IMAGE PROCESSING AND PATTERN RECOGNITION  
CT 725 04

Lecture   : 3  
Tutorial   : 1  
Practical : 3/2

**Course Objectives:**

To be familiar with processing of images, pattern recognition and their applications.

1. Introduction to digital image processing  
   (4 hours)
   1. Digital image representation
   2. Digital image processing: Problems and applications
   3. Elements of visual perception
   4. Sampling and quantization, relationships between pixels
2. Two-dimensional systems  
   (5 hours)
   1. Fourier transform and Fast Fourier Transform
   2. Other image transforms and their properties: Cosine transform, Sine transform, Hadamard transform, Haar transform
3. Image enhancement and restoration  
   (8 hours)
   1. Point operations, contrast stretching, clipping and thresholding, digital negative, intensity level slicing, bit extraction
   2. Histogram modeling: Equalization, Modification, Specification
   3. Spatial operations: Averaging, directional smoothing, median, filtering, spatial low pass, high pass and band pass filtering, magnification by replication and interpolation
4. Image coding and compression  
   (4 hours)
   1. Pixel coding: run length, bit plane coding, Huffman coding
   2. Predictive and inter-frame coding
5. Introduction to pattern recognition in images  
   (3 hours)
6. Recognition and classification  
   (5 hours)
   1. Recognition and classification
   2. Feature extraction
   3. Models
   4. Division of sample space
7. Grey level features edges and lines  
   (6 hours)
   1. Similarity and correlation
   2. Template matching
   3. Edge detection using templates
   4. Edge detection using gradient models, model fitting
   5. Line detection, problems with feature detectors
8. Segmentation  
   (3 hours)
   1. Segmentation by thresholding
   2. Regions based Segmentation, edges, line and curve detection
9. Frequency approach and transform domain  
   (3 hours)
10. Advanced Topics  
    (4 hours)
    1. Neural networks and their application to pattern recognition
    2. Hopfield nets
    3. Hamming nets, perceptron

**Practical:**

Laboratory exercises using image processing and pattern recognition packages.

**References:**

1. R. C. Gonzalez and P. Wintz, "Digital Image Processing", Second Edition, Addison-Wesley Publishing.
2. K. Castlemann. "Digital Image Processing", Prentice Hall of India Ltd.
3. A. K. Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India Pvt. Ltd..
4. Sing Tze Bow, M. Dekker, "Pattern Recognition and Image Processing",
5. M. James, "Pattern Recognition", BSP professional books.
6. P. Monique and M. Dekker, "Fundamentals of Pattern Recognition".

**Evaluation Scheme:**

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

|  |  |  |
| --- | --- | --- |
| **Chapter** | **Hours** | **Marks Distribution\*** |
| 1, 2 | 4, 5 | 16 |
| 3, 5 | 8, 3 | 16 |
| 4, 6 | 4, 5 | 16 |
| 7, 8 | 6, 3 | 16 |
| 9, 10 | 3, 4 | 16 |
| **Total** | **45** | **80** |

\*Note: There could be minor deviation in mark distribution.