

Approximate compressors

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Abstract

This implementation of Approximate compressors has been inspired from one of the earlier implemented approximate multipliers based on new approximate compressors. The circuit implemented here consists 5/3 6/3 approximate compressors. Approximate computing is an emerging trend in digital design that trades off the requirement of exact computation for improved speed and power performance. This proposed approximate compressors circuits provide better power and speed in multipliers. These approximate compressors are used in multipliers. These approximate compressors are used in image filtering. These Approximate compressors are implemented in esim EDA tool and done using Sky Waters 130nm PDK.

1 Circuit Details

A compressor is a logic circuit that counts the number of ones in the input. Approximate compressor have j inputs and compute $j/2$ outputs by using novel approach aimed to minimize the error probability and the average error. The outputs of proposed approximate compressors do not have carry outputs this is different from standard compressors which consists of carry. In this design we implementing 5/3 compressor i.e 5 inputs and 3 outputs 6/3 compressor i.e 6 inputs and 3 outputs. These approximate compressors implemented using AND and OR gates. For AND gate, whenever both inputs are high then output will be high otherwise output will be low and For OR gate, whenever both inputs are low then output will be low otherwise output will be high. We can also use higher order compressors i.e 7/4 8/4 9/5 10/5 11/6 12/6 13/7 14/7 15/8 16/8 17/9 18/9 19/10 20/10 etc. These higher order compressors are implemented using 2/1 3/2 4/2 5/3 6/3.. The output of the multiplier are divided into two parts MSB and LSB. The LSB bits are given to the approximate compressors and MSB bits are given to exact compressors. The output from both compressors are given to the adder circuit for multiplier output includes sum and carry outputs. Approximate compressors are used in the least-significant bits of the multiplier outputs. The approximate multiplier produces output which is approximately equal to the exact multiplier output.

2 Implemented Circuit

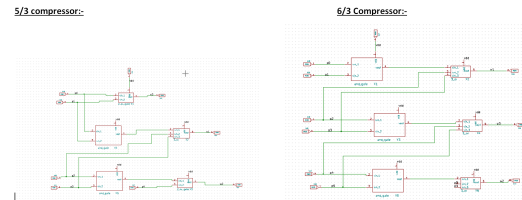


Figure 1: Implemented circuit diagram.

3 Implemented Waveforms

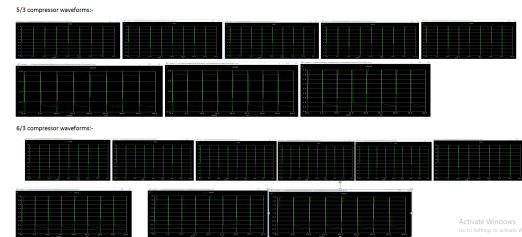


Figure 2: Implemented waveform.

References

- [1] D. E. A. G. M. S. E. N. D. D. C. D. D. Caro and N. Petra. Approximate multipliers based on new approximate compressors. IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS—I REGULAR PAPERS VOL. 65 NO. 12 DECEMBER 2018.