18/12/23 - FN.

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 70061

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023

Seventh Semester

Artificial Intelligence and Data Science

AD 8703 – BASICS OF COMPUTER VISION

(Regulations 2017)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define restoration.
   (a) Corners
   (b) Behaviors
   (c) Edges
2. How are histograms used in computer vision based Processing?
3. List the various edge detectors.
4. Differentiate between SIFT and HoG.
5. "The 3D histogram has more information than 3 separate 1D histograms." Is it true? Justify your answer.
6. Consider two sine waves, one at a frequency of f=3/4 and the other at f = 5/4. What will the ratio of their values be if sampling is done at f=2?
7. What is triangulation?
8. What is bundle adjustment?
9. Differentiate between internal and external object representations.
10. What is image tracking?

PART B — (5 × 13 = 65 marks)

11. (a) Illustrate in detail the different types of affine transformations with mathematical formulations. How is conversion of affine into eucliden images performed? (6+7)

Or

(b) (i) Briefly discuss the different components of a vision system. (6)

(ii) Explain in detail the process of convolution filtering with an illustration. (7)

12. (a) Illustrate the steps in Hough transform technique to detect circle shape. Assume an equation for circle by $(x-a)^2+(y-b)^2=R^2$; where (a,b) is the centre of the circle and R is known radius.

Or

(b) Elaborate on how multi resolution analysis can be done using discrete wavelet transforms.

13. (a) How can K-means clustering be used for image segmentation? Explain the steps when colors are used for segmentation. (6+7)

Or

(b) What is Mathematical Morphology? What are the operations invoked? Explain. Consider the example where A is a rectangle and B is a disc centered on the origin. Use them to illustrate the morphological operations.

14. (a) What is photometric stereo? Why is it chosen? Explain the steps in 3D image based photometric stereo. (3+3+7)

Or

(b) Briefly discuss about parametric motion and layered motion in 3D. (6+7)

15. (a) Explain in detail the process of analyzing images in documents.

Or

(b) What is content based image retrieval? Explain the process of content based image retrieval. List out its advantages and disadvantages. (3+6+4)

PART C — (1 × 15 = 15 marks)

16. (a) Describe histogram equalization. Obtain histogram equalization for the following image segment of size 5 × 5. Write the inference on image segment before and after equalisation.

20	20	20	18	16
15	15	16	18	15
15	15	19	15	17
16	17	19	18	16
20	18	17	20	15

Figure 16 (a)

Or

(b) Explain region growing approach for segmentation. Suppose that we have the image given below. Use the region growing idea to segment the given object. The seed for the object is the center of the image. Region is grown both in horizontal and vertical direction, and when the difference between the two pixel values is less than or equal to 5.

10	10	10	10	10	10	10
10	10	10	69	70	10	10
59	10	60	64	59	56	60
10	59	10	60	70	10	62
10	60	59	65	67	10	65
10	10	10	10	10	10	10
10	10	10	10	10	10	10

Figure 16 (b)

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