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Program Inspection to relate Behavioral and Operational Views for Program Comprehension

Program Comprehension is a discipline of Software Engineering aimed at studying methods and techniques useful to understand programs.

The implementation of Program Comprehension Tools is based on static and dynamic analysis techniques. This task of extracting static and dynamic information is still a big challenge because it is actually difficult to retrieve, store, handle and summarize it.

The static approach uses syntactic and semantic analysis to extract at compile-time structural information, like data and control flow, types and dependencies. The dynamic approach uses code instrumentation techniques to get execution information, as function-call flow or data usage, at runtime. Although distinct, both approaches are related; the extracted information will be represented in the same data structure. To help the user to get a deeper, more complete, knowledge about the program, it is important to provide different perspectives; so the PC tool shall generate various views from that internal representation, at different abstraction levels; it is also mandatory to provide means to relate those views.

Some relations are simple, but others are complex. For instance, to find out and visualize the relationship between Brooks' Operational and Behavioral views is an hard task. The first one is concerned with program domain, while the second describes the problem domain. The relationship between these views is not trivial because it requires the association between the output produced by the program, and the program objects (variables, functions, etc.).

The main goal of my Ph.D work is to develop methods and techniques to discover and show the relationship between different system views. In order to perform this task, some approaches to extract, organize and classify program information will also be created. We plan to explore code instrumentation approaches (based on the weaving of inspectors on the source code); and also to study heuristics to minimize information extracted.