Modeling and Analysis: Analysis

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Abstract
Models only get value when they are actively used. We will focus in this presentation on analysis aspects: accuracy, credibility, sensitivity, efficiency, robustness, reliability and scalability.

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1 Introduction

Figure 1: What Comes out of a Model
2 Model Applicability

![Diagram of model applicability]

Figure 2: Applicability of the Model

**try out models**
- be aware of accuracy, credibility and working range

**simple and small models**
1. Estimate accuracy of results
   - based on most significant inaccuracies of inputs and assumed model propagation behavior
2. Identify top 3 credibility risks
   - identify biggest uncertainties in inputs, abstractions and realization
3. Identify relevant working range risks
   - identify required (critical) working ranges and compare with model working range

**substantial models**
- systematic analysis and documentation of accuracy, credibility and working range

Figure 3: How to Determine Applicability
A system design assumption is often:
the performance of this function 
{is constant | is linear | doesn’t exceed x | ...}

The working range is the interval where this assumption holds

Figure 4: Working Range examples

Figure 5: Example of Picture Cache Working Range
Figure 6: Common Pitfalls
3 Design quality

What is the system behavior and performance for worst case access patterns?

Figure 7: Example of Worst Case Picture Cache

Which design assumptions have a big impact on system performance?

What are the worst cases for these assumptions?

How does the system behave in the worst case?

a. poor performance within spec
b. poor performance not within spec
c. failure -> reliability issue

Figure 8: Worst Case Questions
**Figure 9: FMEA-like Analysis Techniques**

- **safety**
  - hazard analysis
  - potential hazards
  - damage
  - measures

- **reliability**
  - FMEA
  - failure modes
  - exceptional cases
  - effects
  - measures

- **security**
  - vulnerability risks
  - consequences
  - measures

- **maintainability**
  - change cases
  - impact, effort, time
  - decisions

- **performance**
  - worst cases
  - system behavior
  - decisions

**Figure 10: Brainstorming Phases**

- wave 1: the obvious
- wave 2: more of the same
- wave 3: the exotic, but potentially important

> don't stop too early with brainstorming!

**Figure 11: Different Viewpoints for Analysis**
sensitivity: how sensitive is the system output for small changes in input or realization?

Figure 12: Example Sensitivity

CPU utilization is "only" 8%
what is the efficiency?

Figure 13: Example of CPU Utilization and Efficiency
Figure 14: Efficiency is Context Dependent!
4 Specification feasibility

5 Life Cycle Changes

6 Inputs

7 Summary

References


History

Version: 0.2, date: 27 February, 2007 changed by: Gerrit Muller
- article version without text created
- logo defined

Version: 0.1, date: 17 January, 2007 changed by: Gerrit Muller
- added list with pitfalls
- added working range examples
- added worst case example and questions
- added brainstorm recommendation
- added FMEA-like method
- added analysis viewpoints
- added efficiency, sensitivity and robustness slides

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