

Niels Streekmann: Clustering-Based Support for Software Architecture Restructuring

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Kurzfassung:

The modernisation of existing software systems is an important topic in software engineering research and practice. A part of the modernisation of software systems is the restructuring of their architecture. This has to be done in numerous contexts, including the evolution to service-oriented architectures, the re-establishment of the maintainability of a system or the smooth migration of a system to a new development environment. Architecture restructurings are coarse-grained changes to the internal structure of the system that are performed in temporally limited projects. The planning of the transfer of a existing implementation to the target architecture of a system is currently a mostly manual task. While the analysis of the existing system is supported by e.g. architecture reconstruction approaches, the actual restructuring process is not supported by current approaches.

The MARE approach, which is introduced in this thesis, was developed to provide support for the stepwise restructuring of the implementation towards a target architecture. MARE supports architecture restructurings by semi-automatically creating a complete mapping of elements of the existing implementation to components of the target architecture. The creation of the mapping bases on explicit knowledge about the target architecture and its decomposition criteria. MARE employs graph clustering to implement the creation of the complete mapping.

The MARE Method describes an iterative process model for the overall architecture restructuring process. It emphasises the target architecture as the basis for the architecture restructuring. The iterations of the process model allow for a stepwise restructuring of the system and the integration of human influence on the result of MARE.

The clustering algorithm employed by MARE to create the complete mapping bases on agglomerative hierarchical clustering. It is adjusted to incorporate knowledge about the target architecture. The decomposition criteria are considered by the definition of weights for the different types of dependencies that relate the elements of the existing implementation.

The MARE approach was evaluated in three case studies. These examined the application of MARE in small and middle-sized open source projects as well as for an industrial system with 3.5 million lines of code.

The main goal of the evaluation is to show the quality and stability of the clustering algorithm. It furthermore shows the influence factors for the creation of the complete mapping.