Digital Image, Fourier Theory and Multiscale Models

Summary

Digital Image & Filters

Main Topics

- Image Representation
  - Conceptual Framework / Graphical Object / Geometric Interpretation
  - Matrix Representation / Discretization (Sampling + Quantization)
- Classical Filters and Fourier Theory
  - Spatially Invariant Linear Filters / Convolution / Point Spread Function
  - Fourier Transform / Transfer Function
- Study of Filters
  - Characterization / Computation / Types (Low, High, Band Pass)
- Mathematical Morphology
  - Operators (Erosion, Dilation) / Relations (Implicit, EDPs)

Image Representation
&
Multiscale Models

Main Topics

- Basis and Representation
  - Function Spaces / Representation and Reconstruction / Orthonormal Basis
- Frequency Domain
  - Fourier Transform / Frequencies and Details
- Classical Basis
  - Spectral Basis (Fourier Series) / Shannon (Sampling Theorem) / Haar (Scale Spaces)
- Time-Frequency Localization
  - Scale and Details / Frequency Operators / Joint Localization (Heiselberg Principle)
- Wavelets
  - Scale Space (Dilation) / Wavelet Transform / Discretization (Dyadic Lattice)