



Criteria for Comparing Requirements Variability Modeling Notations for Product Lines

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Outline

- Introduction
- Comparison framework
- Evaluation & Results
- Limits and further work

Introduction

- Industrial context: developing a PL of blood analysis automatons.



- Complex systems: biology + software + firmware + electronic + mechanic

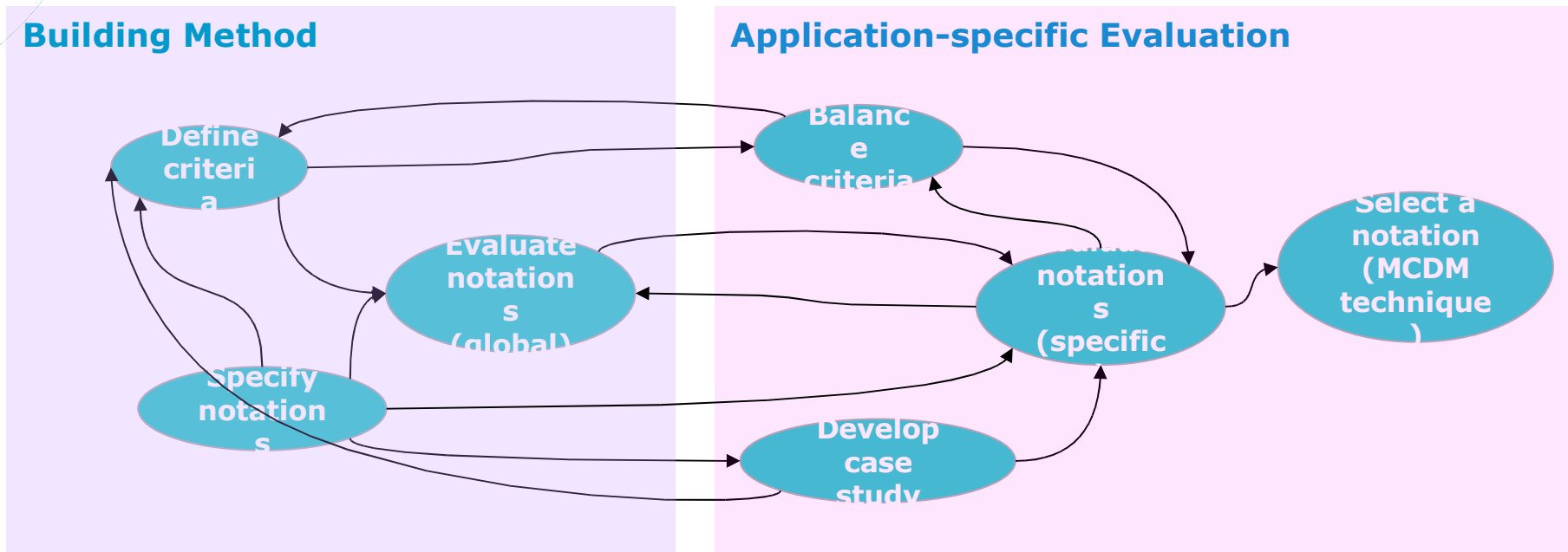
Introduction

- Research project: developing a method to establish a PL specification variability model, by reverse engineering and integrating the existing specification, so that it allows the easy derivation of new automats.
- Paper issue: prescribing a method to enable the automats specification management by considering their variabilities.
- Many approaches (families of) dealing with requirements variability for PL:
 - Feature based approaches: FODA, FeatuRSEB, FORE ...
 - Goal based approaches: MAP, KAOS ...
 - Use Case based approaches: Halmans & Pohl, Maßen, John & Muthig ...
 - UML based approaches: Clauss, Jézéquel & Ziadi ...
 - Aspect based approaches: Gomaa, AORE approaches ...

→ **What to choose ?**

Comparison strategy

- A decision-making method about the use of a given variability modeling technique.
- Research method:



Define criteria

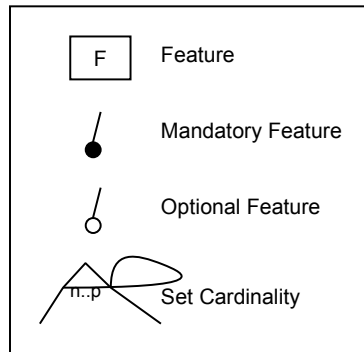
- The criteria on notations are defined over brainstorming sessions gathering different stakeholders.
- Criteria list:
 - c1.** Readability
 - c2.** Simplicity and expressiveness
 - c3.** Type distinction
 - c4.** Documentation
 - c5.** Dependencies
 - c6.** Evolution
 - c7.** Adaptability
 - c8.** Scalability
 - c9.** Support
 - c10.** Unification
 - c11.** Standardizeability

Specify notations

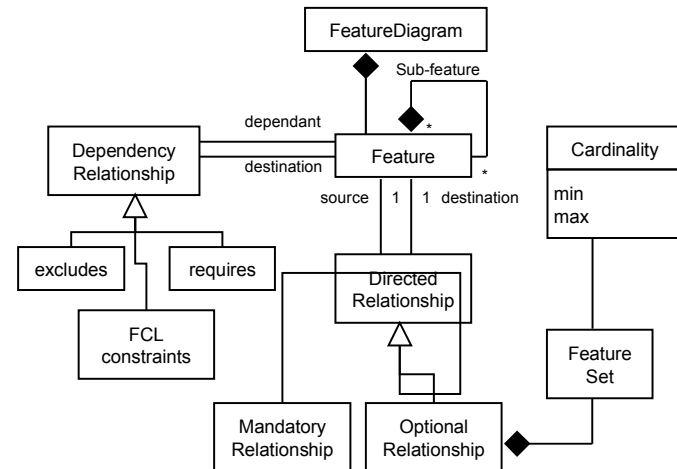
- For each notation:
 - Syntax (c1, c2, c3, c4, c7, c11)
 - Metamodel (c1, c2, c4, c5, c6, c8, c10)
 - Case study example (c1, c2, c3, c8, c11)
 - Evaluation
- Specimen of feature-based notations:
 - FODA
 - FOPLE
 - FORM
 - FeatuRSEB
 - Bosch' notation
 - GP
 - FORE
 - PLUSS notation

Specify notations - FORE example

Syntax

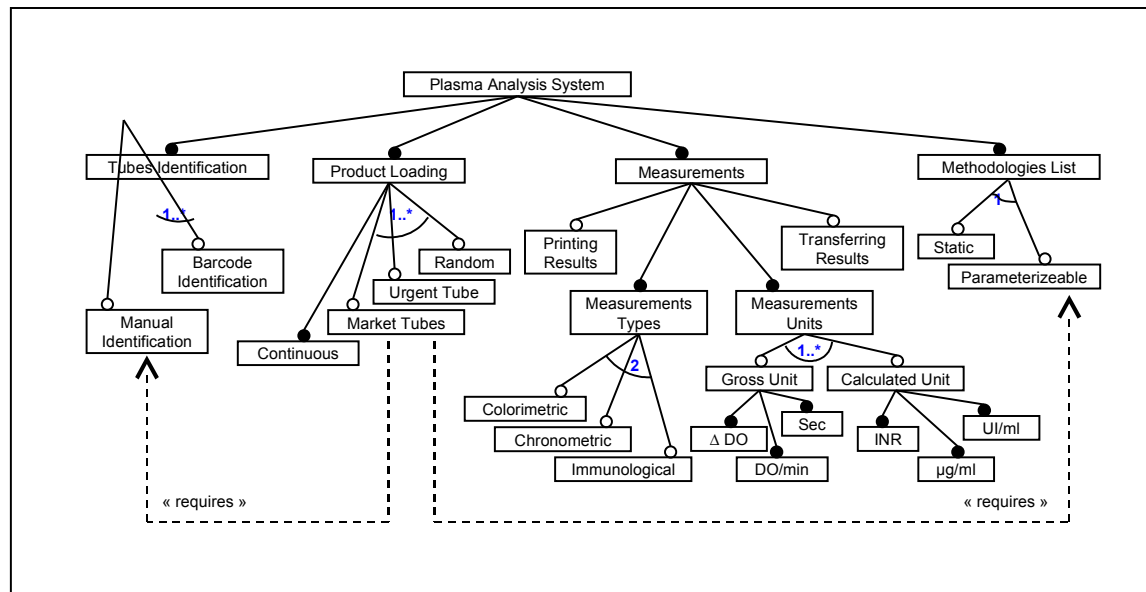


Metamodel



Develop case study - FORE example

Case study



Evaluate notations (global)

	FOPLE	Featu RSEB	GP	FORE
Readability	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Simplicity and expressiveness	<input type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Type distinction				
Documentation			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Dependencies				<input checked="" type="checkbox"/>
Evolution	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Adaptability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Scalability	<input type="checkbox"/>			
Support	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Unification	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Standardizeability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Legend:

- full support of the criterion
- partial support of the criterion
- no support of the criterion

Evaluate notations (specific)

	FOPLE	Featu RSEB	GP	FORE
Type distinction				
Dependencies				■
Standardizeability	□	□	□	
Simplicity and expressiveness	□		■	■
Readability	□	■		

→ FORE notation is the most suitable notation (among our specimen) to model requirements variability for blood analysis automatons PL.

Limits and further work

- Enlarging the spectrum of the modeling requirements techniques to include all approaches families.
- Generalizing the framework to more application domains.
- Defining a formal and systematic method allowing the choose of the most suitable notation for a given context.
- Refining the list of the criteria (new criteria, categorization, ...)
- Defining parameters of the criteria and means to measure them quantitatively and/or qualitatively.
- Validating criteria by domain experts (academia and industry backgrounds).



Thank you

- Questions ?