Refactoring Detection in JavaScript

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This is to certify that the thesis prepared

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and submitted in partial fulfillment of the requirements for the degree of

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Abstract

Refactoring Detection in JavaScript

Mosabbir Khan Shiblu

TODO Para1

TODO Para2

TODO Para3

TODO Para4

Acknowledgments

I would like to express my gratitude and thanks to my supervisor, Dr. Nikolaos Tsantalis. His invaluable guidance and continuous opened a new horizon of knowledge to me.

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Thank you.

Mosabbir Khan Shiblu

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Introduction

TODO

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TODO

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The rest of the thesis is organized as follows...

Chapter 2

Related Wok

Leo Brodie [2] first mentioned the word "Refactoring" in his book "Thinking Forth", originally published in 1984. In addition to describing refactoring techniques, the author also discussed many software development principles and practices.

Over the past few decades, various techniques for detecting refactoring activities have been proposed, implemented, and validated.

2.1 Refactoring Detection Approach

2.1.1 Detection Using Meta Data

2.1.2 Detection by Static Source Code Analysis

Demeyer et al. [3] introduced the first strategy for identifying the refactored elements between two system snapshots. They defined four heuristics based on the changes of object-oriented source code metrics such as method size, class size, number of inherited or overwritten methods to identify refactorings of three general categories (Split/Merge Class, Move Method, and Split Method). To validate their technique, they applied it on different versions of three software systems. However, the precision of their evaluation was

seemingly on the lower side, for example, for Move Method refactorings (limited to super, sub, and sibling classes) the reported average precision was 23%. On the other hand, the paper concluded that from the perspective of reverse engineering, the proposed heuristics were extremely useful to uncover where, how, and maybe why implementation had drifted from its original design.

Antoniol et al. [1] used an automatic technique based on Vector Space cosine similarity to compare identifiers in different classes in order to detect the renaming and splitting of classes. Since it's based on a similarity threshold, it does not perform very well for classes with many changes and may require threshold adjustment on a case basis.

Weißgerber and Diehl [11] developed the first technique for identifying class-level/locally-scoped refactorings i.e refactorings that occur within one class, and thus, within the same file (e.g. Rename Method). Their approach first extracts and identifies added and deleted refactoring candidates (fields, methods, and classes) by parsing deltas and then comparing each pair's name similarity from a version control system. For ambiguous candidate pairs, it uses a clone detection tool CCFINDER [8] to compare their bodies and then rank them. CCFINDER is also configured to ignore whitespaces/comments and to match consistently renamed variables, method names, and references to members. Finally, they used random sampling to estimate the precision whereas commit messages were inspected manually to find documented refactorings in order to compute the recall.

2.1.3 Real-time Detection

Murphy-Hill et al. [9] tracked the usage history of refactoring commands available in Eclipse IDE using a plugin and found that developers had performed about 90% of their refactorings manually instead of opting for the refactoring tool. Additionally, they often interleave refactorings with other behavior-modifying programming activities. Furthermore, developers rarely explicitly report their refactoring activities in commit messages.

Negara et al. [10] developed CODINGTRACKER which infers refactorings from continuous code changes with the help of a refactoring inference plugin. Using their tool, they constructed a large corpus of 5,371 refactoring instances performed by 23 developers working on their IDEs. Their approach reported a precision and recall of 93% and 100% respectively for a sample of both manually and automatically performed refactorings.

Similar to CODINGTRACKER [10], GHOSTFACTOR [6] and REVIEWFACTOR [7] infer fully completed refactorings by monitoring the fine-grained code changes in real-time inside the IDE. On the other hand BENEFACTOR [5] and WITCHDOCTOR [4] offer code completion by detecting ongoing manual refactorings.

Chapter 3

Then

Chapter 4

Conclusion and future work

TODO

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Appendix A

First Appendix

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

$$\bar{x} = \frac{1}{n} \sum_{i=1}^{i=n} x_i = \frac{x_1 + x_2 + \ldots + x_n}{n}$$

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need

for special content, but the length of words should match the language.

$$\int_0^\infty e^{-\alpha x^2}\mathrm{d}x = \frac{1}{2}\sqrt{\int_{-\infty}^\infty e^{-\alpha x^2}\mathrm{d}x \int_{-\infty}^\infty e^{-\alpha y^2}\mathrm{d}y} = \frac{1}{2}\sqrt{\frac{\pi}{\alpha}}$$

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

$$\sum_{k=0}^{\infty} a_0 q^k = \lim_{n\to\infty} \sum_{k=0}^{n} a_0 q^k = \lim_{n\to\infty} a_0 \frac{1-q^{n+1}}{1-q} = \frac{a_0}{1-q}$$

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-p \pm \sqrt{p^2 - 4q}}{2}$$

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest

gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

$$\frac{\partial^2 \Phi}{\partial x^2} + \frac{\partial^2 \Phi}{\partial y^2} + \frac{\partial^2 \Phi}{\partial z^2} = \frac{1}{c^2} \frac{\partial^2 \Phi}{\partial t^2}$$

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like "Huardest gefburn"? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

Appendix B

Concordia Logos

Figure B.1: Concordia University

Figure B.2: Gina Cody School of Engineering and Computer Science (vertical)

Figure B.3: Gina Cody School of Engineering and Computer Science (horizontal)