RbCUDA: CUDA Bindings for Ruby

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BACKGROUND

Few people realise it, but even the modest computers today, including mobile phones,have powerful GPUs. And these GPUs can be used serially and in parallel to CPUs, potentially delivering great performance.

The RbCUDA gem that I am developing is a Ruby wrapper over CUDA libraries . RbCUDA helps Rubyists use Ruby code to program Nvidia GPUs with ease and with near-zero wrapping overhead.

The main objectives of RbCUDA are:

- Map all of CUDA into Ruby.
- Ready-made on-GPU linear algebra, reduction, scan using cuBLAS, cuSolver libraries.
- Random Numer generator using cuRand.
- CUDA profiler for Ruby.

FEATURES

Dtypes and Array Dimensions

Double dtype and arrays upto 2 dimensions are supported by RbCUDA.

BLAS and Solver support

RbCUDA provides support for all BLAS functionalities using cuBLAS library. CuBLASXT support is also presented but has not been well-tested currently.

Solver APIs provides the functionalities for matrix decomposition using CuSolver library.

Custom Kernel code

RbCUDA supports running custom kernels in a Ruby enviorenment using RbCUDA::Driver module.

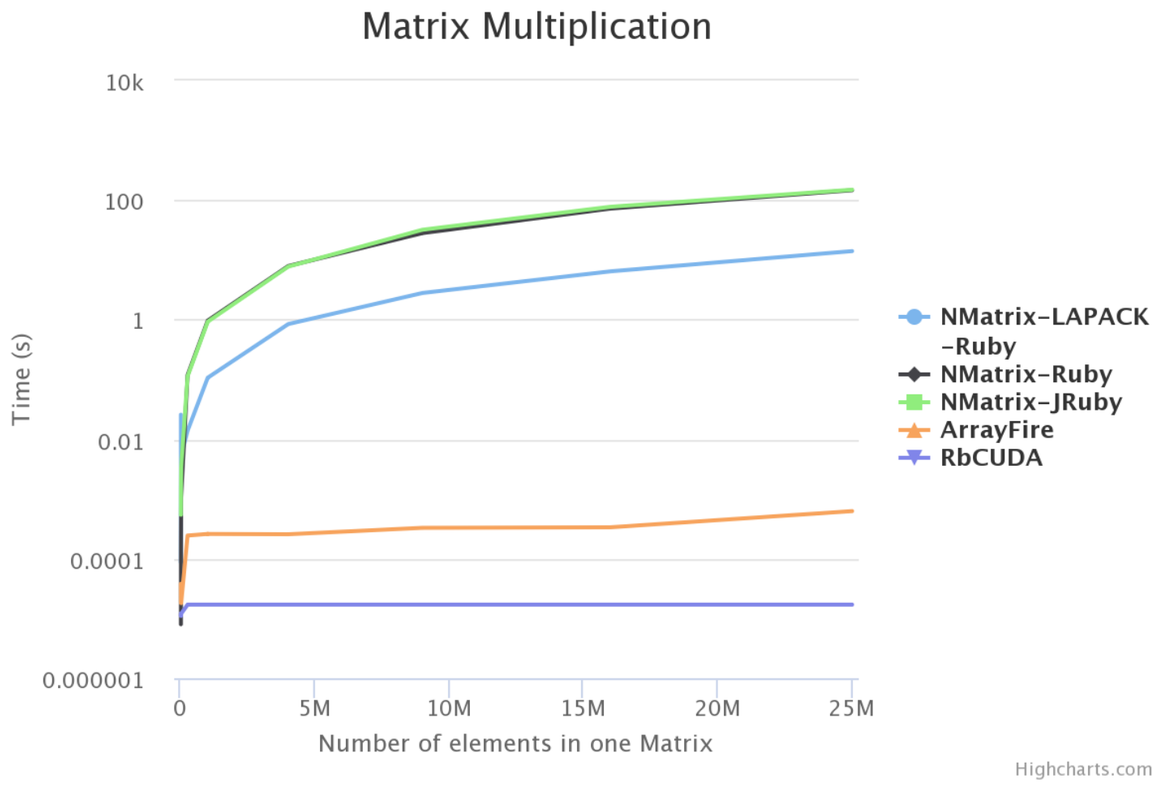
Profiler

RbCUDA supports CUDA code profiling using RbCUDA::Profiler module.

Random Engine

RbCUDA has a limited support for Random Engine routines provided by CuRand currently.

RESULTS



RbCUDA is the fastest of all the Ruby libraries. The time taken for matrix multiplication is 0.000017s on NVIDIA GTX 750 Ti GPU. The plain C code takes 0.000013s for this calculation.

RbCUDA is 24x faster than ArrayFire and a million times faster NMatrix-BLAS for matrix multiplication, Most of the speed gain going straight to CUDA is probably from removing an interaction layer (and buffers) as well as how the data is organized and fed to the underlying architecture.

Hence, an overhead of 0.000004s over plain C code makes, it highly efficient Maths library in Ruby.

Project Download

- RbCUDA is under active development and th pre-release would be available in March 2018.
- RbCUDA is distributed under the BSD 3-Clause License and could be downloaded from https://github.com/prasunanand/rbcuda.

ACKNOWLEDGEMENTS

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REFERENCES

1. https://developer.nvidia.com/cuda-zone