

Software Product Lines

Lecture Topics

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December 1, 2021

Overview – Lecture Topics

Ad-Hoc Approaches for Variability

1. Introduction
2. Runtime Variability and Design Patterns
3. Compile-Time Variability with Clone-and-Own

Modeling and Implementing Features

4. Feature Modeling
5. Techniques for Embedded Software

6. Techniques for Application Software

7. Language-Based Techniques
8. Development Process

Quality Assurance and Maintenance

9. Feature Interactions
10. Product-Line Analyses
11. Product-Line Testing
12. Evolution and Maintenance

Overview – 1. Introduction

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Topic 2

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Topic 3

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Overview – 2. Runtime Variability and Design Patterns

Configuration of Runtime Variability

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Realization of Runtime Variability

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Design Patterns for Variability

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Overview – 3. Compile-Time Variability with Clone-and-Own

Compile-Time Variability and Clone-and-Own

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Summary

Clone-and-Own with Version Control

Software Configuration Management

Version Control Systems

Clone-and-Own with Build Systems

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Overview – 4. Feature Modeling

Feature Models

- Implicit Knowledge About Features
- Features in Industrial Practice
- Feature Models and Configurations
- Summary

Representations and Translations

- Feature Diagrams
- Propositional Formulas
- Transforming Diagrams into Formulas
- Other Representations

Summary

Automated Analyses

- Inconsistencies in Feature Models
- Valid Configurations
- Void Feature Model
- Core and Dead Features
- Edits to Feature Models
- Other Analyses
- Tool Support
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Overview – 5. Techniques for Embedded Software

Build Systems

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Preprocessors

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Feature Traceability

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Overview – 6. Techniques for Application Software

Components

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Services and Microservices

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White-Box and Black-Box Frameworks

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Overview – 7. Language-Based Techniques

Mixins

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FOP

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AOP

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Overview – 8. Development Process

Domain and Application Engineering

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Overview on Implementation Techniques

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Adoption of Product Lines

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Overview – 9. Feature Interactions

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Overview – 10. Product-Line Analyses

Analysis Strategies

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Analysis of Feature Mappings

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Analysis of Variable Code

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Overview – 11. Product-Line Testing

Combinatorial Interaction Testing

- Motivation
- Pairwise Interaction Testing
- A Greedy Algorithm
- Meta-Heuristic Search
- T-Wise Interaction Testing
- Effectiveness of Combinatorial Interaction Testing
- Efficiency of Combinatorial Interaction Testing
- Summary

Solution-Space Sampling

- Coverage in Single-System Engineering
- Coverage of Ifdef Blocks

- Presence-Condition Coverage
- Encoding Solution Space in Feature Models
- Overview on Coverage Criteria
- Overview on Input for Sampling Algorithms
- Summary

Sampling without Coverage

- Random Sampling
- Uniform Random Sampling
- Automation in Product Sampling
- Expert Knowledge in Sampling
- Testing the Linux Kernel
- Missing: Test-Case Selection/Generation
- Summary

Overview – 12. Evolution and Maintenance

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