

Title

CORDIC-Based trigonometric and hyperbolic function Implementation in eSim

Problem Statement

The efficient hardware implementation of non linear functions such as trigonometric and hyperbolic is crucial for energy, speed constrained systems like edge-AI accelerators, IoT devices, and many embedded systems. Traditional lookup tables or polynomial approximations consume large power and area, drastically need to increase power and size. The CORDIC (Coordinate Rotation Digital Computer) algorithm provides an iterative, shift and add based method that significantly reduces hardware complexity. Moreover it can be done in pipelining method which decreases the time in even more, resulting in speed and near real time values.

Objective

To reproduce and validate the results of the referenced paper using eSim (open-source EDA), by implementing CORDIC-based serial computation of trigonometric functions, and comparing simulation outcomes with the reference values.

Proposed Work

- 1.Implement CORDIC iterative architecture for computing trigonometric functions in eSim.
- 2.Simulate key building blocks (adders, shifters, registers) using Verilog co-simulation.
- 3.Verify convergence of sigmoid and tanh values through transient and mixed-signal analysis.
- 4.Compare eSim-generated plots (accuracy, latency, power consumption estimates)

Reference

L. Benini, S. Emery, "An Ultra-Low-Power Serial Implementation for Sigmoid and Tanh Using CORDIC Algorithm," 2023 Design, Automation & Test in Europe Conference (DATE 2023) – Late Breaking Results. IEEE, 2023.