Refinement Propagation
Towards Automated Construction of Visual Specifications

Context:
SEAM is a method for enterprise design where the enterprise, its environment and its construction are represented as a hierarchy of systems.

Modeling process:
1. Modeler's design decision.
2. The modeler needs to adjust the specification to maintain its correctness.

• The number of adjustments might make the design process tedious for large specifications
• Goal: to control specification correctness by automated adjustment.

References:
- Refinement calculus: [Back, R.-J. and von Wright, J. (1998)]

Research Result:

DEF: Specification $S$ (old) is correctly refined by specification $S'$ (new) $S \sqsubseteq S'$, if $S'$ satisfies any requirement satisfied by $S$.

Refinement Propagation
A basis refinement of an arbitrary element $X$ of the specification may cause a conflict between certain elements, such that

$$X \sqsubseteq X' \land S(X) \sqsubseteq S(X')$$

To resolve this conflict, refinement $X_1'$ of some other element $X_1$ of the spec is usually required.

Adjustment:

1. Initiating
2. Conflict
3. Adjustment

**Step 1**

Adjustment:

To express “old” Name using a “new” data structure.

Client_old = $\{n:Name\}$;
Client_new = $(fn:FName, ln:LName)$;
R: $(\Sigma_{Client} \rightarrow \{true, false\}) \rightarrow ($
$(\Sigma_{Client} \rightarrow \{true, false\}) \land ($
$(\Sigma_{FName} \times \Sigma_{LName}) \rightarrow \Sigma_{Name}$)

1. $n := \text{substr}(fn + ln, 30)$
2. $n := ln$

**Step 2**

Adjustment:

$E(\text{n:Name}) \Leftrightarrow E1(\text{fn:FName}; \text{ln:LName})$,
Considering $n = ln$

$E1(\text{"John","Smith"}) \Leftrightarrow E(\text{"Smith"})$
(Rule 2)

**Step 3**

Adjustment:

Pre (n:Name) $\Leftrightarrow$
Pre1(fn:FName; ln:LName), …
(Rules 4-5)