University of Zurich UZH

Department of Informatics

Advanced Software Engineering

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Reading Assignment: Problem Solving, Problem Frames

1. Mandatory preparation tasks (to be done PRIOR to the lecture)

1.1 Mandatory reading

• Read [Jackson 2005] on Problem Frames. For deepening your understanding, you may study the slides by Jackson [Jackson 2006]. From [Jackson 2005] extract in particular

  – Problem Frames as a problem solving technique,

  – The impact of the entailment $S, W \mathrel{|\!-} R$,

  – The role of normal vs. radical design.

  Please note that there are typesetting errors [Jackson 2005]: On p. 905, left column: $S, W \mid R$ should be $S, W \mathrel{|\!-} R$ and in Fig. 2 and 3: $\aleph$ should be $\approx$.

• Read [Shaw 2012] on Design Spaces. Reflect on the role of design spaces for problem analysis and problem solving. Search for examples of design spaces in your own software design experience.

• Read the essay by Grady Booch [Booch 2012] on balancing discovery, invention, and implementation when tackling innovation problems. Contrast this with the notion of a well-organized software development process.

• In his essay, Booch mentions Parnas' approach of faking a design process. He actually doesn't cite the corresponding paper; maybe assuming that every software engineer knows that seminal paper. In fact, if you want to call yourself a software engineer, you must have read this paper [Parnas and Clements 1986]. In the context of this assignment, you must at least browse the paper and get an idea of Parnas' and Clements' notion of faking a rational design process.

• Read the section on Parnas Tables in [Herrmannsdörfer et al. 2008] for a short account of the so-called four-variable model, originally developed by Parnas and Madney (1995). For which class of problems does the four-variable model provide a generic problem solution?

• Repeat/recall other problem structuring and problem solving approaches such as

  – Design patterns and architectural patterns, in particular Model-view-controller [Krasner and Pope 1988]

  – Abstraction / Information hiding [Parnas 1972] / Design by Contract [Meyer 1992]

  – The 4+1 View [Kruchten 1995]

  and analyze what & how they contribute to organizing and solving problems.

1.2 Preparation tasks

Be prepared to

  • summarize the papers you have read,

  • answer questions in class,

  • discuss your insights from your reading in class.

2. Optional reading

- You find an in-depth treatment of problem frames in Jackson's book [Jackson 2001].
- As mentioned above, once in your lifetime you should read [Parnas and Clements 1986] in full.

3. Lecture

There will be no classic lecture. Instead, we will discuss the topic based on your reading.

References

Booch, G. (2012). The Professional Architect. *IEEE Software* **29**, 1 (Jan 2012). 12-13.

Herrmannsdörfer, M., S. Konrad, B. Berenbach (2008). Tabular Notations for State Machine-Based Specifications. *Crosstalk*, issue 3/2008. 18-23.

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M. Jackson (2005). Problem Frames and Software Engineering. *Information and Software Technology* **47**, 14 (Nov 2005). 903-912.

M. Jackson (2006). *A Tutorial on Software Development Problem Frames*. BCS RESG Problem Frames Day, The Open University, Milton Keynes, UK. 10 May 2006.

Krasner, G.E., S.T. Pope (1988). A Cookbook for Using the Model-View-Controller User Interface Paradigm in Smalltalk-80. *Journal of Object-Oriented Programming* **1**, 3. 26-49.

Kruchten, P.B. (1995). The 4+1 View Model of Architecture. *IEEE Software* **12**, 6 (Nov 1995). 42-50.

Meyer, B. (1992). Applying "Design by Contract". *IEEE Computer* **25**, 10 (Oct. 1992). 40-51.

Parnas, D.L. (1972). On the Criteria To Be Used in Decomposing Systems into Modules. *Communications of the ACM* **15**, 12 (Dec. 1972). 1053-1058.

Parnas, D.L. and Clements, P.C. (1986). A Rational Design Process: How and Why to Fake It. *IEEE Transactions on Software Engineering* **SE-12**, 2 (Feb 1986). 251-257.

Parnas, D.L., J. Madey (1995). Functional Documents for Computer Systems. *Science of Computer Programming* **25**, 1 (October 1995). 41-61.

Shaw, M. (2012). The Role of Design Spaces. *IEEE Software* **29**, 1 (Jan 2012). 46-50.

Hints

- Jackson (2001) is available in the IfI library (Standardliteratur Glinz)
- Jackson (2005) is available (free download from the uzh.ch domain) at
  http://www.sciencedirect.com/science/article/pii/S0950584905001229
- Herrmannsdörfer et al (2008) can be downloaded from
  http://www.crosstalkonline.org/storage/issue-archives/2008/200803/200803-Herrmannsdrfer.pdf
- Papers published by IEEE are downloadable from the IEEE digital library
  (http://ieeexplore.ieee.org; free access from the uzh.ch domain)
- The other papers/slides will be made available at
  http://www.ifi.uzh.ch/seal/teaching/courses/ase.html
- The Problem Frames notation is summarized in Appendix 1 (pp.354-360) of Jackson (2001).