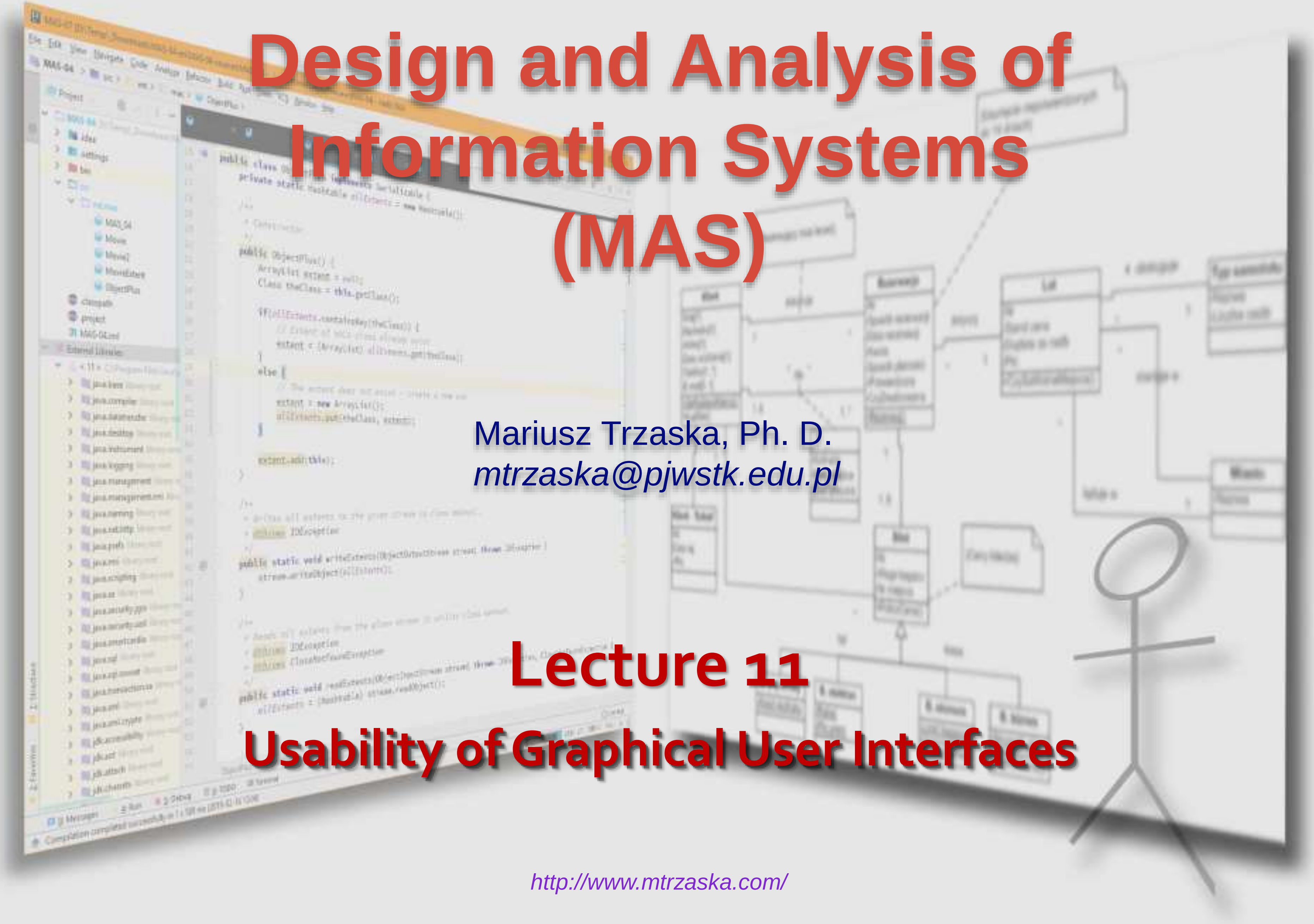
POLISH-JAPANESE ACADEMY OF INFORMATION TECHNOLOGY



Design and Analysis of Information Systems (MAS)

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Lecture 11

Usability of Graphical User Interfaces

http://www.mtrzaska.com/

Outline

- An introduction
- The usability
- Usability formation
- Usability tests
- Usability and business
- GUI checklist
- The Fitts' Law
- Different ways for implementing the GUI
- Summary

Graphical User Interfaces

- Very important topic related to a software development.
- Unfortunately, usually underestimated.
- Why?
- A user judges the application through the GUI.
- The borderline topic related to:
  - Computer sciences (including programming),
  - Psychology,
  - Ergonomic,
  - …

The Usability

- An ability to satisfy user's needs by:
  - A device,
  - An application,
  - An interface.
- In HCI and computer science, usability usually refers to the elegance and clarity with which the interaction with a computer program or a web site is designed.

http://www.uzytecznosc.pl, wikipedia.com

The Usability (2)

- The usability is related to:
  - Practical usefulness. Does the system perform all the task, which are needed by a user?
  - Easiness of learning. How long it takes to learn using the system? Is it easy enough?
  - Efficiency. Is the result presented in a right way?

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The Usability (3)

- The usability is related to – cont.:
  - Productivity. Is the result achieved with a moderate user's effort?
  - Satisfaction. Does a user like working with the system? Does he/she would recommend the system to other people?

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A Usability Formation

- A frequent surveys among the users during the development process,
- Testing the prototypes with the target users,
- A surveillance of the way the users work in real environment,
- Surveys, polls, etc..

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Usability and Business

- Nowadays, many applications have counterparts with similar functionalities.
- Hence, what are the criteria for selecting particular application by users?
  - A price,
  - Easy access for system's functions, which translates to user's satisfaction.

The high level of usability is just profitable!

Usability and Business (2)

- The new versions of popular applications (e.g. the ribbon in MS Office 2007) focus on usability improvements rather then adding new functionalities.
- Applications which succeeded because of high usability and a nice GUI.

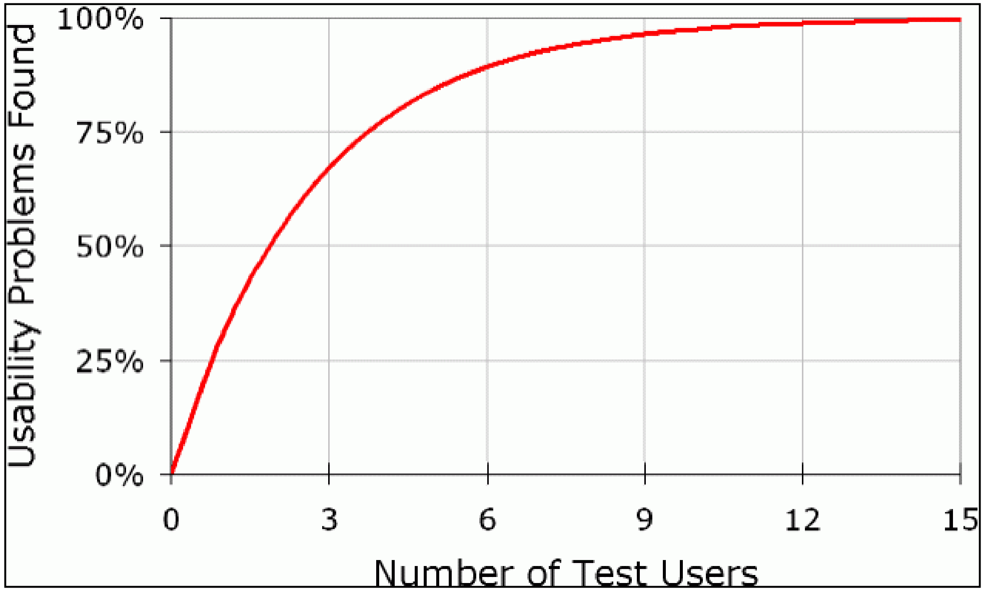
Usability Tests

- Tests with users:
  - Relevant testers
  - Realization of typical tasks
  - Watching:
    - What users do?
    - Where they have problems?
    - Recording, using e.g. a camera and/or a dedicated software.
  - Testers should be on their own. Do not:
    - give advices,
    - help.

http://www.useit.com/alertbox

Usability Tests (2)

- The number of testers
  - On contrary to statistical tests, the usability tests do not require many subjects,
  - Usually the group of 5 people is enough to catch most of usability problems,



Source: *Jakob Nielsen, Why You Only Need to Test with 5 Users*

Usability Tests (3)

- The number of testers – cont.
  - People in bigger groups just report the same problems,
  - It is much better to perform tests in small groups at the end of each iteration rather then use one big group.
- It is more important what users do rather then what they say.

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Usability Tests (4)

- Before we start a new project, let’s test a previous version (of course if there were a previous version) :
  - Identify positive and negative properties,
  - Strength the good ones and eliminate the bad ones.
- Check competitor’s solutions,
- Use prototypes:
  - A paper one,
  - A computer one.
- Iteration work – each phase ends with tests.
- Check the project according to existing guides.

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Benefits of a High Usability

- Shorter time of performing an operation,
- Decreased number of errors made by a user,
- Shorter learning curve,
- Trust to the product and wiliness of extending them,
- Permanent satisfaction for the product.

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GUI Tips

- Consistency,
- Clarity,
- Following the guidance for a particular platform.
- Utilization of the entire screen – proper resizing of the windows.
  - Very important,
  - Sometimes hard to implement.

The GUI Checklist

- A functionality
  - Do you take the same care to functionality and a presentation layer?
  - Does your window follow the design in 100%?
  - Does it have all required (designed) functions?
  - Does it have only designed functions?
  - Do you help user in avoiding typical mistakes by a proper window’s design?
  - Is your window in compliance with other windows of the same application?

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The GUI Checklist (2)

- A platform
  - Is your project in compliance with the platform (operating system) guidance?
    - Controls, fonts, colours,
    - Proper windows sizes,
    - A right layout,
    - Behaviour of controls and windows,
  - Exceptions from the above rules might cause in „strange” behaviour of the application.

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The GUI Checklist (3)

- A window
  - Does your window has a title?
    - Is the title similar to the button’s/option’s name which opened the window?
    - Windows without titles are hard to identify, e.g. in the task bar.
  - Does a title bar contain appropriate buttons?
    - Is it possible to maximize the window,
    - If so, is the possibility reasonable?
    - Is there a context help button?

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The GUI Checklist (4)

- A window – cont.
  - Is there a right border?
  - Does the window has a right order number?
  - Do you use modality?
- Controls
  - Do you use right types of controls rather artificially describing possible actions?

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The GUI Checklist (5)

- Controls – cont.
  - Are controls placed according to the user's reading order?
  - Are the most used options at „the beginning" of the window?
  - Is the number of controls not too big?
  - If so, then reorganize the layout using e.g. tabs.

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The GUI Checklist (6)

- Controls – cont.
  - Do you use controls according to their purpose described in the platform guide? E.g.
    - Exclusive options: radio buttons,
    - Many choices: check boxes.
    - List with single/multi selection.
  - Do your controls respond in a default way? E.g.:
    - Buttons after clicking should execute a command or open a window,
    - Radio buttons or check boxes should only change state.

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The GUI Checklist (7)

- Controls – cont.
  - Are controls with similar semantics grouped using e.g. frames?
  - Don’t you use too many frames, borders, etc. especially for single controls?
  - Does software turn on/off particular controls depending on user’s choice?
- Buttons
  - Does your dialog window have a default button? Is it specially marked?

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The GUI Checklist (8)

- Buttons - cont.
  - Is it possible to close the window using a default way, e.g.:
    - A button in the title bar,
    - The Esc key,
    - A Cancel button.
  - Is it possible to close a window without applying any changes?
  - A user should always have a safe way to cancel any changes.

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The GUI Checklist (9)

- Buttons – cont.
  - Are control buttons („OK,” „Cancel”) separated from the „main” controls?
- A menu
  - Is there a default option in the combo boxes?
  - Is an expanding list big enough to save many scrolls from user?

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The GUI Checklist (10)

- A menu – cont.
  - Is expanding list width enough to present all available items?
- Labels
  - Do you use proper labels for controls (especially in lists and menus)?
  - Are all presented data described?
  - What is an alignment of the labels (related to controls and other labels)?

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The GUI Checklist (11)

- Labels - cont.
  - Are colons consistently used (or avoided) in all labels?
  - Do you use tooltips describing details of the interface?
    - Tooltips which replicate standard labels are useless.
  - Do you use special, national chars?

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The GUI Checklist (12)

- A keyboard
  - Do you use shortcuts, which are preferred by advanced users?
  - Is it possible to move focus from one control to another using Tab and Shift-Tab keys?
  - Is a moving order compliant with controls order?
  - Is it possible to get to every control in the window?

http://www.uzytecznosc.pl

The Fitts Law

- The test

http://www.uzytecznosc.pl/prawofittsa/index.html

The Fitts Law (2)

- The time of selecting a target depends on a distance and target’s size.
- Simplified model of the Fitt’s law:
- $T = \log_2(D/W + 1)$
  - T is average time needed to track the target.
  - D is a distance from the starting point to the target’s centre.
  - W is a target’s width).
- Ability to precise measurement of the pointing devices quality.

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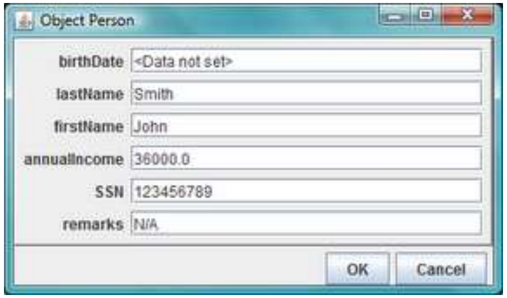
The GUI Implementation

- Manual implementation of the GUI:
  - Is time-consuming and complicated,
  - Could leads to many errors,
- Dedicated GUI editors are worth using. They allow „drawing" the GUI and connecting events.
- Sometimes there might be a need to introduce manual fixes to the generated code.
- A declarative way.

The GUI Implementation (2)

- A declarative way
  - Could be based on annotations, configuration file, etc.
  - Using a dedicated language – usually a DSL (Domain Specific Language)
    - Communication through Strings of the „main" programming language,
    - A compilator modification,
    - A special design of the API,

      which mimics a separated language:



birthDate	<Data not set>
lastName	Smith
firstName	John
annualIncome	36000.0
SSN	123456789
remarks	N/A

```
JFrame frame1 = create.frame.usingOnly(person);
```

    - A sample DSL: http://code.google.com/p/gcl-dsl/

The GUI Implementation (3)

- Most of the modern programming languages uses components working with events.
  - Java
    - AWT
    - Swing
    - SWT (Eclipse)
    - JavaFX
  - MS .NET (C#, C++, VB)
    - Windows Forms,
    - Windows Presentation Foundation.

The GUI Implementation (4)

- The set of components used for the GUI creation is similar in each programming language.
- The most important differences affect the layout managers
  - It seems that in most cases the best one is „anchored" (utilized in MS .NET and recently in Java).
- The deep understanding of the GUI design and implementation process is time-consuming and requires a lot of practise.

The Summary

- A Graphical User Interface is a very important aspect of almost any application.
- Unfortunately it is always one of the most underrated one.
- The right design of the GUI is not an easy task but still possible.
- Implementation of the GUI is usually quite complicated. Therefore it is a good idea to use some editors, libraries which makes the whole process much easier.
- The declarative approach is getting more attention.