Visualisation of Variability to Support Product Derivation in Software Product Lines

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Research Area	SPL 1
Project Title	Visualisation of Variability to Support Product Derivation in Software Product Lines

Motivation

In software product line engineering similarities between products are exploited to optimise the production of a new software product. Developing products based on a product line approach allows:

- ❑ a variety of systems with a minimum of technical diversity
- ❑ significant improvements in time-to-market, cost and quality

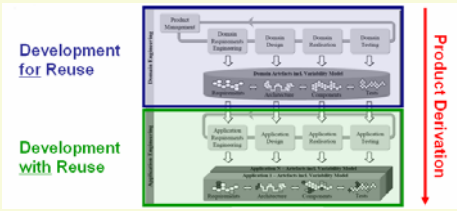

Fig. 1: Software Product Line Engineering Framework

To benefit from these productivity gains we have to ensure that application engineering processes are performed as efficiently as possible. One way of facilitating this is to support the activities by providing visual and interactive tools.

Research Challenge

Industrial size product lines can easily incorporate thousands of variation points and configuration parameters for product customization. Managing this amount of variability is extremely complex.

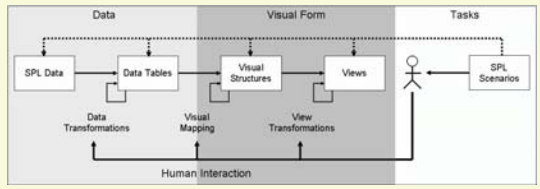

Fig. 2: Reference model for SPL visualisation

The challenge is to explore the effectiveness of basic and advanced visualisation techniques and layouts in the management of variability applied to the product derivation process within software product line engineering.

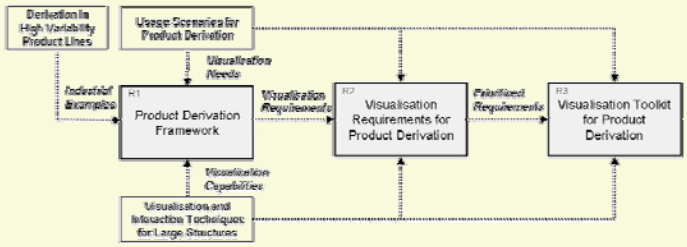

Fig. 3: Research Framework

Envisaged Research Approach

- ❑ Explore the viability of automatically generating interactive visualisations with interactions defined in a model
- ❑ Attempt to use novel combinations of focus+context and interaction techniques and explore their effectiveness at assisting cognition

State of the Art

Visualisation is widely used in software engineering and has proven useful to assist cognition in data intensive environments.

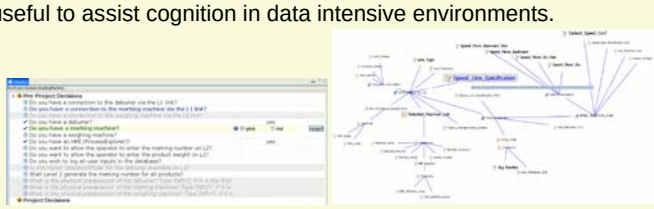

Fig. 4: Detail from DOPLER (right) and V-Visualise (left)
Both are decision trees

- ❑ Product lines often represented by **decision trees** or **feature trees**
- ❑ Though conceptually different – visually these are both **graphs**
- ❑ **Feature trees** most popular method

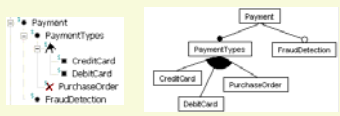

Fig. 5: Polyarchy and FODA style representations of a feature tree

Results

- ❑ Literature review of general visualisation techniques
- ❑ Meta model developed based on current modelling approaches
  - Provides **syntax** and **semantics** for a visual representation
- ❑ Development of prototype tool – **VISIT-FC**
- ❑ **Publications:** Papers presented at ViSPLE '07, VaMoS '07 and '08 CASCON '07 and accepted at SPLC '08 show how the use of simple *interaction* and *focus+context* techniques assist the user in comprehension of both the model, and the consequences of any action taken
- ❑ A unique feature of the approach used is the ability to view the product line from a high level with ***decisions***, at the ***feature*** level and at the ***component*** level, while dependency information to maintains context

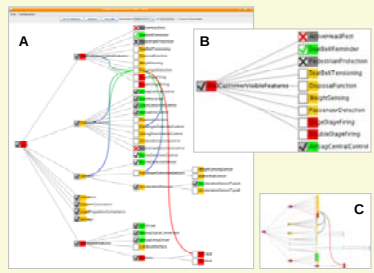

Fig. 7: VISIT-FC Configuration viewer showing features of a product line

Future Work

- ❑ Implementation of functionality described by feature meta-model
- ❑ Evaluation of approach
  - User studies, case studies
- ❑ Use of different layouts and views
  - particularly those that provide distortion