Refactoring Product Lines

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Product line derivation and evolution benefit from refactoring

Guidelines and safety
But PL refactoring should go beyond code…

Rain of fire
and deal with populations and families too!
Outline

- Feature model semantics and refactoring
- Feature model refactoring catalog
- Population and family refactoring
- Case study
Feature model transformational semantics

\[ \text{forms} = (B \Rightarrow \neg C) \land (C \Rightarrow \neg B) \]
Reduction strategy to features and formulae language

\[ \text{forms} = \text{forms} \land (A \Rightarrow (B \lor C)) \]
Valid configurations semantics

\[ \text{semantics}(A, B, C) = \{A, B\}, \{A, C\}, \ldots \]
Feature model refactorings as improved configurability

\[
\begin{align*}
\{A, B\} & \subseteq \{A, C\} \\
\{A, B\} & \subseteq \{A, B, C\} \\
\cdots & \\
\end{align*}
\]
But no need to think about semantics directly: add alternative node
Refactoring catalog
Refactoring populations and families: feature models

\[ fm_1 \sqsubseteq fm = \]
\[ fm_1 \sqsubseteq fm \land fm_2 \sqsubseteq fm \]
Refactoring populations and families: code

\[
p1 \ p2 \sqsubseteq pL = \exists p,q \in pL \bullet p1 \sqsubseteq p \land p2 \sqsubseteq q
\]
Case study: code refactoring
Case study: feature model refactoring
Conclusions

- Extended refactoring notion
  - feature models
  - populations and families
- Formalization
- Refactoring catalog
- Need to deal with
  - configuration knowledge
  - refactorings relationships
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