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**UNIVERSITÄT  
BERN**

# **Where does this null come from ?**

## **Bachelor Thesis**

Lina Tran

from

Biel/Bienne BE, Switzerland

Faculty of Science

University of Bern

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Prof. Dr. Oscar Nierstrasz

Research assistant Nevena Milojković

Research assistant Boris Spasojević

Software Composition Group

Institute for Computer Science

University of Bern, Switzerland

# Abstract

A previous study found out that `NullPointerException`s are very serious in Java projects. When a `NullPointerException` occurs the developer is provided only with a stack trace to where the exception happened. This only gives insight into the effect of the fault but not into its cause. So we have to ask the question when and why this reference was set to null.

The aim of the project is to be able to provide the user with an additional stack trace of where the value was actually set to null, next to the normal stack trace of an exception. We attempt to achieve this goal by instrumenting java source code ideally with a minimal overhead.

By tracking the null assignments the debugging after a `NullPointerException` will be simplified.

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# 1

## Introduction

Nowadays, certainly every programmer is confronted with `NullPointerException`s in big Java Projects, whether it is for an enterprise or for private purposes. Not to mention even in small Java Projects they are also heavily present.

So what are those `NullPointerException`s? This thesis is going to attach importance to Java that is a concurrent, class-based, object-oriented programming language. We chose Java because `NullPointerException`s are more serious in this language than in others, e.g. Smalltalk. `NullPointerException` is a `RuntimeException`. In Java, an object reference can be assigned with a special null value. The exception is thrown when an application attempts to use an object reference that has the null value. (There are multiple ways this exception can be thrown, like: Calling an instance method on the object referred by a null reference; Accessing or modifying an instance field of the object referred by a null reference and so on.) In Java Projects developers always have to deal with a huge amount of references which means avoiding these `NullPointerException`s is as good as impossible.

On regular meetings among programmers they report what they have been doing and what they are planning to do for the next few weeks. But all too often it is stated that they are trying to fix bugs or have spent a lot of time fixing them. If there would be a way to minimize the time fixing exceptions and allow to work more efficiently, projects would progress much faster.

The main goal of the NullSpy application takes a step to that ideal vision. Anytime developers are facing a `NullPointerException` they don't have to spend time on debugging finding where and why a reference was set to null. With NullSpy the exact location of the null assignment is shown next to the ordinary stack trace the Java virtual machine

produces.

In this thesis it is explained how the goal mentioned above is achieved step by step, by using a class library Javassist (Java Programming Assistant) which allows us to deal with Java bytecode.

# 2

## Related Work

In which we learn what have other done to address similar problems. For example, the work of Star [? ]

# 3

## The Problem

In which we understand what the problem is in detail.

# 4

## The Solution

In which you describe your solution.



# 5

## The Validation

In which you show how well the solution works.

# 6

## Conclusion and Future Work

In which we step back, have a critical look at the entire work, then conclude, and learn what lays beyond this thesis.

# 7

## Anleitung zu wissenschaftlichen Arbeiten

This consists of additional documentation, e.g. a tutorial, user guide etc. Required by the Informatik regulation.

# Bibliography