Analysis and Propagation of Feature Revisions in Preprocessor-based Software Product Lines

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Abstract: This is a summary of a paper [Mi23] published in the IEEE International Conference on Software Analysis, Evolution and Reengineering (SANER) 2023. It describes a tool-supported approach for analyzing and propagating feature revisions between SPL releases.

Keywords: Variability management; Feature propagation; Version control systems; Preprocessor directives; Software reuse

1 Summary

Preprocessor directives are frequently used to define variable parts of systems and thereby also allow to track the evolution of features in software product lines (SPLs). Evolution in space means adding or removing features, while evolution in time means revising existing features. Version Control Systems (VCSs) like Git are commonly used to manage the evolution of preprocessor-based SPLs. However, managing feature revisions within VCSs is challenging as changes are tracked at the level of commits, without analyses about feature-level evolution. Current VCSs also do not analyse and visualize how features interact due to the complexities of preprocessor directives. At the same time, developers often need to propagate feature revisions between SPL releases for bug fixes, refactoring, or enhancements. This process is difficult and lacks automation, resulting in time-consuming and tedious tasks. To address these challenges, the paper introduces a tool-supported approach for analyzing and propagating feature revisions between SPL releases. The approach is evaluated on real-world SPLs and shows promising results in terms of correctness and runtime performance. Interviews with developers confirm the usefulness of our tools. We further provide a dataset for replication and future research in the domain of preprocessor-based SPLs managed in VCSs.

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