Rule-based code analysis

1. PROJECT DESCRIPTION

Overview

Static code analysis is a powerful means to improving code quality in different contexts and on different levels. Its ultimate goal is – using an automated (but often customizable) analysis tool – to help the programmer write better programs. Be it due to just a typing error (i. e. one that does not lead to a syntactic error), some other form of incautiousness, or perhaps a lack of knowledge, – a code analysis framework will be capable of issuing warnings, errors, and even correctional suggestions each referring to a part of the source code. Code analysis is a useful part in the world of software quality improving concepts.

In addition to the already established theoretical background in program analysis, implementations of rule-based code analysis tools exist for several programming languages and environments.

The task in this project is to implement a rule-based code analysis for Eiffel. These rules can for example be about coding style, code structure, or API usage. A basic set of rules helps to enforce a standard coding style, and users can change or extend the existing rules to fit their needs.

Scope of the work

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1. Other such concepts are (automated) testing, formal verification and Design by Contract, etc.

2. See section 2, related software.
A tool for rule-based Eiffel code analysis will be implemented. The set of rules will be designed in a manner that allows extensibility and customizability (such as possibility of enabling/disabling rules or setting the warning level). The tool shall analyze an Eiffel System (in this context a project, respectively) and output a list of rule violations found in the code.

The tool will be designed as a semi-independent module. It will get the syntactic structure of the source code from the Eiffel compiler, which will be used for the analysis. The analysis result will then be output to the user. Further steps include a smooth and easy-to-use integration into the EiffelStudio UI, and integrating other verification tools (AutoTest, AutoProof; integration of code analysis into EVE) in order to be able to run a series of tools automatically on every compilation.

**Intended results**

The resulting software is intended to be fully usable, working, and well-integrated in its environment. It should also be a basis for further extensions and improvements.

### 2. BACKGROUND MATERIAL

**Reading list**

- [1], Good programming style and practices
- [1,10], Eiffel as a language
- [2,3,4], Compiler design in general
- [5,6,8], program analysis

**Related Software**


### 3. PROJECT MANAGEMENT

**Objectives and priorities**

- Design and implementation of a rule-based code analysis module
- Command line functionality
- User interface / EiffelStudio integration
• EVE integration
• Complete documentation and report

*Criteria for success*

Minimum quality requirements

• Command line usage and output
• All predefined test cases working
• Rules according to rule set 1\(^1\) implemented

Expected requirements

• Integration into EiffelStudio user interface
• Two thirds of the rules according to rule set 2 implemented

Requirements for a result that significantly exceeds expectations

• Integration into EVE
• All rules according to rule set 2 implemented
• All rules according to rule set 3 implemented
• Hints / enforcement of naming conventions

*Quality management*

*Documentation*

The comprehensive documentation will be part of the report. In addition, the source code will be commented briefly.

*Validation steps*

• In the weekly meetings, the current status will be observed and evaluated.
• Partial test-driven development: Test cases that cover at least the most important features will be run regularly during development.
• Optionally, alpha testing by users outside the project.

4. PLAN WITH MILESTONES

*Project steps*

1. Getting acquainted with the EVE and EiffelStudio source code
2. General literature study of program analysis and rule-based code analysis
3. Object-oriented design of analysis and rules
4. Basic implementation including command line usage and output
5. Complete Implementation of rule set 1

\(^1\) The rule sets will be precisely defined at a later date.
6. EiffelStudio user interface integration
7. Implementation of rule set 2
8. EVE integration
9. *Implementation of rule set 3
10. *Implementation of naming convention rules
11. Testing
12. Write documentation
13. Write master thesis report

* optional

**Deadline**
1st April 2014

**Tentative schedule**
(corresponds to project steps above)

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