Abstract

Scaling is one of the difficult operations in Residue Number System (RNS) and also one of the most important units and a necessary operation used to avoid overflow in RNS based systems. In this paper, a scaling algorithm for a new moduli set \( \{2^{2n+1} + 1, 2^{2n+1}, 2^{2n+1} - 1\} \) using the Chinese Remainder Theorem (CRT) is presented. In the design of digital systems, the goal of designers is to increase performance and decrease the amount of hardware resources. In order to achieve this, a new moduli sets is proposed to obtain a larger dynamic range and less complex hardware architecture. The CRT is further simplified for the selected moduli set to reduce the hardware complexity of the scaling algorithm. The scaling algorithm does not introduce any scaling errors and thus is efficient. When compared with the state of the art scaling algorithm using the Unit- Gate model, the results show that, the proposed scaling algorithm outperforms the state of the art scaling algorithm in terms of dynamic range (DR), area consumption, and delay by 98%, 18.4% and 21.7% respectively.


Index Terms

Computer Science

Circuits and Systems

Keywords

Scaler, RNS, Chinese Remainder Theorem, Moduli Set, Dynamic Range.