  - You should be in permanent contact with potential users during the whole design process
    - testing of UI prototypes

Diagram: Requirements, Evaluation, Design, Implementation
Product development process
Product development process phases

- Application domain: Personal Weather Forecast

- Development process phases
  - problem analysis
    - user research (ethnography study, interview, experiment)
    - user modeling (persona)
  - design
    - sketching
    - prototyping (low-fi, high-fi)
    - user evaluation
  - engineering
    - programming, manufacturing, assembling
    - testing & evaluation
  - sales
Strictly distinguish design and engineering

Source: Buxton 2007
In reality it is a bit more complicated
Prototyping as a part of SW dev. process

- **Waterfall**
  - in design phase
  - not evaluated
  - serves as specification
    - rather then text description

- **Iterative**
  - in implementation phase
  - can be evaluated
  - design perceived as a part of implementation

- In fact we can/should do prototyping in every stage continuously

- HOW? The role of evaluation must be revised?

Source: Buxton 2007
Users
What users expect?

- Support from the system
- Easy available functions
- Manageable cognitive load
- Focus on the primary task
- Pleasant experience
What kind of users do we have in mind?

- People are different
- The particular design is always a compromise
  - we do not consider rare extremes (illiterate user)
- Usually 5% “outlier” cases are eliminated
  - the result of this strategy is that some potential users can be discriminated
- Examples
  - car: height, weight
  - computer: font size, use of colors (colorblind)…
Classes of users

- **Novices**
  - limited set of functions available

- **Casual users**
  - standard set of functions

- **Advanced users**
  - advanced functionality

- **Experts**
  - sophisticated functionality

Consequence: necessity to split functions into individual categories

How can influence particular class of users implementation of functions?

What about the user interface design?
Examples of improper UI design
Examples of improper UI design

Hydroelectric power station Orlik
Interaction

MONITORING A SLEDOVÁNÍ AKTIVIT NA PC

Software Aktivity umožňuje legální monitorování zaměstnanců na PC. Poskytuje detailní přehled o činnosti v rámci pracovní úoby a využití software.

více informací

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Feedback, Where am I?
Functionality is not reachable

VÝZKOUŠET ZDARMA

Demo

Máte dvě možnosti:

• Stáhnout aplikaci pro vyzkoušení na svém počítači
• Vyzkoušet naše ONLINE verze bez nutnosti instalace

KAM DÁLE?

• Funkčionalita - Co umí aplikace Správce IT?
• Technické informace
• Chcete vidět, jak aplikace vypadá
• HelpDesk - správa požadavků a úkolů
Standards

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Usability

- Simplicity of learning to use the system
  - System can be learned easily and fast

- Memorability = Recall (Easy to remember)
  - Whether the user is able to use the system after a longer time

- Efficiency
  - Once the user learned how to use the system, the system will be fast to use
  - To carry out the task quickly and efficiently
Usability

- Minimum amount of errors
  - Preventing users from making errors
  - If encountered, inform the users on the cause and give an advice

- Satisfaction of the user
  - Subjectively pleasing
  - The user is convinced that the task has been successfully achieved
Design heuristics by Jakob Nielsen

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation
FORMAL DESCRIPTION OF UI

Scenarios, use-cases, storyboards
Goals vs. Tasks vs. Actions

- **Goal**
  - end result to be achieved

- **Task**
  - structured set of related activities undertaken in a sequence

- **Action**
  - one step or action performed (part of a task)
Describing Tasks and Requirements

- **Stories (extreme programming)**
  - short (3 sentences) narrative description of user activities
  - written by the user

- **Scenarios**
  - an informal narrative story, simple, ‘natural’, personal, not generalizable

- **Use cases**
  - assume interaction with a system
  - assume detailed understanding of the interaction

- **HTA form of Task Analysis**
Scenarios & Use-cases
Scenarios

- By one definition, a scenario is:
  - an informal narrative story
  - simple, ‘natural’, personal
  - not generalizable

- Some use term Task Scenario
  - Narrative description of a specific thing done with a current system
  - Like a concrete use-case (Real, representative)
Scenario example: Shared calendar

“The user types in all the names of the meeting participants together with some constraints such as the length of the meeting, roughly when the meeting needs to take place, and possibly where it needs to take place. The system then checks against the individuals’ calendars and the central departmental calendar and presents the user with a series of dates on which everyone is free all at the same time. Then the meeting could be confirmed and written into people’s calendars. Some people, though, will want to be asked before the calendar entry is made. Perhaps the system could email them automatically and ask that it should be confirmed before it is written in.”
Use cases

- Each use case has a name
  - e.g. Planning a meeting; Canceling a meeting

- A family (or set, or class) of scenarios
  - One main scenario for “normal” behavior or situation
  - A sequence of interactions
  - Also set of different but related scenarios

- Documenting Use Cases
  - (Maybe) A UML Diagram showing all of them
    - Actors are stick-figures; use cases are ovals
  - (Certainly) For each use case define using human language
    - A clear textual description (like a stories, a scenarios)
    - A set of scenarios in outline form
Example: Template for Use Cases

- **Use case number or id**
- **Use case title**
- **Text description (a few sentences)**
- **Preconditions (if applicable)**
- **Flow of Events**
  - **Basic path**
    - 1. First step
    - 2. Second step
    - 3. etc.
  - **Alternative Paths**
    - Name and short description (in words) of first alternative path/scenario.
    - Name and short description (in words) of 2nd alternative path/scenario.
- **Post conditions (if applicable)**
- **Special conditions (if applicable)**
Path for use case for shared calendar

1. The user chooses the option to arrange a meeting.
2. The system prompts user for the names of attendees.
3. The user types in a list of names.
4. The system checks that the list is valid.
5. The system prompts the user for meeting constraints.
6. The user types in meeting constraints.
7. The system searches the calendars for a date that satisfies the constraints.
8. The system displays a list of potential dates.
9. The user chooses one of the dates.
10. The system writes the meeting into the calendar.
11. The system emails all the meeting participants informing them of their appointment.
Storyboard
Storyboard

- a series of key frames as sketches
  - originally from movie industry; used to get the idea of a scene

- integrates scenarios and use-cases
  - shows the situations (sequence of tasks) where the user will interact with the future system to achieve the desired goal
  - typically one scenario = one storyboard (with possible alternative endings)
  - no explicit visualization of UI
  - no detail description of interaction with the system

- designer has a big picture of the whole situation

- users can evaluate intuitively the design plans
Storyboard example - BEEPER

Source: Ondřej Mandík, CTU student

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**Storyboard example - BEEPER**

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Storyboard example - Archive

Predarchivní pece - prevzetí

Ááá, skartační návrh. Tak tam zajedu vytištít objekty k archivaci.

Tak, vše je vsouadu se seznamem z protokolu o skartaci.

Nyní můžeme podepsat protokol o prevzetí.

Výborně.

Ted' si to nahrubo přetřidím a překartonuji.

Upravím soupis z protokolu o prevzetí, přidám evidenční číslo, metrál.

Tak a vše může jít na očištění a pak do depoču.

V areálu Archivu.

Ted' vše zaeviduji do knihy přírušků a urpavím evideční list NAD.

Nyní v Excelu udělám záznam do lokálního seznamu.

Peva

Excel

Archiválie jsou očištěny a uloženy do depoču.

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Storyboard example - Archive

Priprava a poradání arch. souboru

Tak se podívám na ten velkokotlak "Nováků". Mrknu do šanónu se spisem o Fondu...

Toto je důležité, zapíši si to ve Wordu do budoucího úvodu.

Soubor mám rozšířen a můžu se pustit do inventárního seznamu.

Spustím BACH a můžu začít.

Po dvou měsících v kanceláři.

Objevily se mi tu zajímavé archiválie. Chcím jsem s tebou probrat úpravu pořadacího schématu.

Inventář mám hotový.

Zavolám vedoucí, že to může můžeme dát k posouzení.

Objevily se mi tu zajímavé archiválie. Chcím jsem s tebou probrat úpravu pořadacího schématu.

Tak co jsi chtěl probrat.

Půl roku po zahájení zpracování.
PSYCHOLOGICAL ASPECTS
Moore’s Law

Memory
Speed
Portability
Affordability

Computers

Human Abilities

1950  1990  2014
Weather forecast - Nokia

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Weather forecast - iPhone
Weather forecast: What is the main difference?

- **Number of "clicks"?**
  - NOT necessarily

- **User's mental model?**

  ![Diagram showing relationships between application, browser, bookmark, web address, weather, and forecast for Nokia and iPhone devices.]

- **Is there anything wrong?**
  - complexity of mental model - NO
  - unknown terms and relations (coming from system mental model)
    - What is the weather in **Prague** for **tomorrow**?

- **What are the consequences?**
Different mental models

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Recommended readings

- Alan Cooper: About Face – The Essentials of Interaction Design
- Bill Buxton: Sketching User Experience
- Colin Ware: Visual Thinking for Design
Recommended readings

- Steve Krug: Don’t make me think
- Don Norman: The Design of Everyday Things
- Jakob Nielsen: Designing Web Usability
Other useful sources

- Nieslen&Norman Group
  - https://www.nngroup.com/

Recommended by PUR course

PREPARATION FOR THE NEXT WEEK

- Storyboards
  - https://www.pixton.com/
- Nielsen’s heuristics
Thank you for attention