先端科学技術研究科　修士論文要旨

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要旨

Refactoring plays an important role in enhancing software quality, fundamentally restructuring code without altering external behavior. While extensively studied in production code, refactoring in test code, particularly test-specific refactorings that address challenges unique to test suites, such as managing test fixtures, assertions, and overall test organization, remains underexplored. Current automated tools offer limited support, detecting only a fraction of these practices. This study aims to bridge this knowledge gap by comprehensively investigating the prevalence, types, and impact of test-specific refactorings on test quality in real-world software development projects.

We conducted an empirical analysis of diverse open-source Java projects on GitHub, employing rigorous manual inspection complemented by automated detection tools. Our methodology involved quantifying refactoring frequencies, manually classifying test-specific refactoring types through consensus-based annotation, and assessing their relationship with various test smells.
Our findings reveal that only around half of the test refactorings co-occurred with general refactorings. More importantly, we identified 37 distinct types of test-specific refactorings through manual analysis, significantly expanding beyond the 9 types supported by existing automated tools. Furthermore, while the overall impact on test smells is specific rather than broad (85.6% of the test smell instances remained unchanged at the file level and 91.9% at the refactoring level), certain refactorings can significantly reduce specific test smells. In contrast, some refactorings may unintentionally introduce or increase the number of test smells, highlighting their specific impact.