Abstract

The AVEGA simulator transpires from the Sanskrit word meaning onrush, boost and excitement. As the meaning suggests it is a tool for a large number of computations, and here it is applied for solving memristor crossbar networks. Currently investigations are being performed to model such a memristor that follows a desired hysteresis loop. AVEGA is the first step towards such a validation and verification method, which will capacitate researchers with ways to filter out useful designs, hence AVEGA will be a simulator capable of:

1. Simulating a large number of similar devices in a very short time.
2. Testing against different parameters concurrently.
3. Testing models for the common process variations that occur in such devices.
4. Adding noise to the parameters to check for a range close to proposed parameters.
5. Trying all 2^n combinations and permutations of parameters.

In this poster the simulator is directed towards solving a current issue which is of much importance to our lab, and which will bring about significant changes in the near future. The memristor has demonstrated great potential as a memory and computing platform, and could serve as a next generation computing device. The only thing stopping this, is the synthesizing of a memristor that follows a desired hysteresis loop. A VEGA is the first step towards such a validation and verification method, which will capacitate researchers with ways to filter out useful designs, hence AVEGA will be a simulator capable of:

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Objectives and Vision

The memristor has demonstrated great potential as a memory and computing platform, and could serve as a next generation computing device. The only thing stopping this, is the synthesizing of a memristor that follows a desired hysteresis loop. A VEGA is the first step towards such a validation and verification method, which will capacitate researchers with ways to filter out useful designs, hence AVEGA will be a simulator capable of:

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People who are not that familiar with CUDA programming and the underlying GPU architecture, will be assisted by AVEGA as the simulator through device query and thread assessment will try to optimize the code. Therefore the user might only write the input language and the following benefits will be provided without the user’s participation:

- No Performance Tuning Required – The simulator through device query and search space assessment, automatically finds the optimal kernel launch configuration to deliver the best performance.
- High Performance – The kernel launch will be modified according to the GPU’s capabilities.
- Performance and Software Portability – The simulator will run on any Nvidia GPU as long as the GPU supports CUDA. The kernel is launched according to the GPU’s capacity and it is optimized by device query and thread assessment.
- Error Handling – Every time the simulator is not able to complete the assigned task an error log is made to help the user understand what went wrong.
- Plug and Play Use – The user might only give the input language as the input and watch the magic unfold.

There are a lot of areas where a high amount of computation is required, for example gene matching and protein folding. The enormous compute capability displayed here with respect to the memristor crossbars can be applied/extended for:

1. Verifying memristor crossbar designs for neuromorphic computing
2. SAT solving using heuristics coupled with exhaustive enumeration
3. Memristor circuit flow, simulating the flow of current in a highly dense memristor crossbar circuit

References