Feasibility Study of a Type-Directed API Search Engine for Java

A search engine prototype for Java-APIs

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Introduction: Writing modern software consists largely of composing pre-existing functionality from various libraries. The task then often consists of finding the proper library which offers the desired functionality. Most people currently use general-purpose search engines to find such libraries. However, specialized type-directed search engines have also been successful for certain programming languages. To evaluate the feasibility of such a search engine for Java, we created a prototype we call JavaTypeSearch. JavaTypeSearch is a primarily type-driven search engine, focusing on finding methods using queries containing type information.

JavaTypeSearch directly uses the Scaps engine under the hood. Scaps is a type-directed search engine for Scala, developed by Lukas Wegmann during his master studies at OST.

Approach: To evaluate JavaTypeSearch's accuracy and relevance of results, we performed measurements for different kinds of queries. The method for every measurement was the same: First, we selected a random sample of 500 definitions from the index (i.e. JDK definitions). Next, we transformed every sample into a query of each type shown in the table to the right. Finally, we executed all the queries and collected the corresponding measurements.

Result: We show that JavaTypeSearch successfully retrieves the desired definition in the top three results in 92.2% of keyword queries, and 73.4% of type queries. The results for each different query type are shown in the charts below.

Through this preliminary evaluation, we conclude that a type-directed API search engine for Java is feasible.

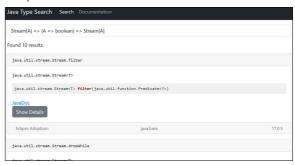However, it will require additional effort to be usable in everyday development.

Examples of different query types
Own presentment

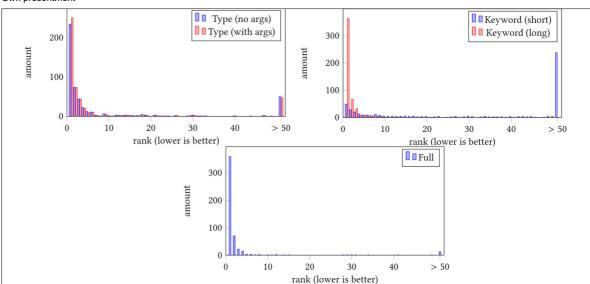| Query Type	java.lang.Runtime$Version#build
Keyword (short)	build
Keyword (long)	java.lang.Runtime.Version.build
Type (no args)	java.lang.Runtime.Version => Optional
Type (with args)	java.lang.Runtime.Version => Optional[java.lang.Integer]
Full	build : java.lang.Runtime.Version => Optional[java.lang.Integer]

JavaTypeSearch UI Screenshot
Own presentment

Distribution of rankings per query type
Own presentment

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