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Just-in-Time Compilation of Mathematical Expressions

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The SBML ODE Solver Library (SOSlib) is both a programming library and a command-line application for symbolic and numerical analysis of a system of ordinary differential equations (ODEs) derived from a chemical reaction network encoded in the Systems Biology Markup Language (SBML). [http://www.tbi.univie.ac.at/~raim/odeSolver/]

SOSlib has two ways of evaluating equations: either interpret equations or, if needed for performance reasons, translate equations to C-code compile and execute it. The C-code will be compiled with TinyCC [http://tinycc.org/] or GNU C Compiler [http://gcc.gnu.org/]. Both solutions have their trade-offs. TinyCC is small, fast and easy to integrate; yet it is also ill maintained and not available for x64 machines. The GNU C Compiler on the other hand is well maintained and available on various architectures, but it is bulky and hard to integrate.

A possible solution is a specialized compiler for SOSlib. In this diploma thesis such a compiler should be developed.

Project goals are:

- Compilation of mathematical expressions and method calls.
- On-the-fly generation of in-memory machine code (Intel x86, x64).
- Accepting abstract syntax trees (*AST*), as used in SOSlib as input.
- Accelerated execution by omitting the AST to C-code transformation step.
- Reduced application footprint by omitting the external compiler.
- Enhanced maintainability by removing external compiler dependency.

Der Fortgang der Arbeit ist in 14-tägigem Abstand mit dem Betreuer zu besprechen. Für die Ausarbeitung der schriftlichen Arbeit sind die Richtlinien des Instituts für Systemsoftware zu beachten.

Programmiersprache: C++

Betreuer: DI Markus Löberbauer

Ausgegeben am: 5.9.2007