M.Sc. CS Semester-II Image Processing

Objective: The course begins with low level processing and works its way up to the beginnings of imageinterpretation. This approach is taken because image understanding originates from a common databaseof information. The learner will be required to apply their understating of the concepts involved throughthe process of building applications that manipulate bi-level and gray scale images through the use ofsuitable packages (e.g. MATLAB).

Prerequisite: To learn this course basic knowledge of Digital Signal Processing, Mathematics andStatistical Techniques is must.

Unit 1: Image Processing Fundamentals: Digital image, digital image processing, History of digitalimage processing, State of the art examples of digital image processing, Key stages in digital imageprocessing, The human visual system, Light and the electromagnetic spectrum, Image representation,Image sensing and acquisition, Sampling, quantization and resolution.

Unit 2: Image Enhancement (Histogram Processing, Point Processing and Spatial Filtering): imageenhancement, Different kinds of image enhancement, Histogram processing, Point processing, Neighborhood operations, Negative images, Thresholding, Logarithmic transformation, Power lawtransforms, Grey level slicing, Bit plane slicing, Neighborhood operations, spatial filtering, Smoothingoperations, What happens at the edges?, Correlation and convolution, Sharpening filters, 1st derivativefilters, 2nd derivative filters, Combining filtering techniques.

Unit 3: Image Enhancement (Frequency Filtering): Jean Baptiste Joseph Fourier, The Fourier series &the Fourier transform, Image Processing in the frequency domain, Image smoothing, Image sharpening,Fast Fourier Transform

Unit 4: Image Restoration (Noise Removal): image restoration, Noise and images, Noise models, Noiseremoval using spatial domain filtering, Periodic noise, Noise removal using frequency domain filtering,

Unit 5: Segmentation, Morphology and color (Points, Lines, Edges & Thresholding): Thesegmentation problem, Finding points, lines and edges, thresholding, Simple thresholding, Adaptive thresholding, morphology, Simple morphological operations, Compound operations, Morphological algorithms, Colour fundamentals, Colour models.

Text Book

1. Digital Image Processing, 3/e, Rafael C. Gonzalez, Richard E. Woods. Pearson Education, ISBN:9788131726952

Lab Exercise: CSC457 Practical based on CSC407

At least two experiments should be carried out on each unit.