



SIGNAL PROCESSING BASED ON STABLE RADIX-2 DCT I-IV ALGORITHMS HAVING ORTHOGONAL FACTORS*

SIRANI M. PERERA[†]

Abstract. This paper presents stable, radix-2, completely recursive discrete cosine transform algorithms DCT-I and DCT-III solely based on DCT-I, DCT-II, DCT-III, and DCT-IV having sparse and orthogonal factors. Error bounds for computing the completely recursive DCT-I, DCT-II, DCT-III, and DCT-IV algorithms having sparse and orthogonal factors are addressed. Signal flow graphs are demonstrated based on the completely recursive DCT-I, DCT-II, DCT-III, and DCT-IV algorithms having orthogonal factors. Finally image compression results are presented based on the recursive 2D DCT-II and DCT-IV algorithms for image size 512×512 pixels with transfer block sizes 8×8 , 16×16 , and 32×32 with 93.75% absence of coefficients in each transfer block.

Key words. Discrete cosine transform, Sparse and orthogonal factors, Radix-2 algorithms, Recursive algorithms, Stable algorithms, Arithmetic cost, Error bounds, Image reconstruction, Signal flow graphs.

AMS subject classifications. 15A23, 15B10, 65F35, 65F50, 65T50, 65Y05, 65Y20, 94A08, 94A12.

*Received by the editors on January 2, 2016. Accepted for publication on April 20, 2016. Handling Editor: James G. Nagy.

[†]Department of Mathematics, Embry-Riddle Aeronautical University, Daytona Beach, Florida 32114, USA (pereras2@erau.edu).