CHAPTER 2  Overview of the Articles

This chapter provides an overview of the articles included in this thesis. In addition the relation of a few related publications to the work in this thesis is explained (Section 4). The articles have been grouped in three parts.

Part I discusses OO frameworks. Object Oriented frameworks can be seen as a specific technique for capturing the commonalities of a family of related applications in a domain. By extending the OO framework with application specific functionality, a specific product can be created.

In Part II, the topic is variability and variability realization techniques. OO frameworks can be seen as a specific technique for incorporating variability in a reusable piece of software. However, there are many more techniques that can be used at various points in the life cycle of a software system.

Finally, in Part III we discuss design erosion, a phenomenon we have observed in large systems which have been under development for a few years. Such systems have a tendency to erode under the constant pressure of new requirements that were not foreseen during the initial development of the system and consequently cannot be met by using variability realization techniques such as discussed in Part I and Part II. In order to meet such requirements, developers make changes to the system that bend or even break the assumptions under which it was designed. The accumulation of such changes causes the overall quality of the system to decrease making it even harder to meet additional requirements. Countering design erosion often requires major architecture level changes that have a large impact on the rest of the system. Part III also includes a partial solution to this problem in the form of an architecture notation with support for separation of concerns. The notation makes it possible to modularize and rearrange architecture designs.

The included articles have only been edited for layout. The content of the articles is the same as the corresponding publications.
1 Part One: Object Oriented Frameworks

The articles in this part discuss Object Oriented Frameworks. Chapter 3 discusses a framework for the implementation of finite state machines and the rationale for the design. Based on this work and our analysis of other frameworks, Chapter 4 was written. This article discusses framework concepts and guidelines for creating reusable and evolvable frameworks. In Chapter 5 the notion of role based software engineering is discussed. The ideas in this book chapter elaborate on the ideas in the previous article. Finally, Chapter 6 discusses a method for analysing and evaluating framework designs using a so-called bayesian belief network. The belief network (SAABNet) is a representation of knowledge about quality attributes and certain design decisions. The concepts and guidelines from Chapter 4 were used to structure the knowledge in SAABNet.


2 Part Two: Variability

The two articles included in part two both discuss the concept of variability in software systems. The object oriented frameworks we discussed in part one, can be seen as a concrete technique to have variability in a software system. The articles in this part abstract from this concrete technique. The first article (Chapter 7) discussess terminology as well as a procedure for managing variability in software systems. The other article Chapter 8 presents a taxonomy of techniques that can be used to create variability in a software system. Unfortunately, this article was not yet accepted at the moment of writing and is included as a technical paper.


3 Part Three: Design erosion

In the last part of this thesis, two articles are presented that identify, define and address the phenomena of design erosion. In Chapter 9, we introduce this phenomena and present a case study to demonstrate the effects of design erosion. Also we identify a number of design erosion related issues in this article. In Chapter 10, we outline an approach to addressing some of these issues and present a technique for implementing the first step of this approach.


4 Related publications

The following related publications are not included in this thesis. Chapter 3 and Chapter 4 are both based work presented in my master thesis [Van Gurp 1999]. These articles, Chapter 6 and an early version of Chapter 8 were also included in my licentiate thesis [Van Gurp 2000] which was defended at the Blekinge Technical University on Februari 26, 2000. The Swedish licentiate degree is unique to Scandinavian countries and is typically awarded to people who are half way through their Ph. D. Two early versions of Chapter 6 were presented at workshops [Van Gurp & Bosch 1999] [Van Gurp & Bosch 2000a]. Also, an early version of Chapter 7 was submitted to the Landelijk Architectuur Congres [Van Gurp & Bosch 2000b]. Finally, Chapter 7 was also a deliverable for the ESAPS project we took part in and was included in the public results of this project [Van Gurp & Bosch 2001].
