

Code No: 138BH**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B. Tech IV Year II Semester Examinations, July - 2021****COMPUTER VISION****(Electronics and Communication Engineering)****Time: 3 hours****Max. Marks: 75**

Answer any Five Questions
All Questions Carry Equal Marks

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- 1.a) Discuss the limiting effect of repeatedly applying a 2×2 low-pass spatial filter to a digital image. Ignore border effects. Is this effect different from applying 4×4 filter.
- b) Discuss in detail about Corner detection algorithms. [7+8]
- 2.a) Devise an efficient algorithm to compute the distance transform. The algorithm should take a binary image and return at each pixel the city block distance to the nearest non-zero element of the original image. The city block distance d between pixels (x_1, y_1) and pixel (x_2, y_2) is defined as $d = |x_1 - x_2| + |y_1 - y_2|$.
- b) Explain the method of Active Contours. What underlying trade-off governs the solutions they generate? How is that trade-off controlled? What mathematical methods are deployed in the computational implementation of deformable models? [7+8]
- 3.a) Describe the use of the Hough transform for circular object detection, assuming that object size is known in advance. Show also how a method for detecting ellipses could be adapted for detecting circles of unknown size.
- b) Discuss how an increase in the complexity of curve under detection increases the computations in an exponential way in Hough transform. [8+7]
- 4.a) Discuss how cutting down the possible number of positions in gradient space for a given point on the surface of the object is done.
- b) A cube is viewed in orthographic projection. Show that although the cube is opaque, it is easy to compute the theoretical position of its centroid in the image. Show also that the orientation of the cube can be deduced by considering the apparent areas of its faces. [8+7]
- 5.a) Discuss in detail about In-vehicle vision system.
- b) When visually inferring a 3D representation of a face, it is useful to extract separately both a shape model, and a texture model. Explain the purposes of these steps, their use in morphable models for pose-invariant face recognition, and how the shape and texture models are extracted and later re-combined. [7+8]
- 6.a) Prove that if the histogram of an image is uniform over all possible intensity levels, the basic global thresholding algorithm converges to average intensity of the image $(L-1)/2$.
- b) Discuss in detail about mathematical morphology. [8+7]

- 7.a) Show that if only two Fourier descriptors are used to reconstruct a boundary, the result will be a circle.
- b) Find the differential chain code of i) Hexagon ii) Quadrilateral and iii) Octagon.
[7+8]
- 8.a) What information about the shape and orientation of an object can be inferred, and how, from the extraction of texture descriptors; and what is the role of prior assumptions in making such inferences from texture?
- b) Show how a GHT version of the spatial matched filter can be devised to detect an equilateral triangle, leading to a star-shaped transform that peaks at the center of the triangle.
[7+8]

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