AXC: A new format to perform the SpMV oriented to Intel Xeon Phi architecture in OpenCL

Título AXC: A new format to perform the SpMV oriented to Intel Xeon Phi architecture in OpenCL

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Abstract Emerging new architectures used in High Performance Computing require new research to adaptandoptimisealgorithms tothem.Aspartofthis effort,wepropose the new AXCformattoimprovethe performance of the SpMV product for the Intel Xeon Phi coprocessor. The performance of theOpenCL kernel, based on our new format, is compared with three very different and high efficientsparse matrix formats, ie, CSR, ELLR-T, and K1. We perform tests with most of the matrices fromthe Williams collection used to test SpMV kernels for GPUs architectures in several related works.The numerical results show that the AXC format is more robust to spatial indirections proper ofsparse matrices and prefers matrices with low variability amongst their rows' population, verymuch like matrices originated by FEM codes. The Conjugate Gradient (CG) is implemented inOpenCL using all the formats in this work to expose strengths and weaknesses of the formats in areal application. The CG implementation shows that the AXC has the fastest conversion time andits coherent with the numerical results generated by the SpMV tests, and that the format has aslower memory operations time due to an extra step required by the format and its larger memory footprint.

Palabras chave conjugate gradient, coprocessor, OpenCL, sparse matrix format, sparse matrix vector product, Xeon Phi

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