**LUT Optimization for Memory-Based Computation**

**ABSTRACT**

Recently, we have proposed the antisymmetric product coding (APC) and odd-multiple-storage (OMS) techniques for lookup-table (LUT) design for memory-based multipliers to be used in digital signal processing applications. Each of these techniques results in the reduction of the LUT size by a factor of two. In this brief, we present a different form of APC and a modified OMS scheme, in order to combine them for efficient memory-based multiplication. The proposed combined approach provides a reduction in LUT size to one-fourth of the conventional

LUT. We have also suggested a simple technique for selective sign reversal to be used in the proposed design. It is shown that the proposed LUT design for small input sizes can be used for efficient implementation of high-precision multiplication by input operand decomposition. It is found that the proposed LUT-based multiplier involves comparable area and time complexity for a word size of 8 bits, but for higher word sizes, it involves significantly less area and less multiplication time than the canonical-signed-digit (CSD)-based multipliers. For 16- and 32-bit word sizes, respectively, it offers more than 30% and 50% of saving in area–delay product over the corresponding CSD multipliers.

**LANGUAGE USED:**

* Vhdl/verilog

**TOOLS REQUIRED:**

* MODELSIM – Simulation
* XILINX-ISE – Synthesis