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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VIII-Semester

Open Elective EC 803 (B) Digital Image Processing

Course Objectives

To study the image fundamentals and mathematical transforms necessary for image processing, image enhancement techniques, image restoration procedures, and image compression.

Course Outcomes:

1. Understand the basic elements of digital image processing
2. Develop and analyse the algorithm for discrete fourier transformations.
3. Understand the concept of Image enhancement by analyzing different filtering techniques.
4. Applying different models and techniques to understand the concept of image restoration
5. Analyze and implement different image encoding methods

Unit-I
Digital Image Processing (DIP)
Introduction, examples of fields that use DIP, fundamental steps in DIP, components of an image processing system.
Digital Image Fundamentals: elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels.

Unit-II
Image Transforms
Two-dimensional (2D) impulse and its shifting properties, 2D continuous Fourier Transform pair, 2D sampling and sampling theorem, 2D Discrete Fourier Transform (DFT), properties of 2D DFT.
Other transforms and their properties: Cosine transform, Sine transform, Walsh transform, Hadamard transform, Haar transform, Slant transform, KL transform.

Unit-III
Image Enhancement
Spatial domain methods: basic intensity transformation functions, fundamentals of spatial filtering, smoothing spatial filters (linear and non-linear), sharpening spatial filters (unsharp masking and high boost filters), combined spatial enhancement method.
Frequency domain methods: basics of filtering in frequency domain, image smoothing filters
(Butterworth and Gaussian low pass filters), image sharpening filters (Butterworth and Gaussian high pass filters), selective filtering.

Unit-IV

Image Restoration

Image degradation/restoration, noise models, restoration by spatial filtering, noise reduction by frequency domain filtering, linear position invariant degradations, estimation of degradation function, inverse filtering, Wiener filtering, image reconstruction from projection.

Unit-V

Image Compression

Fundamentals of data compression: basic compression methods: Huffman coding, Golomb coding, LZW coding, Run-Length coding, Symbol based coding.
Digital image watermarking, representation and description- minimum perimeter polygons algorithm (MPP).

References:

1. Gonzalez and Woods: Digital Image Processing, Pearson Education.
2. Anil Jain: Fundamentals of Digital Image Processing, PHI Learning.
3. Annadurai: Fundamentals of Digital Image Processing, Pearson Education.
4. Sonka, Hlavac and Boyle: Digital Image Processing and Computer Vision, Cengage Learning.
5. Chanda and Majumder: Digital Image Processing and Analysis, PHI Learning.
6. Jayaraman, Esakkirajan and Veerakumar: Digital Image Processing, TMH.
7. William K. Pratt, Digital Image Processing, Wiley India.