Software Reuse and Reusability based on Requirements

Product Lines, Cases and Feature-Similarity Models

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***Abstract*—Several socio-economic trends are increasing personalised customer demands. Suppliers are responding with mass customisation but the management of large-scale cost-effective software reuse remains a difficult challenge. Software reuse and reusability range from operational, ad-hoc and short-term to strategic, planned and long-term. Often the focus of attention is just on code or low-level design. This tutorial presents and compares two different requirements-led approaches. The first approach deals with requirements reuse and reusability in the context of *product line engineering*. The second approach deals with requirements reuse and reusability in the context of *case-based reasoning*. Both approaches have different key properties and trade-offs between the costs of making software artefacts *reusable* and the benefits of *reusing* them. To aid large-scale development we have proposed a *Feature-Similarity Model*, which draws on both approaches to facilitate discovering requirements relationships using similarity metrics. A Feature-Similarity Model also helps with the evolution of a product line, since new requirements can be introduced first into a case base and then gradually included into a product line representation.**

***Keywords*-reuse; reusability; feature-similarity model; case-based reasoning**

I. Presenters' Bios

Hermann Kaindl joined the Institute of Computer Technology at TU Wien in Vienna, Austria, in early 2003 as a full professor. Prior to moving to academia, he was a senior consultant with the division of program and systems engineering at Siemens Austria. There he has gained over 24 years of industrial experience in software development and human-computer interaction. He has published five books and over 230 papers in refereed journals, books and conference proceedings. He is a *Senior Member* of the IEEE and a *Distinguished Scientist* Member of the ACM, and he is on the executive board of the Austrian Society for Artificial Intelligence.

Mike Mannion is a full Professor of Computing at Glasgow Caledonian University, Glasgow, Scotland, UK. He has several years' software engineering industrial experience and his research interests include product-line engineering, software engineering and engineering education. He is a Chartered Engineer, a member of IEEE and ACM, and a *Fellow* of the British Computer Society. He has published over 50 papers and delivered over 25 tutorials.

II. Motivation and Objectives

A. Motivation

This tutorial focuses on effective requirements reuse and reusability to reduce the effort in developing requirements whilst maintaining the level of precision and quality and risk mitigation that has been worked through on previous projects.

B. Objectives

At the end of this tutorial, participants will be able to:

- understand strategic versus operational reuse and reusability,
- debate the trade-offs between the costs and benefits of reuse and reusability,
- describe two different approaches to requirements-led strategic requirements reuse and reusability: in software product line engineering and using case-based reasoning,
- explain a new Feature-Similarity Model, which draws on both approaches to facilitate managing software reuse and reusability based on requirements, in large-scale systems with commonality and variability.

III. Target Audience

Attendees will be assumed to have some familiarity with software product line development environments and feature modelling but do not need a background in case-based reasoning, because the fundamental ideas and concepts will be introduced.

IV. Overview of the Content

- Introduction
- Part 1: Motivation for Retrieving Similar Products in Software Product Lines
- Part 2: Feature Model Based Development
- Part 3: Case-Based Reasoning
- Part 4: Similarity Matching in Software Product Line Development
- Summary and Conclusion

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