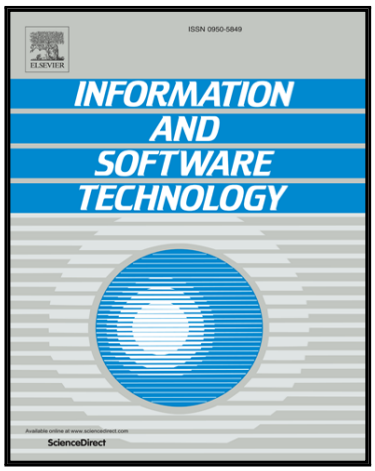

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PII: S0950-5849(17)30219-7
DOI: 10.1016/j.infsof.2017.10.001
Reference: INFSOF 5887

To appear in: *Information and Software Technology*

Received date: 15 March 2017
Revised date: 28 September 2017
Accepted date: 2 October 2017

Please cite this article as: André Lanna, Thiago Castro, Vander Alves, Genaina Rodrigues, Pierre-Yves Schobbens, Sven Apel, Feature-Family-Based Reliability Analysis of Software Product Lines, *Information and Software Technology* (2017), doi: 10.1016/j.infsof.2017.10.001

Feature-Family-Based Reliability Analysis of Software Product Lines

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Abstract

Context: Verification techniques are being applied to ensure that software systems achieve desired quality levels and fulfill functional and non-functional requirements. However, applying these techniques to software product lines is challenging, given the exponential blowup of the number of products. Current product-line verification techniques leverage symbolic model checking and variability information to optimize the analysis, but still face limitations that make them costly or infeasible. In particular, state-of-the-art verification techniques for product-line reliability analysis are enumerative which hinders their applicability, given the latent exponential blowup of the configuration space.

Objective: The objectives of this paper are the following: (a) we present a method to efficiently compute the reliability of all configurations of a compositional or annotation-based software product line from its UML behavioral models, (b) we provide a tool that implements the proposed method, and (c) we report on an empirical study comparing the performance of different reliability analysis strategies for software product lines.

Method: We present a novel *feature-family-based* analysis strategy to compute the reliability of all products of a (compositional or annotation-based) software product line. The *feature-based* step of our strategy divides the behavioral models into smaller units that can be analyzed more efficiently.