Unifying FPGAs and SIMD Arrays

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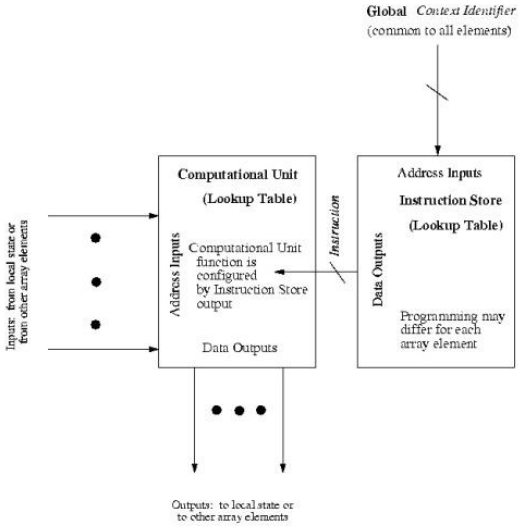

Configurable Instruction-Store View of DPGA AE

This is a unique paper that takes a philosophical view of the FPGA computing medium and relates it to the single-instruction multiple data (SIMD) approach to computation. The paper was among the first to show how the two methods of computation can be view on a continuum, thus *unifying* them in a sense.

The paper then proposes a hybrid architecture that has elements of both approaches, called a Dynamically Programmable Gate Array (DPGA). Here the configuration bitstream of the logic and routing changes rapidly, taken from a local memory made for that purpose. This is made somewhat SIMD-like by the notion that a central *context identifier*, which is broadcast throughout the array, determines which configuration is loaded from the local memory. If those local memories are all the same, then the same 'instruction' is executed; if the memories are different, then each logic processor can be doing something different. In this way, the array can both operate on data in a spatially-parallel way, and in a data-parallel way.

The authors also present an interesting analysis of the costs and benefits of organization computation in this new way.

This is the first of a series of influential papers on the DPGA, and one of the first that considers multiple *contexts* for the programming of an FPGA. While this method of programmability has yet to catch on, there have been numerous interesting attempts to make it work, and this paper was one of the first to work with it.

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