

Computer Vision

B.E. Sem. VIII [CMPN]

(Elective – II)

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Oral Exam	–	25
Term Work	–	25

SYLLABUS

Objectives of the course: To introduce the student to computer vision algorithms, methods and concepts which will enable the student to implement computer vision systems with emphasis on applications and problem solving.

Pre-requisites: Introduction to Image Processing.

1. Recognition Methodology

Conditioning, Labeling, Grouping, Extracting, Matching.

2. 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.

3. Image Representation and Description

Representation schemes, Boundary descriptors, Region descriptors.

4. Binary Machine Vision

Thresholding, Segmentation, Connected component labeling, Hierarchical segmentation, Spatial clustering, Split & merge, Rule-based Segmentation, Motion-based segmentation.

5. Area Extraction

Concepts, Data-structures, Edge, Line-Linking, Hough transform, Line fitting, Curve fitting (Least-square fitting).

6. Region Analysis

Region properties, External points, Spatial moments, Mixed spatial gray-level moments, Boundary analysis: Signature properties, Shape numbers.

7. Facet Model Recognition

Labeling lines, Understanding line drawings, Classification of shapes by labeling of edges, Recognition of shapes, Consistent labeling problem, Back-tracking Algorithm

8. Perspective Projective geometry, Inverse perspective

Projection, Photogrammetry - from 2D to 3D, Image matching : Intensity matching of ID signals, Matching of 2D image, Hierarchical image matching.

9. Object Models And Matching

2D representation, Global vs. Local features

10. General Frame Works For Matching

Distance relational approach, Ordered structural matching, View class matching, Models database organization.

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Distance -relational approach, Ordered -Structural matching, View class matching, Models database organization.

12. Knowledge Based Vision

Knowledge representation, Control-strategies, Information Integration.

13. Object recognition

- Hough transforms and other simple object recognition methods
- Shape correspondence and shape matching
- Principal component analysis
- Shape priors for recognition

References

1. Computer and Robot Vision, Vol I, II, (*Robert Haralick and Linda Shapiro*) Addison-Wesley, 1993.
2. Computer Vision: A Modern Approach (*David A. Forsyth*) Jean Ponce.
3. Image Processing, Analysis, and Machine Vision (*Milan Sonka, Vaclav Hlavac, Roger Boyle*) Thomson Learning.

