Prasad V. Potluri Siddhartha Institute of Technology, Kanuru, Vijayawada.

1/2 M.Tech. SECOND SEMESTER

CSCS2T6D IMAGE PROCESSING AND PATTERN RECOGNITION Credits: 4

ELECTIVE – II

Lecture: 4 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

Objectives:

1. Learn the fundamentals of digital image processing.
2. Understand the basics of morphology.
3. Learn various compression techniques.
4. Understand the concepts of basic pattern recognition.

Learning Outcomes:

1. Understanding of digital image processing fundamentals: hardware and software, digitization, enhancement and restoration, encoding, segmentation, feature detection.
2. Ability to apply image processing techniques in both the spatial and frequency domains.
3. Ability to compress a given image using image compression techniques.
4. Able to apply the concepts of pattern description.
5. Understanding of fundamental concepts of basic pattern classification.
6. Ability to classify the samples by applying pattern classification techniques.

UNIT - I

Introduction: Fundamental steps of image processing, components of an image processing of system. The image model and image acquisition, sampling and quantization, relationship between pixels, distance functions, scanner.

UNIT - II

Transformation and Filtering: Statistical and spatial operations, Intensity functions transformations, histogram processing, smoothing & sharpening,spatial filters Frequency domain filters, homomorphic filtering, image filtering & restoration. Inverse and weiner filtering, FIR weiner filter, Filtering using image transforms, smoothing splines and interpolation.

UNIT - III

Morphology: Morphological and other area operations, basic morphological operations, opening and closing operations,dilation erosion, Hit or Miss transform, morphological algorithms, extension to grey scale images.

UNIT - IV

Segmentation and Edge Detection: Segmentation and Edge detection region operations, basic edge detection, second order detection, crack edge detection, gradient operators, compass and laplace operators, edge linking and boundary detection, thresholding, region based segmentation, segmentation by morphological watersheds.

UNIT - V

Image compression: Types and requirements, statistical compression, spatial compression, contour coding, quantizing compression, image data compression-predictive technique, pixel coding, transfer coding theory, lossy and lossless predictive type coding, Digital Image Water marking.

UNIT - VI

Representation and Description: Chain codes, Polygonal approximation, Signature Boundary Segments, Skeltons, Boundary Descriptors, Regional Descriptors, Relational Descriptors, Principal components for Description, Relational Descriptors

UNIT - VII

Pattern Recognition Fundamentals: Basic Concepts of pattern recognition, Fundamental problems in pattern recognition system,design concepts and methodologies, example of automatic pattern recognition systems, a simple automatic pattern recognition model

UNIT - VIII

Pattern classification: Pattern classification by distance function: Measures of similarity, Clustering criteria, K-means algorithm, Pattern classification by likelihood function: Pattern classification as a Statistical decision problem, Bayes classifier for normal patterns.

Learning Resources

Text Books:

1. Digital Image Processing, 3/e,,Rafael C. Gonzalez, Richard E. Woods, PEA
2. Pattern recognition Principles, Julus T. Tou, and Rafel C. Gonzalez, Addision-Wesly

Reference Books:

1. Image Processing, Analysis and Machine Vision, Second Edition, Milan Sonka, Vaclav Hlavac and Roger Boyle. Thomson learning.
2. Digital Image Processing,Williamk. Pratl, John wiley edition
3. Fundamentals of digital image processing, A.K. Jain. PH
4. Pattern classification, Richard Duda, Hart and David strok John Weily publishers.
5. Digital Image Processing,S.Jayaraman,S.Esakkirajan,T.Veerakumar,TMH.
6. Pattern Recognition, R.Shinghal,Oxford University Press.