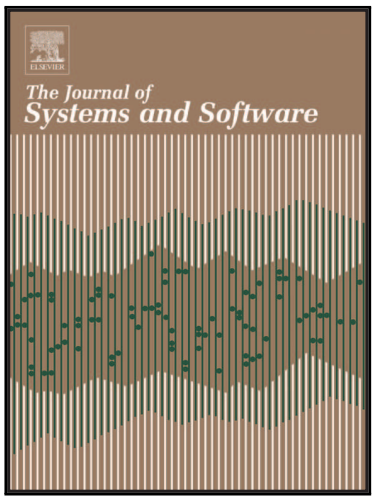

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An Approach for Optimized Feature Selection in Large-scale Software Product Lines

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Abstract

Context: Feature selection in Product Line Engineering is an essential step for individual product customization, in which the multiple objectives, that are often competing and conflicting, have to be taken into consideration. These objectives always need to be balanced during selection, leading to a process of multi-objective optimization. What's more, the massive complex dependency and constraint relationships between features present another huge challenge for optimization.
Objective: In this work, we propose a multi-objective optimization algorithm, IVEA-II, to automatically search through configurations to obtain an optimal balance between various objectives. Additionally, all the relationships between features must be conformed to by the optimal feature solutions.
Method: Firstly, a two-dimensional fitness function in our previous work is reserved. Secondly, to prevent the negative impact of this 2D fitness on the diversity of final Pareto Fronts, the crowding distance is introduced into each fitness-based selection. Lastly, a new mutation operator is designed to improve the scalability of IVEA-II.
Results: A series of experiments were conducted to verify the effectiveness of IVEA-II on five large-scale feature models with five optimization goals.
Conclusion: Experiments showed that IVEA-II can generate more valid solutions over a set period of time, with optimal solutions also having better diversity and convergence.

Keywords: Software Product Lines, Feature Selection, Product Derivation, Multi-objective Optimization