RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Computer Science and Engineering, VIII-Semester

Open Elective – CS803 (A) Image Processing and Computer Vision#

Course Objectives: Students should be able to

- Understand practice and theory of computer vision.Elaborate computer vision algorithms, methods and concepts
- Implement computer vision systems with emphasis on applications and problem solving
- Apply skills for automatic analysis of digital images to construct representations of physical objects and scenes.
- Design and implement real-life problems using Image processing and computer vision.

Contents:

UNIT 1
Introduction to computer vision and Image processing (CVIP): Basics of CVIP, History of CVIP, Evolution of CVIP, CV Models, Image Filtering,Image Representations,Image StatisticsRecognition Methodology: Conditioning, Labeling, Grouping, Extracting, and Matching, Morphological Image Processing: Introduction, Dilation, Erosion, Opening, Closing, Hit-or-Miss transformation, Morphological algorithm operations on binary images, Morphological algorithm operations on gray-scale images, Thinning, Thickening, Region growing, region shrinking.

UNIT 2
Image Representation and Description: Representation schemes, Boundary descriptors, Region descriptors Binary Machine Vision: Thresholding, Segmentation, Connected component labeling, Hierarchal segmentation, Spatialclustering, Split& merge, Rule-based Segmentation, Motion-based segmentation. Area Extraction: Concepts, Data-structures, Edge, Line-Linking, Hough transform, Line fitting, Curve fitting (Least-square fitting).

UNIT 3
Region Analysis: Region properties, External points, Spatial moments, Mixed spatial gray-level moments, Boundary analysis: Signature properties, Shape numbers. General Frame Works For Matching: Distance relational approach, Ordered structural matching, View class matching, Models database organization

UNIT4
Facet Model Recognition: Labeling lines, Understanding line drawings, Classification of shapes by labeling of edges, Recognition of shapes, Consisting labeling problem, Back-tracking AlgorithmPerspective Projective geometry, Inverse perspective Projection, Photogrammetric -from 2D to 3D, Image matching: Intensity matching of ID signals, Matching of 2D image, Hierarchical image matching. Object Models And Matching: 2D representation, Global vs. Local features

UNIT 5
Knowledge Based Vision: Knowledge representation, Control-strategies, Information Integration. Object recognition-Hough transforms and other simple object recognition methods,   Shape correspondence and shape matching, Principal component analysis , feature extraction, Neural network and Machine learning for image shape recognition

Reference Text
1. Robert Haralick and Linda Shapiro, "Computer and Robot Vision", Vol I, II, Addison-Wesley, 1993
2. David A. Forsyth, Jean Ponce, "Computer Vision: A Modern Approach" Pearson
3. Milan Sonka,VaclavHlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision" Thomson Learning.