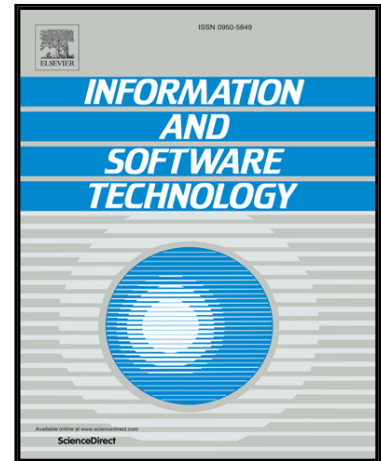


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Object-Oriented Code

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Predicting Move Method Refactoring Opportunities in Object-Oriented Code

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Abstract

Context: Refactoring is the maintenance process of restructuring software source code to improve its quality without changing its external behavior. Move Method Refactoring (MMR) refers to moving a method from one class to the class in which the method is used the most often. Manually inspecting and analyzing the source code of the system under consideration to determine the methods in need of MMR is a costly and time-consuming process. Existing techniques for identifying MMR opportunities have several limitations, such as scalability problems and being inapplicable in early development stages. Most of these techniques do not consider semantic relationships.

Objective: We introduce a measure and a corresponding model to precisely predict whether a class includes methods in need of MMR. The measure is applicable once a class has entered the early development stages without waiting for other classes to be developed.

Method: The proposed measure considers both the cohesion and coupling aspects of methods. In addition, the measure uses structural and semantic data available within the class of interest. A statistical technique is applied to construct prediction models for classes that include methods in need of MMR. The models are applied on seven object-oriented systems to empirically evaluate their abilities to predict MMR opportunities.

Results: The results show both that the prediction models based on the proposed measure had outstanding prediction abilities and that the measure was able to correctly detect more than 90% of the methods in need of MMR within the predicted classes.

Conclusions: The proposed measure and corresponding prediction models are expected to greatly assist software engineers both in locating classes that include methods in need of MMR and in identifying these methods within the predicted classes.

Keywords: object-oriented design, move method refactoring, class quality, logistic regression analysis.

1. Introduction

Refactoring refers to altering the internal structure of existing object-oriented software code without changing its external behavior (Fowler 1999), and it aims to improve several quality attributes of the considered code, such as maintainability and reliability (Fowler 1999, O’Cinneide et al., 2011, Al Dallal and Abdin 2017). Fowler (1999) defined several refactoring scenarios and explained how they can be applied. One of the defined

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