

UEI832 DIGITAL IMAGE PROCESSING

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3	1	0	3.5

Intensity Transformations and spatial Filtering

Logarithmic and Contrast-Stretching Transformations, Histogram Processing and Function Plotting: Generating and Plotting Image Histograms, Histogram Equalization, Histogram Matching (Specification). Spatial Filtering: Linear Spatial Filtering, Nonlinear Spatial Filtering.

Frequency Domain Processing

2-D Discrete Fourier Transform, Computing and Visualizing the 2-D DFT in MATLAB. Filtering in the Frequency Domain: Fundamental Concepts, Basic Steps in DFT Filtering, An M-function for Filtering in the Frequency Domain. Obtaining Frequency domain Filters from Spatial Filters. Generating Filters Directly in the Frequency Domain: Creating Meshgrid Arrays for Use IN Implementing Filters in the Frequency Domain. Lowpass Frequency Domain Filters.

Image Restoration

Adding noise with Function imnoise, Generating Spatial Random Noise with a Specified Distribution, Periodic Noise, Estimating Noise Parameters
Restoration in the Presence of Noise Only-Spatial Filtering : Spatial Noise Filters, Adaptive Spatial Filters, Periodic Noise Reduction by Frequency Domain Filtering, Modeling the Degradation Function, Direct Inverse Filtering, Wiener Filtering, Constrained Least Squares (Regularized) Filtering
Iterative Nonlinear Restoration using the Lucy-Richardson Algorithm, Blind Deconvolution. Geometric Transformations and Image Registration: Geometric Spatial Transformations, Applying Spatial Transformations to images, Image Registration

Image Compression

Coding Redundancy: Huffman Codes, Huffman Encoding, Huffman Decoding. Interpixel Redundancy. Psychovisual Redundancy. JPEG Compression: JPEG, JPEG 2000

Morphological Image Processing

Basic Concepts from Set Theory, Binary Images, Sets, and Logical Operators. Dilation and Erosion: Dilation, Structuring Element Decomposition, The strel Function, Erosion. Combining Dilation and Erosion: Opening and Closing, The Hit-or-Miss Transformation, Using Lookup Tables, Labeling Connected Components, Morphological Reconstruction: Opening by Reconstruction, Filling Holes, Cleaning Border Objects. Gray-Scale Morphology: Dilation and Erosion, Opening and Closing, Reconstruction

Image Segmentation

Point, Line, and Edge Detection: Point Detection, Line Detection, Edge Detection. Line Detection Using the Hough Transform: Hough Transform Peak Detection, Hough Transform Line Detection and Linking. Thresholding: Global Thresholding, Local Thresholding. Region-Based Segmentation: Basic Formulation, Region Growing, Region Splitting and Merging. Segmentation Using the Watershed Transform: Watershed Segmentation Using the Distance Transform, Watershed Segmentation Using Gradients, Marker-Controlled Watershed Segmentation.

COURSE LEARNING OUTCOME (CLO):The student will be able to

1. Understand the concept of image processing
2. Understand the various methods for image enhancement, restoration, segmentation and compression
3. Understand the concept of colored images and object recognition techniques

Text Book:

1. Gonzalez, R.C. and Woods, R. E., *Digital Image Processing Using MATLAB*, Pearson Education (2003).

Reference Book:

1. Jain, A.K., *Digital Image Processing*, PHI Learning Pvt. Limited (2008).
2. Gonzalez, R.C. and Woods, R. E., *Digital Image Processing*, 3rd Edition, Prentice Hall (2008)

Evaluation Scheme:

Sr. No.	Evaluation Elements	Weightage (%)
1	MST	30
2	EST	45
3	Sessionals (May include Assignments/Projects/Tutorials/Quizzes/Lab Evaluations)	25