QUALITY-ORIENTED SOFTWARE PRODUCT LINE

By

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Abstract

In software engineering, quality evaluation and achievement are difficult tasks because of the complexity of the software systems. Software reuse is one of the most promoted ways to improve software quality. Software Product Line Engineering (SPLE) is a newly established reuse-based paradigm, which has been well-recognised by the industry. SPL has been successfully applied by the companies such as HP, Philips, Siemens, TomTom and so on.

Instead of developing individual software products from scratch, SPL aims to develop a set of similar software systems which share commonalities within a particular application domain. In software product lines (SPLs), reusable assets are developed from the beginning with the view that they will be used in other similar software products. Once they have been successfully developed, the individual product development follows a rigorous customisation process.

Quality-related issues for product lines, on both requirement and architectural levels, are the main focus of my research. To enhance quality-oriented product configuration, we have proposed an approach of measuring the contributions of software features to quality attributes. Features are compared in a pair-wise fashion, and the result is used to generate a ranking list, in which is indicated the relative importance of features to software quality achievement. The ranking list of features is able to greatly help software engineers to understand the factors that impact on final quality, thus assisting product configuration of SPLs. Additionally, the efficiency of feature-based configuration should also be improved, as configuration is normally a time-consuming and error-prone task. To improve the efficiency of configuration, we have taken into account of the dependencies between features,
and adapted some classical algorithms to reduce errors and rollbacks possibly occurring in
the product configuration. We have also considered quality issues in the process of soft-
ware product line architecture development. A quality-oriented architectural framework
has been proposed to specify various views and components composition for improving
the quality awareness at the architectural level.

We believe that software quality should be emphasised and modelled throughout the
whole process of SPL development, rather than been focused on in a particular phase
in the development. We have proposed an aspect-oriented SPL framework, in which
we have introduced aspect-oriented modelling for both feature modelling and reference
architecture design. The proposed framework is expected to model the impact of the non-
functional requirements (NFRs) better, and to deal with software quality from requirement
engineering to architecture design in a systematic way in SPL development.
DECLARATION

The thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to the final version of my thesis being made available worldwide when deposited in the University’s Digital Repository**, subject to the provisions of the Copyright Act 1968. **Unless an Embargo has been approved for a determined period.
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