A Relational Virtual Machine for Program Evolution

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Abstract

Many tools that analyze, refactor or otherwise evolve source code use ad-hoc, task-specific representations because the detailed information they need is hidden in the code and difficult to extract and organize. This leads to limited capabilities and interoperability. To address the problem, we propose the Relational Model of Computation (RMC), a Turing-complete virtual machine that is at the same time a relational database and a container for source code. Because it is a database, it can efficiently handle large volumes of data such as source code representations or programming language specifications. Because it is a virtual machine, it can emulate any algorithm operating on the data. And because it is formal, it can help to bring program evolution into a more rigorous and coherent footing. We formally define the RMC, prove its Turing equivalence, discuss some of its properties and mechanisms, and present small examples.

Keywords: virtual machine, program representation and analysis, object-oriented design, software maintenance and evolution, refactoring.