OpenCL Related FPGA Paper Review

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1 Paper Review

Here is a list about recent papers on OpenCl based FPGA acceleration.

- Improving the performance of OepnCL-based FPGA accelerator for convolutional neural network [7]: 1) The authors argue that a direct opencl-based OpenCL-based CNN design is insufificient to achieve the desired performance. To that end, an analytical performance model is used to identify the performance bottleneck of CNN on FPGAs. 2) With the analysis, the authors thus propose a new kernel design to effectively address the bandwidth optimization. Finally the resulting performance is even better than previous design (mostly due to the much higher implementation frequency)

- A study of data partitioning on OpenCl based FPGAs [5]: 1) Explore the challenges of porting the opencl design for GPU to opencl design on FPGAs. 2) Optimize the data paritioning using opencl optimization techniques such as on chip buckets. 3) Develop of a cost model for design parameters optimization.

- An OpenCL Deep Learning Accelerator on Arria 10 [1]: 1) proposed a methodology to minimize the bandwidth of convolutional layer and full-connected layer by caching intermediate feature-map in stream buffers. 2) proposed a design space exploration that leverages analytical models for resource consumption and throughput and provides optimized architectural configuration. 3) Introduce the Winograd transformation to reduce the amount of convolution operations.

- Energy efficient scientific computing on FPGAs using OpenCL: [6]: 1) Implement partial differential equations (PDE) on FPGA and provide a series of optimizations including vendor-dependent optimizations and vendor-independent optimizations. 2) Discuss the portability of the opencl optimization between different vendors i.e. Xilinx FPGA and Intel-Altera FPGA. 3) Compare the performance and energy efficiency over CPU and GPUs.

- Accelerating Database query processing on opencl-based FPGAs [4]: 1) Implement the SQL query operators using OpenCL on FPGA. 2) Build the

performance model of the opecl based SQL operator performance. With the models, optimized query plan can be generated.

- Evaluation of an OpenCl-based FPGA platforms for Particle Filter [2]: 1The authors implemented the particle filter using OpenCL on FPGA. 2) It allows the designers to achieve significant performance speedup without much hardware circuit design expertises.

- OpenCL-Based FPGA Accelerator for 3D FDTD with periodic and absorbing boundary conditions [3] This work also focuses on the opencl based algorithm acceleration.

References

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