# ON THE AUTOMATION OF DEPENDENCY-BREAKING REFACTORINGS IN JAVA

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# Abstract

Over a period of time software systems grow large and become complex due to unsystematic changes that create a high level of interconnection among software artefacts. Consequently, maintenance becomes expensive and even making small changes may require considerable resources due to change propagation in the system, a phenomenon known as *ripple effects*. Industrial evidence suggests that more resources are spent on the maintenance phase than on the initial development. It is evident that companies make huge investments to maintain legacy systems until a point comes where a complete restructuring of the system is required. In most cases, it becomes very expensive to refurbish legacy systems manually due to their inherent complexity. Several semi-automated solutions have been proposed to restructure simplified models of existing systems. It is still expensive, in terms of resources, to translate those model level transformations into source code transformations or refactorings. The question that arises here is whether we can automate the application of model level changes on the source code of programs.

In this thesis, we have developed novel algorithms to automate the application of a class of architectural transformations related to improving modularity of existing programs. In order to evaluate our approach, we have analysed a large dataset of open source programs to determine whether the manipulation of models can be translated into source code refactorings, whether we can define constraints on those refactorings to preserve program correctness, and to which extent the automation of the whole process is possible. The results indicate that this automation process can be achieved to a significant level, which implies that certain economic benefits can be gained from the process.

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