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Integrating Formal Specification and Test Coverage Information in Source Code Search

Source Code Search

Source Code Analysis

Source Code Test Coverage

Support Software Developers to Write Quality Code

Formal Specifications

The Mindbreeze source code search engine collects and summarizes diverse information offered by a set of tools. Software developers get a quick overview and a basic understanding of source code elements and their relations. In particular, searching for code with formal specification and coverage information can be helpful in improving the code quality.

Mindbreeze Code Search

The base of the Mindbreeze Code Search project was built last year that was enhanced with further features by Rami Magdi and me.

To handle information extracted by different tools we defined a generic framework, which enables the addition of different source code processors. Examples of such processors: Java source code parser (implemented in 2008 by László Lukács), sub-versioning information processor (implemented by Rami Magdi), test coverage and JML (Java Modeling Language) specification processors.

The extracted bits of information are modeled as item instances (ie. classes, methods, specifications, authors writing source code) with properties (ie. name) and relations between them (ie. specifiedBy relation between method and specification). A set of aggregation algorithms were defined, that compose the existing relations and properties, and give as result new and more interesting information.

The retrieved source code elements are sent to the Index Service of the Mindbreeze Enterprise Search system, the base product of the company. The Query Service enables searching the indexed data through the Mindbreeze Web User Interface, which we adjusted for an efficient source code search.

Integrating Formal Specification and Test Coverage Information

The quality of source code is defined, among others, by its maintainability, reliability and functionalities that must conform to the specified requirements. Testing and specifications written in a natural or formal (like JML) language influence these characteristics of source code. Test coverage percentages show how well tested a source code is. Formal specifications enable the definition of requirements in an unambiguous, precise way and help to detect inconsistencies between requirements and implementation.

By integrating formal specification and test coverage information in the Mindbreeze Code Search system, it becomes able to answer questions like: “Was this component/class/method tested?”, “What is the quality of testing of a specific component?”, “What is the specification that a class/method fulfils, so that I can use it accordingly?”, “Show examples of formal specifications, so that I can learn how to write them”. In such way it helps developers to maintain or improve the quality of source code.

We explored the possibilities and limits of creating a code search tool using the services offered by the Mindbreeze Enterprise Search SDK. We think due its generic design, the application can be easily enhanced and extended with further features, based on a more thorough analysis of the needs of software developers. Therefore it has a significant potential for enhancing productivity of software development processes.

