

عنوان مقاله:

Improving Stochastic Computing Fault-Tolerance: A Case Study on Discrete Wavelet Transform

محل انتشار:

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نویسندگان:

Shabnam Sadeghi - *Reliable and Smart Systems Lab (RSS), Shahid Bahonar University of Kerman, Kerman, Iran*

Ali Mahani - *Reliable and Smart Systems Lab (RSS), Shahid Bahonar University of Kerman, Kerman, Iran*

خلاصه مقاله:

The stochastic computing (SC) method is a low-cost alternative to conventional binary computing that processes digital data in the form of pseudo-random bit-streams in which bit-flip errors have a trivial effect on the signal final value because of the highly redundant encoding format of this method. As a result, this computational method is used for fault-tolerant digital applications. In this paper, stochastic computing has been chosen to implement ۲-dimensional discrete wavelet transform (۲-D DWT) as a case study. The performance of the circuit is analyzed through two different faulty experiments. The results show that stochastic ۲-D DWT outperforms binary implementation. Although SC provides inherent fault tolerance, we have proposed four structures based on dual modular redundancy to improve SC reliability. Improving the reliability of the stochastic circuits with the least area overhead is considered the main objective in these structures. The proposed methods are applied to improve the reliability of stochastic wavelet transform circuits. Experimental results show that all proposed structures improve the reliability of stochastic circuits, especially in extremely noisy conditions where fault tolerance of SC is reduced.

کلمات کلیدی:

Stochastic Computing, Fault-Tolerant Computation, Image Processing, Discrete wavelet transform

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