

Vector spaces-Properties- Dot product-Basis-Dimension, Orthogonality and Orthonormality, Concept of convergence - Fourier series expansion, Fourier transform, Short time Fourier transform, Time-frequency analysis.

Definition of multi resolution analysis (MRA)-Haar basis-Construction of general orthonormal MRA – Wavelet basis for MRA – Continuous time MRA interpretation for the DTWT– Discrete time MRA – Basis functions for the discrete wavelet transform.

Wavelet transform – Definition and Properties – Concept of scale and its relation with frequency– Continuous wavelet transform (CWT) – Scaling function and Wavelet functions (Daubechies Coiflet Mexican Hat, Sinc, Gaussian, Bi Orthogonal) –Tiling of time – Scale plane for CWT.

Filter bank and Sub band-Coding principles-Wavelet filters-Inverse DWT-Computation by filter banks-Basic properties of filter coefficient-Choice of wavelet, Function coefficients – Derivations of Daubechies Wavelets – Mallet’s algorithm for DWT – Multi band wavelet transforms lifting Scheme- Wavelet transform using Poly phase matrix factorization-Geometrical foundation of lifting Scheme-Lifting scheme in Z-Domain.

Wavelet methods for signal processing- Image compression techniques, Image Denoising techniques: Noise estimation – Shrinkage rules – Shrinkage functions – Edge detection and Object isolation, Image fusion, and Object detection.

References

1. Goswami, J. C. and A. K. Chan; Fundamentals of wavelets Theory, Algorithms and Applications Wiley Interscience Publication, John Wiley & Sons Inc, 1999.
2. Schowengerdt, R.A., 1997. Remote sensing –Models and Methods, for Image Processing, Academic Press, London.
3. Stephen G. Mallat; A wavelet tour of signal processing 2nd Edition Academic Press, 2000.
4. Soman K P and Ramachandran K I; -Insight into Wavelets from Theory to practice Prentice Hall, 2004.