TRANSFORM TECHNIQUES

Course Code: 13EC2104

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Course Objectives:

Upon completion of the course, the student will be able to

CO1: Comprehend the various two dimensional transforms and their applications.

CO2: Analyze and compare the different image transforms.

CO3: Comprehend the time-frequency analysis of transforms.

CO4: Design and Analyze the continuous and discrete wavelet transforms.

CO5: Analyze the orthogonal wavelets and Multi Resolution Analysis of transforms.

UNIT-I

TWO DIMENSIONAL TRANSFORMS-I:

Introduction, need for transforms, concept of Two Dimensional Fourier transforms- properties & their significance, energy & power spectral density functions, Discrete Cosine Transform and applications.

UNIT-II

TWO DIMENSIONAL TRANSFORMS-II:

Walsh transform, Hadamard transform, Haar Transform, Slant transform, KL transform, Singular Value Decomposition, Hough Transforms, Radon Transforms, and comparison of different Image transforms.

UNIT-III

TIME-FREQUENCY ANALYSIS:

Window function, Short Time Fourier Transform, Properties of STFT, Discrete Short Time Fourier Transform, The origin of wavelets, Continuous Wavelet Transforms (CWT), The Uncertainty Principle and Time frequency Tiling, Properties of wavelets in CWT.

UNIT-IV

DISCRETE WAVELET TRANSFORMS:

Introduction to the Discrete Wavelet Transforms, Continuous versus Discrete Wavelet Transform, Haar Scaling and Wavelet Functions and Function Space, Translation and Scaling, Orthogonality of Translates,

Function Space, Nested Spaces, Scaled Haar Wavelet Functions and Orthogonal Wavelets, Support of Wavelet System, Daubechies Wavelets, Applications of DWT.

UNIT-V

ORTHOGONAL WAVELETS AND MRA:

Refinement Relation for Orthogonal Wavelet Systems, Restrictions on Filter Coefficients, Signal Decomposition and Relationship with Filter Banks, Frequency Response, Signal Reconstruction, Perfect Matching Filters, Multi-Resolution Analysis (MRA), Two Scale Relations, Ortho Normal Wavelets, Their Relationship to Filter Banks, PRQMF Filter Banks.

TEXT BOOKS:

[1] A.K.Jain, "*Fundamentals of Digital Image Processing*", 2/e, Pearson.

[2] K.P. Soman and K.I Ramachandran, "*Insight into Wavelets from Theory to Practice*", PHI, 2nd edition, 2008.

REFERENCES:

[1] C. Gonzalez & Redwoods, "*Digital Image Processing*", 1/e, 2001.

[2] Raghuveer M. Rao, Ajit S Bopardikar, "*Wavelet transforms – Introduction to theory & applications*", Pearson education, Asia.

[3] JaidevaC.Goswami, Andrew K.Chan, "*Fundamentals of wavelets – Theory, Algorithms & applications*", John Willey & Sons.