NEW - Image Processing and Computer Vision

[2hr lecture]-0-[2hr lab]-[4hr self-study] (4 credits)

Prerequisite: *CS102/ CS103, MA202*

Unit 1. ***Introduction*** *04- hours*

Light, Brightness adaptation and discrimination, Pixels, coordinate conventions, Imaging Geometry, Perspective Projection, Spatial Domain Filtering, sampling and quantization. Basic concepts of Image Formation, Geometric Transformations, Camera Models

Unit 2. ***Spatial Domain Filtering*** *06- hours*

Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution, Smoothing filters, sharpening filters, gradient and Laplacian.

Unit 3. ***Morphological Image Processing*** *04- hours*

Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion.

Unit 4. ***Image Descriptors*** *08- hours*

Object Boundary and Shape Representations, Interest or Corner Point Detectors, Histogram of Oriented Gradients, Texture Descriptors, Scale Invariant Feature Transform, Speeded up Robust Features, Saliency, Feature Matching

Unit 5. ***Image Segmentation*** *08- hours*

Boundary detection based techniques, Point, line detection, Edge detection, Edge linking, local processing, regional processing, Hough transform, Thresholding, Iterative thresholding, Otsu's method, Moving averages, Multi-variable thresholding, Region based segmentation, Watershed algorithm, Use of motion in segmentation

Unit 6. ***Applications of Computer Vision*** *09- hours*

Artificial Neural Network for Pattern Classification, Gesture Recognition, Motion Estimation and Object Tracking

Evaluation Scheme:

ETE: 40% MTE: 25% Quiz: 10% Assignments: 25%

Text Book:

1. *Digital Image Processing, 3rd Edition, by Rafael C Gonzalez and Richard E Woods. Publisher: Pearson Education*
2. *Computer and Machine Vision: Theory, Algorithms, Practicalities, 4th Edition, by E. R. Davies*

References:

- *1. Fundamentals of Digital Image Processing By Anil K Jain*
- *2. Image Processing: Principles and Applications by Tinku Acharya, Ajoy K. Ray*