

## Image processing and computer vision

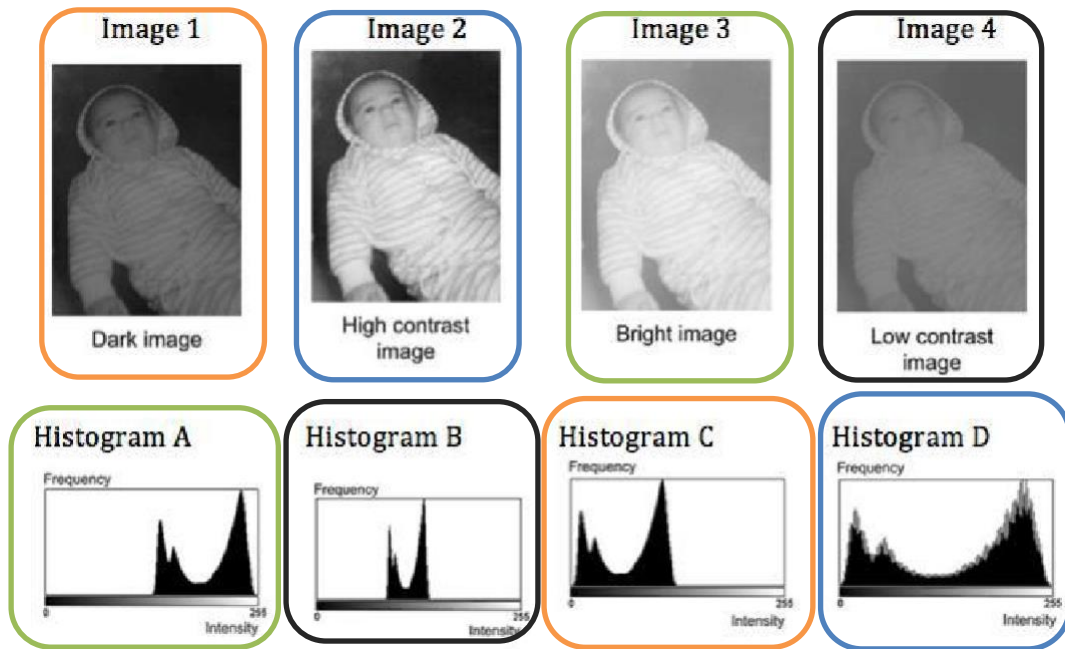
### Sample Written Exam

#### Notes:

- Sample exam (30 questions) that covers the same parts and has similar difficulty level of the final exam.
- The final exam will be 45 questions.

#### Choose all correct answers (more than one answer can be correct)

1. Smoothing in frequency domain of a given image is achieved by applying which of the following?
  - a. suppressing of high-frequency components
  - b. suppressing low-frequency components
  - c. suppressing high amplitude components
  - d. suppressing low amplitude components
2. Which of the following filters leads to less sharp details with respect to the original image?
  - a. High-pass filter
  - b. Low-pass filter
  - c. Gaussian low-pass filter
  - d. None of the mentioned
3. Which of the following is not a valid response when we apply a second derivative of an image?
  - a. Zero response at onset of gray level step
  - b. Nonzero response at onset of gray level step
  - c. Zero response at flat segments
  - d. Nonzero response along the ramps
4. The type of Interpolation where the intensity of the 4 neighboring pixels is used to obtain intensity a new location is called \_\_\_\_\_
  - a. Nearest neighbor interpolation
  - b. Bilinear interpolation
  - c. Bicubic interpolation
  - d. Averaging
5. Which is a colour attribute that describes a pure colour?
  - a. Saturation
  - b. Hue
  - c. Brightness
  - d. Intensity
6. Match the images below with corresponding histogram:



7. Hit-or-miss transformation is used for shape
  - a. Removal
  - b. Detection**
  - c. Compression
  - d. Decompression
  
8. The gradient vector is:
  - a. Perpendicular to the contour lines of the image (in the direction of intensity change)**
  - b. Points towards the direction of the higher intensity**
  - c. Parallel to the contour lines of the image (perpendicular to the direction of intensity change)
  - d. Points towards the direction of the lower intensity
  
9. The aim of applying a gaussian filter as a step for edge detection is to:
  - a. Sharpen edges
  - b. Reduce noise**
  - c. Highlight details
  - d. Increase blur

10. Affine transformation includes

- a. Translation
- b. 2D in-plane rotation
- c. Uniform scale
- d. Shearing

11. For edge localization, which of the following operations can be applied

- a. First derivative in the direction of the change and finding the local extrema (maxima)
- b. Second derivative in the direction of the change and finding the local extrema (maxima)
- c. First derivative in the direction of the change and finding the zero crossing
- d. Second derivative in the direction of the change and finding the zero crossing

12. What is the process of moving a filter mask over the image and computing the sum of products at each location (without flipping the mask) called as?

- a. Convolution
- b. Correlation
- c. Template matching
- d. Smoothing

13. Which of the following could affect the intrinsic parameters of a camera?

- a. A crooked lens system.
- b. Diamond/Rhombus shaped pixels with non-right angles.
- c. Light conditions.
- d. Camera orientation.

14. the theory of mathematical morphology is based on \_\_\_\_\_

- a. image size
- b. set theory
- c. probability
- d. correlation

15. The Hough transform is used to fit points as \_\_\_\_\_

- a. lines
- b. edges
- c. curves
- d. ROI's

16. Smoothing of an image can be applied by convolving a Gaussian kernel

- a. True
- b. False

17. Applying convolution with the derivative of the Gaussian kernel results in the same image as convolving the Gaussian kernel then calculating the derivative of the output of image after convolution

- a. True
- b. False

18. Two-dimensional Gaussian filtering can be separated into 2 one-dimensional Gaussian filters

- a. True
- b. False

19. Two-dimensional Laplacian of Gaussian can be separated into 2 one-dimensional Gaussians
- True
  - False**
20. Higher sigma of the Gaussian filter will result in detection of more weak edges
- True
  - False**
21. After calculating the second derivative of an image, the higher the slope at the zero-crossing the weaker the edge is.
- True
  - False**
22. In feature extraction, which techniques are used to detect interest points or keypoints in an image?
- Harris Corner Detector**
  - SIFT (Scale-Invariant Feature Transform)**
  - Hough Transform
  - Sobel operator
23. Which of the following are characteristics of the Harris Corner Detector?
- Rotation invariance
  - Scale invariance
  - Edge response**
  - Corner response**
24. which of the following are true for disparity in the binocular vision?
- Depth is inversely proportional to disparity**
  - Disparity is proportional to Baseline.**
  - Larger baselines improve depth map resolution.
  - Baseline distance only affects the focal length.
25. Question: What role does the essential matrix play in stereo vision?
- Describing the camera's internal parameters
  - Quantifying the fundamental matrix
  - Representing the 3D transformation between stereo cameras**
  - Correcting lens distortion in images
26. Which of the following are challenges addressed by the Lucas-Kanade method in motion analysis?
- Large displacements
  - Illumination changes**
  - Object recognition
  - Camera calibration
27. What is the significance of radial distortion in camera calibration?
- It improves depth estimation accuracy.
  - It has no impact on camera calibration.
  - It introduces errors in the mapping between 3D and 2D coordinates.**
  - It reduces the computational complexity of calibration algorithms.

28. What does the term "image registration" refer to in computer vision?

- a) Aligning images from different sources or time points
- b) Changing the resolution of images
- c) Classifying images based on content
- d) Adding noise to images

29. Which of the following are challenges addressed by the Laplacian of Gaussian (LoG) edge detector?

- a) Noise sensitivity
- b) Smoothing artifacts
- c) Multiple scales
- d) Limited orientation response

30. What can you get from camera calibration for a signal camera?

- a) Intrinsic matrix
- b) Extrinsic matrix
- c) Radial or tangential distortions
- d) Depth information of the 3D object