

A Unified Algorithm for Subband-Based Discrete Cosine Transform

宋志雲, 柯律庭, 陳竹一, 辛錫進, 謝曜式

Electronics Engineering

Engineering

ysdaniel@chu.edu.tw

Abstract

Discrete cosine transform (DCT) and inverse DCT (IDCT) have been widely used in many image processing systems and real-time computation of nonlinear time series. In this paper, the unified DCT/IDCT algorithm based on the subband decompositions of a signal is proposed. It is derived from the data flow of subband decompositions with factorized coefficient matrices in a recursive manner. The proposed algorithm only requires $\frac{4}{3} \log_2 n - 1$ and $\frac{4}{3} \log_2 n - 1$ multiplication time for n -point DCT and IDCT, with a single multiplier and a single processor, respectively. Moreover, the peak signal-to-noise ratio (PSNR) of the proposed algorithm outperforms the conventional DCT/IDCT. As a result, the subband-based approach to DCT/IDCT is preferable to the conventional approach in terms of computational complexity and system performance. The proposed reconfigurable architecture

o f l i n e a r a r r a y D C T / I D C T p r o c e s s o r
h a s b e e n i m p l e m e n t e d
b y F P G A .

Keyword : DCT, Subband, FPGA