On the Sensitivity of FPGA Architectural Conclusions to Experimental Assumptions, Tools, and Techniques

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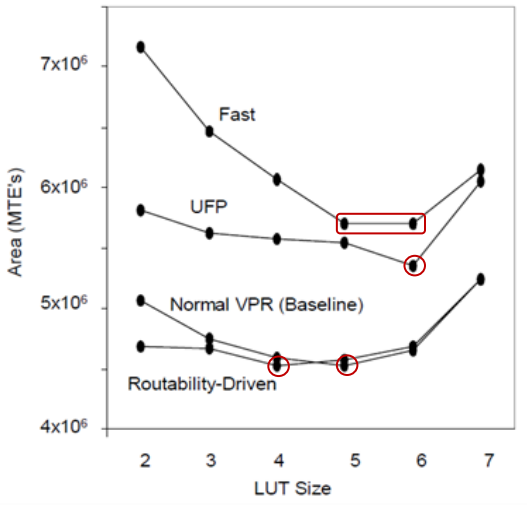
Year of publication: *2002*
Area: *Architecture*



This paper is essential reading for any beginning researcher in architecture and CAD.

Architectural exploration research is a staple of the FPGA conference. Experienced researchers in this area know that the outcomes of this (or any other) type of research can be heavily influenced by the chosen experimental methodology. The set of examined benchmark circuits, the CAD tool that maps the circuits to the architecture, and other architectural parameters can all affect the answer to the question, "*what is the best value for **this particular** FPGA architectural parameter?*"

Knowing that these factors *could* affect the outcome is one thing; seeing that they *do* affect the outcome is another. This paper presents actual data as proof that conclusions drawn from experiments designed to find the "best" FPGA architectural parameters (such as LUT size or connection block flexibility) are not necessarily conclusive—the results may actually be dependent on the experimental setup. As an example, the figured included above demonstrates that the LUT size that minimizes overall FPGA area for a set of circuits ranges from four to six inputs depending on the CAD tools used in the experiment**.**

More significantly, the paper encourages researchers to more carefully design their experiments and frame their conclusions. It is therefore important reading for both experienced researchers and new ones. In fact, it is essential reading for any beginning researcher because they are the most prone to take results at face value and make dramatic, sweeping conclusions based on the data they have gathered.

In short, this paper demonstrates the importance of carefully constructing experiments and thoughtfully analyzing the results—questioning their validity and applicability. The core message of the paper, the dependent nature of experimental methodologies and results, is timeless and transcends the FPGA research field.

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DOI: http://doi.acm.org/10.1145/503048.503071