Parallel Code Generator for Modelica to Nvidia 2 teraflop 2050 GPU

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At PELAB, together with the Open Source Modelica Consortium (an international open source effort supported by 28 organizations, see www.openmodelica.org) the OpenModelica environment including the OpenModelica Compiler (OMC) of the Modelica language including MetaModelica extensions is developed. The development is open source under the OSMC-PL and GNU V3 licenses.

Currently OMC compiles Modelica/MetaModelica into C-code via several optimizing steps. The development is supported by an Eclipse plug-in MDT (Modelica Development Tooling), also including a debugger, and a template language already used for developing code generators to C and C#. There has earlier been developed several parallel code generator prototypes from OpenModelica generating CUDA code for Nvidia.

The goal of this master thesis project is to improve the new parallel CUDA code generator, to extract data parallelism by loop analysis for automatic vectorization. Some speedup from the old CUDA code generator is shown below.

If there is time, the code generator should also be adapted to the new portable C-based standard parallel programming model called OpenCL. Target platform is PELABs new 2-teraflop Fermi GPU machine, see below.

The master thesis project requires some knowledge of compiler construction, parallel programming, as well as some experience and interest in advanced programming.
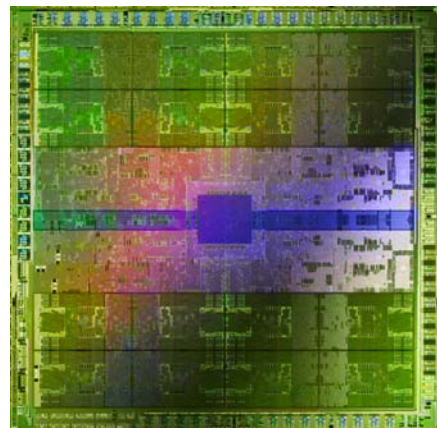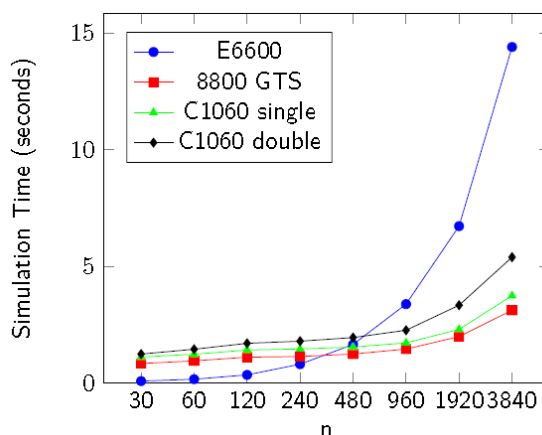
References:

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