

# Selective Regression Testing on Node.js Applications

Yufeng Chen

University of British Columbia

Vancouver, Canada

yufengcy@student.ubc.ca

**Abstract**—Node.js is one of the most popular frameworks for building web applications today. As software system becomes mature, the cost of performing the retest-all regression test becomes significant. A technique of reducing running time is Selective Regression Testing (SRT). By rerunning a subset of tests based on code change, selective regression testing can detect software failures more efficiently. However, previous studies mainly focused on standard desktop applications. The Node.js applications are considered hard to perform test reduction because its asynchronous, event-driven programming model and JavaScript is a loosely typed, dynamic programming language. In this paper, we present NodeSRT, a Selective Regression Testing framework for Node.js applications. By performing static and dynamic analysis, NodeSRT gets relationship between changed method and their relationships with each test, then reduce the whole regression test suite to only tests that are affected by change, which would improve the execution time of the regression test suite. To evaluate our selection technique, we applied NodeSRT to two open-source projects: Uppy and Simorgh, then compared our approach with retest-all strategy and current industry used SRT technique: Jest OnlyChange option. The results demonstrate that NodeSRT correctly selects affected tests based on changes and is 457.94% more precise than the Jest OnlyChange option.

**Index Terms**—JavaScript, Selective Regression Testing, Node.js Application, Static Analysis, Dynamic Analysis

## I. INTRODUCTION

With the continuous growth of web applications, Node.js has become one of the most popular frameworks for web application development [2]. Since JavaScript is a loosely typed, dynamic language, test selection on JavaScript projects is hard. Besides, modern web applications are usually composed of different kinds of components; running unit tests only does not judge the overall behaviour of the web application [3].

There are four levels of granularity for test selection techniques: statement, method, file, module. Current industry used SRT technique: Jest OnlyChange uses file-level granularity, which selects tests to be rerun based on file changes in the Git repository. Although fast, this approach may not be precise enough for some test suites. Therefore, our research starts from a question: “Can we find a more effective test selection technique for Node.js Applications?”

To evaluate effectiveness, Rothermel et al. [1] proposed four categories: Inclusiveness, Precision, Efficiency, Generality. Inclusiveness measures the extent to which SRT technique chooses tests that are affected by the change. Precision measures the ability that SRT technique omits tests that are not affected by the change. Efficiency measures the time and

space required. Generality measures its ability to function in a comprehensive and practical range of situations. We say a selection technique is safe if it achieves 100% inclusiveness.

In this work, we first discovered a regression test selection technique for Node.js application then evaluate the selection technique by performing an empirical study on two open source Node.js projects in different size and test coverage.

## II. RELATED WORK

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TABLE I  
TABLE TYPE STYLES

Table Head	Table Column Head		
	Table column subhead	Subhead	Subhead
copy	More table copy <sup>a</sup>		

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Fig. 1. Example of a figure caption.

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ACKNOWLEDGMENT

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