DIGITAL IMAGE PROCESSING

The objective of the course is to familiarize students with basics of Digital Image Processing. Image processing is an area of active interest for research as well as academics purpose. This course focuses on MATLAB implementation of various ideas related to Image Processing.

OUTLINE OF THE COURSE

S. No.	Topic	Minimum number of Hours
1	Introduction And Fundamentals of Digital Image Processing	8
2	Digital image Representation	4
3	Image Enhancement in the Spatial Domain	8
4	Image Enhancement in the Frequency Domain	5
5	Image Restoration	8
4	Image Compression	4
7	Image Segmentation	3

LECTURE: 40 hrs

PRACTICLE/TUTORIAL: 40 hrs

PROJECT: 40 hrs

TOTAL: 120 hrs

DETAILED SYLLABUS

1. Introduction And Fundamentals of Digital Image Processing:

The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems

Image Sampling and Quantization, Some basic relationships like Neighbours, Connectivity, Distance Measures between pixels, Translation, Scaling, Rotation and Perspective Projection of image, Linear and Non Linear Operations

2. Digital image Representation

Reading, Displaying, Writing Images using MATLAB, Data Classes, Image Types using MATLAB, Converting Between data classes and Image Types, Introduction to M Function Programming using MATLAB

3. Image Enhancement in the Spatial Domain

Some basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Combining Spatial Enhancement Methods, Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters, Intensity Transformation Function (MATLAB), Histogram Processing and Function Plotting (MATLAB)

4. Image Enhancement in the Frequency Domain

Introduction to Fourier Transform and the frequency Domain, Computing and Visualizing the 2D DFT (MATLAB), Smoothing Frequency Domain Filters, Sharpening Frequency Domain Filters, Homomorphic Filtering

5. Image Restoration
A model of The Image Degradation / Restoration Process, Noise Models, Restoration in the presence of Noise Only Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invariant Degradations, Estimation of Degradation Function, Inverse filtering, Wiener filtering, Geometric Mean Filter, Geometric Transformations
6. Image Compression
Coding, Interpixel and Psychovisual Redundancy, Image Compression models, Compression standards
7. Image Segmentation
Detection of Discontinuities, Edge linking and boundary detection, Thresholding

REFERENCE BOOKS

1. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.

ONLINE RESOURCES

http://www.tutorialspoint.com/dip/index.htm

http://www.imageprocessingplace.com/root_files_V3/tutorials.htm

http://www.cs.washington.edu/research/metip/tutor/tutor.html

http://www.imageprocessingbasics.com/

http://www.bogotobogo.com/Matlab/Matlab_Tutorial_Digital_Image_Processing_I.php

http://blogs.mathworks.com/steve/ http://in.mathworks.com/discovery/digital-image-processing.html

Assignments

1. Read and display an inbuilt Matlab image and obtain information about the same.
2. Read and display any user image and obtain information about the image.
3. Taking a colored image as input and converting it to grayscale image. (rgb2gray) 4. Conversion between different image formats. (im2bw)
5. Perform various arithmetic operations on images. (imadd,imsubstract,immultiply,imdivide,imabsdiff,imcomplement,imlincomb)
6. Obtain and equalize histogram of a grayscale image.
7. Other histogram operations.
8. Study various sliding window for filtering.
9. Apply various linear and non-linear spatial filtering methods on an image.
10. Smoothening, sharpening, blurring of image through filtering.
11. Convert an image to frequency domain and use log transform to perform various operations.
12. Study of frequency domain filters.
13. Adding various types of noise to an image and using filters to spatial filters.
14. Designing a simple degrading filter and using inverse filtering to obtain original image.
15. Image cropping, zooming, pinching.
16. Quality loss Image compression using sampling.
17. Basics of Huffman coding.
18. Coding and Pshycovisual redundancy. Calculation and removal of redundancy. 19. Compression models and standards. (theoretical introduction)
20. Point, line and edge detection.
21. Detection of discontinuity.
22. Effect of thresolding on detection.