ABSTRACT

Approximate computing is a technique that gives some inaccurate results instead of guaranteed accurate results. It is useful for error tolerant applications. The idea is, *"A perfect result is not always necessary, but an approximate result is even sufficient"*. This trade-off in accuracy can improve area, energy and performance of the system. The FPGA has been the hot topic of research in Industry because of its short time to market, prototype nature, reconfigurablity, hardware accelerator etc in various Multimedia and DNN applications. In our work we have focused on building the energy efficient arithmetic circuits on Xilinx Kintex7 KC-705 FPGA board. It includes adder, subtractor and multiplier which can be used as a basic unit in any large system which involves extensive data computation. All these units are runtime configurable and have maximum error bound. For approximate computing the two important things are the choice of data to be approximated and the region till which we need to approximate so that the accuracy does not suffer. In large complicated systems where the region of approximation is uncertain there it is better to have the runtime configurable designs that can switch between accurate and approximate. This concept of runtime configurabilty is achieved using CFGLUT5 and SRLC32E. We have proposed two designs RCAC (improves energy efficiency) and SEDAF (improves performance/speed) in our entire work. RCAC acts like single exact and single approximate with varying levels of error while SEDAF is a single exact and double approximate design. These types of special arithmetic circuits can be used in applications like deep neural networks, image processing, super-scalar processors, data mining etc. where data computation is involved in excess.