Accepted Manuscript

CL_ARRAY: A new generic library of multidimensional containers for c++ compilers with extension for OpenCL framework

Chakib Mustapha Anouar Zouaoui, Nasreddine Taleb

PII: S1477-8424(16)30135-X
DOI: 10.1016/j.cl.2017.04.004
Reference: COMLAN 254

To appear in: *Computer Languages, Systems & Structures*

Received date: 12 October 2016
Revised date: 24 March 2017
Accepted date: 28 April 2017

Please cite this article as: Chakib Mustapha Anouar Zouaoui, Nasreddine Taleb, CL_ARRAY: A new generic library of multidimensional containers for c++ compilers with extension for OpenCL framework, *Computer Languages, Systems & Structures* (2017), doi: 10.1016/j.cl.2017.04.004

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

CL_ARRAY : A new generic library of multidimensional containers for c++ compilers with extension for OpenCL framework

Chakib Mustapha Anouar Zouaoui[a,*], Nasreddine Taleb[a]

[a] *RCAM Laboratory, Department of Electronics, Djillali Liabes University, Sidi Bel-Abbes, Algeria*

Abstract

This paper presents a new metaprogramming library, CL_ARRAY, that offers multiplatform and generic multidimensional data containers for C++ specifically adapted for parallel programming. The CL_ARRAY containers are built around a new formalism for representing the multidimensional nature of data as well as the semantics of multidimensional pointers and contiguous data structures. We also present OCL_ARRAY_VIEW, a concept based on metaprogrammed enveloped objects that supports multidimensional transformations and multidimensional iterators designed to simplify and formalize the interfacing process between OpenCL APIs, standard template library (STL) algorithms and CL_ARRAY containers. Our results demonstrate improved performance and energy savings over the three most popular container libraries available to the developer community for use in the context of multi-linear algebraic applications.

Keywords: `C++ Multidimensional Data Container, Metaprogramming, parallel programming`

1. Introduction

Open Computing Language (OpenCL) has been proposed as an open standard by the Khronos Group [1, 2, 3, 4, 5, 6, 7, 8]. This language is known for heterogeneous parallel system programming, including applicability to a large variety of potential parallel CPU, GPU and DSP devices[9, 10, 11, 12, 13]. The expected objective of a unified model for parallel programming places OpenCL at the interface of two major parallel programming paradigms : CPUs and GPUs.
OpenCL provides two types of programs [14]. The first type is a typically sequential program coordinator called the Host program, which involves the Host processor (CPU). The Host program is essentially composed of OpenCL function calls (APIs). The second type includes one or more program Kernel functions that are typically parallel and written in a language with a C subset of parallel static semantics for the 1.1, 1.2 and 2.0 releases [1, 2, 3] or with a subset of both C and C++14 parallel static semantics for the newly forecasted C++14 OpenCL standards (2.1 and 2.2 releases) [4, 5, 6, 7, 8]. The C kernel functions allow for two types of arguments : a scalar operand

*. Corresponding author
Email addresses: `chakib@ipatdz.info` (Chakib Mustapha Anouar Zouaoui), `ne_taleb@univ-sba.dz` (Nasreddine Taleb)

Download English Version:

https://daneshyari.com/en/article/4949412

Download Persian Version:

https://daneshyari.com/article/4949412

Daneshyari.com