

Research Migration Project

<https://esim.fossee.in/research-migration-project>



The Research Migration Project is an initiative of FOSSEE, IIT Bombay that promotes the use of eSim for reproducing published research circuits originally implemented using proprietary simulation tools. The objective is to migrate these validated designs to eSim to build an open source resource database.

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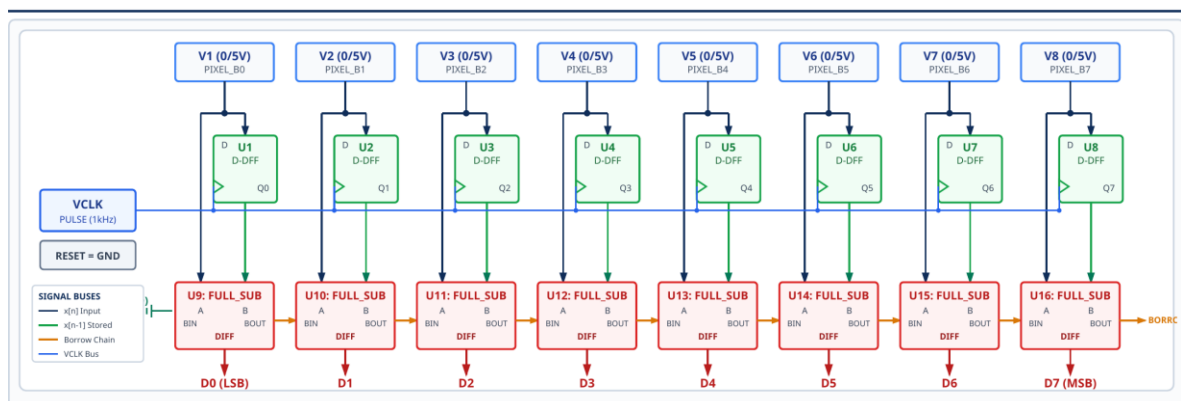
Title of the circuit : Design and Simulation of an 8-bit DPCM Encoder Circuit

Theory/Description : Differential Pulse Code Modulation (DPCM) encodes the difference between successive samples using first-order prediction $d[n] = x[n] - x[n-1]$. The proposed eSim core utilizes an 8-bit input sequence, eight clocked D flip-flops to store the prior sample on each clock edge, and an 8-stage full-subtractor chain to perform bitwise subtraction. The resulting 8-bit two's-complement differential output represents the encoded DPCM data.

Reason to reproduce with eSim : The selected research utilizes DPCM within a hardware image compression architecture using commercial tools. Migrating this core design to open-source eSim/ngspice enables accessible, tool-independent circuit-level simulation and study, demonstrating practical predictive storage and differential processing fundamentals.

Expected Outcome/outputs : The circuit will store successive 8-bit inputs and compute correct two's-complement differential outputs $d[n]$. Identical consecutive inputs will produce zero output, while highly correlated successive samples will generate minimal amplitude transitions.

Circuit Diagram(s) :



Expected Results (Input, Output waveforms and/or Multimeter readings) : A clocked 8-bit input range (0–255) supplied by V1–V8 with a 1 kHz clock will generate an 8-bit two's-complement output waveform showing corresponding positive, negative, or zero differences via eSim plot probes.

Research Paper/Journal/etc. :

Title: *An Ingenious Design of a High Performance-Low Complexity Image Compressor for Wireless Capsule Endoscopy*

Authors: Ioannis Intzes, Hongying Meng, John Cosmas

Journal: *Sensors*, 2020, 20(6), 1617, pp. 1–16

DOI: 10.3390/s20061617 **Link:** <https://doi.org/10.3390/s20061617>

Note: Fields marked with an asterisk (*) are mandatory and must be filled for successful submission.