Research Article

Low-Power and Reliable Approximate Subtractors for Image Processing Applications

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Abstract

In this paper, two new approximate subtractors are presented. The proposed circuits are implemented based on gate diffusion input (GDI) and dynamic threshold (DT) techniques and are named Proposed-1 and Proposed-2. The Proposed-1 subtractor has 10 transistors, while Proposed-2 has 12 transistors. Subtractors are implemented by 32 nm carbon nanotube field effect transistor (CNTFET) technology. Various studies have been performed and show the high efficiency and performance of the circuits in different conditions without reducing their output voltage, which is caused by the use of DT in their implementation. The proposed circuits use XOR and NOT gates, both of which have 4 out of 8 error states. The presented subtractors can be implemented in an unsigned non-recovery divider with different structures including vertical, horizontal, square and triangular, etc., and finally, they can be used in image processing applications to detect the difference between two images, either medical or standard images. The simulation results show the better performance of the proposed circuits, Proposed-1 and Proposed-2 save PDP of 88.36% and 83.25%, respectively.

Keywords: Approximate computing, subtractor, GDI technique, CNTFET

Highlights
- Using of approximate computing and GDI technique to reduce power consumption
- Integration of DT technique and CNTFET technology to solve problems of GDI gates
- Design of low-power and small-area approximate subtractors due to the use of only 10 and 12 transistors

Citation: