

Design of Approximate compressors

ketha chandana tejaswini, Vignans Foundation for Science and Technology and Research

July 1, 2021

Abstract

Approximate computing is an emerging trend in digital design relaxing the requisite of exact computation to gain substantial performance improvement in terms of power, speed and area. This implementation of Approximate compressors has been inspired from one of the earlier implemented approximate multipliers based on new approximate compressors. The circuits implementing here are 4/2 and 3/2 approximate compressors. The proposed approximate compressors are used in different multipliers. These are used in image filtering, data recognition, data signal processing etc. These Approximate compressors can be implemented in esim EDA tool and will be done using Sky Waters 130nm PDK

1 Circuit Details

compressors also known as counters computes the arithmetic sum and encoding the results in the binary format. Approximate compressors can be obtained by truncating the outputs of the exact compressors. The most common compressor is full adder. Approximate compressor have j inputs and compute $j/2$ outputs by using novel approach aimed to minimize the error probability and the average error. In this circuit design we implementing 3/2 and 4/2 compressors. 3/2 compressors means the compressors consists of 3 inputs and 2 outputs. 4/2 compressors consists of 4 inputs and 2 outputs. These approximate compressors are implemented by using and and or gates. These basic compressors are used to design high ordered compressors. 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. hence we are using the basic and and or gates the designing of these compressors are very easy and simple. In 3/2 compressor we use one and gate and two or gates. In 4/2 compressor we use two and gates and two or gates. 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 outputs. These compressors are used in the different kinds of multipliers. By using these 3/2 and 4/2 we can design high order compressors 7/4 and 8/4 and 9/5 etc. These approximate compressors provides the better power and speed in the multipliers.

2 Implemented Circuit

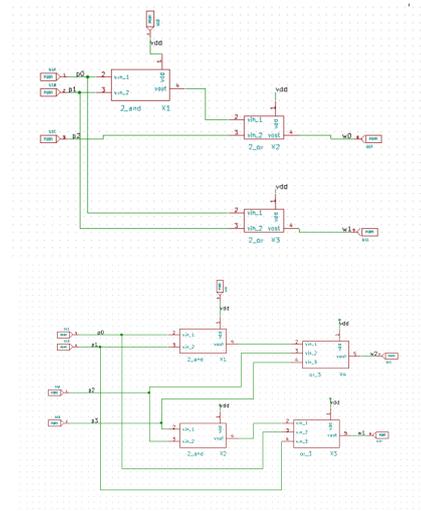


Figure 1: Implemented circuit diagram.

3 Implemented Waveforms



Figure 2: Implemented waveform.

References

- [1] A. G. M. S. S. M. I. E. N. S. M. I. D. S. M. I. Darjn Esposito Member, IEEE. Approximate multipliers based on new approximate compressors. IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS–I: REGULAR PAPERS, VOL. 65, NO. 12, DECEMBER 2018.