Isolated Features Detection in Feature Models

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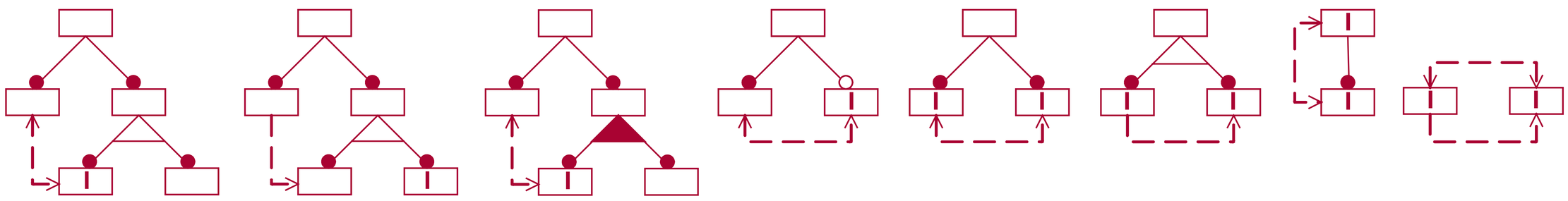
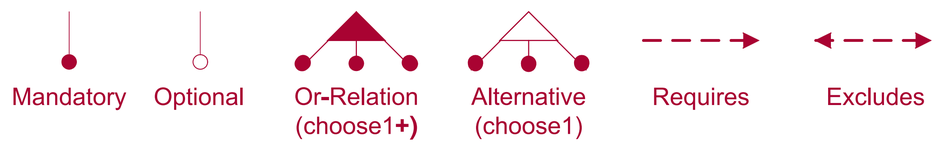
ISOLATED FEATURES



A feature in a feature model is isolated iff it does not appear in any product of the product family represented by a feature model

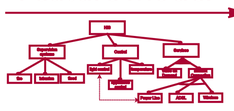
LEGEND

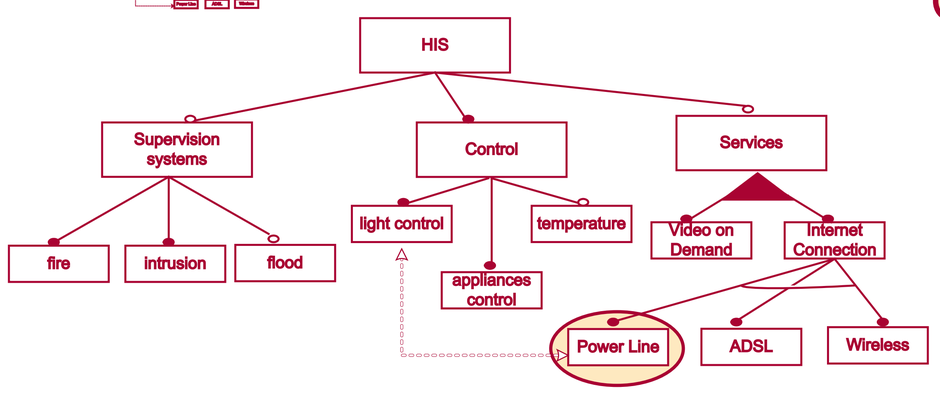


A feature model is a declarative way to represent the set of products in a product family in terms of features.

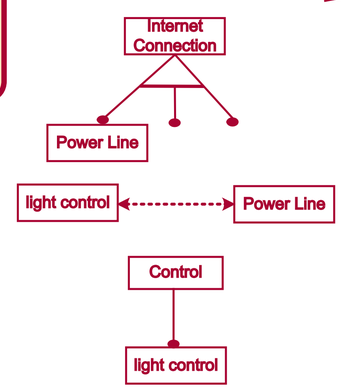
ISOLATED FEATURES TREATMENT

Feature Model → ISOLATED FEATURES DETECTION → Isolated Features → EXPLANATION OF THE ORIGIN OF ISOLATED FEATURES → Conflicting relations → GIVE SOLUTIONS TO CONFLICTING RELATIONS

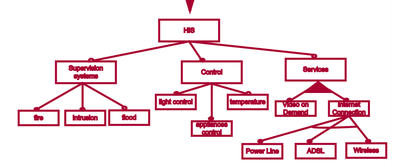




Isolated Features: Power Line



USER DECISION



Error-Free Feature Model

DETECTION

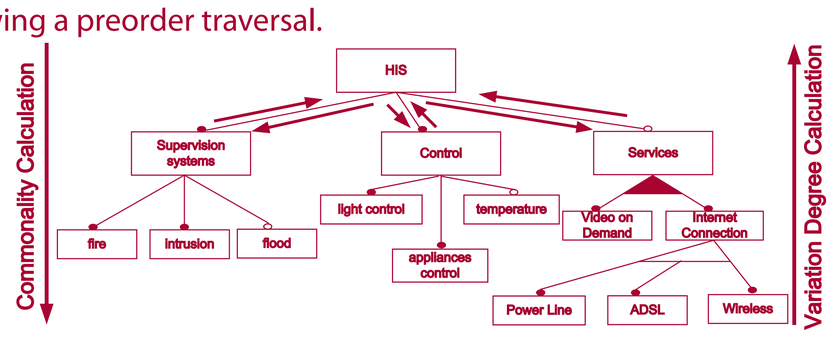
CONSTRAINTS SATISFACTION PROBLEMS (CSP)

Feature Model → CSP Mapping → CSP → Solver → Isolated Features

- CSP is a set of variables each in a finite domain, and a set of constraints.
- Mapping FM onto CSP that represents the set of products in the product family.
- For each feature f, use CSP to calculate the number of products containing it
  If #products(f) = 0 then f is an isolated feature
  If #products(f) <> 0 then f is not an isolated feature

COMMONALITY-BASED ALGORITHM

- Feature Commonality is the number of products where the feature appears.
- We propose an algorithm to calculate commonality from variation degree following a preorder traversal.



Repeating this process for each feature may have a low performance

Cannot give an exact result when more than one depends/excludes but bounds.

MIXED DETECTION METHOD

- PHASE ONE
  Calculate commonality bounds from commonality-based algorithm.
  Pot = set of features that have zero within the commonality bounds.

PHASE TWO
For each feature in Pot use CSP to precisely determine if it is isolated or not.

BIBLIOGRAPHY

[1] D. Benavides, P. Trinidad and A. Ruiz Cortés. *Automated Reasoning on Feature Models.* CAiSE 2005
[2] D. Benavides, A. Ruiz Cortés and P. Trinidad. *Using Constraint Programming to Reason on Feature Models.* SEKE' 05