Module 2

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(1) How would you write a nested for loop to iterate through all the pixels in an image? (10 pts)

- 1. for i in range(0, height * width):
- 2. for row in range(0, height):

for pixel in range(0, width):

3. for col in range(0, width):

for row in range(0, height):

4. for pixel in range(0, width): for row in range(0, height):

5. None of the above

Answer:

(2) What is the purpose of thresholding in image processing? (10 pts)

- 1. To search for values that exactly match black or white.
- 2. To select all pixels above a certain brightness value.
- 3. To convert an RGB image to greyscale.
- 4. To perform a filter on the image using a fixed value as the dividing point.
- 5. None of the above

Answer:

(3) The following pseudo code will detect what feature? (10 pts)

For each row in the image:

For each pixel in the row:

Subtract the current pixel's RGB values with the pixel to the left

Set the current pixel to this value.

- 1. Colors
- 2. Edges
- 3. Noise
- 4. Circles
- 5. None of the above

Answer:

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- 1. Sharpening
- 2. Blur
- 3. Horizontal Edge Detecting
- 4. Circle Detecting
- 5. None of the above

Answer:

(5) Which of the following statements is true regarding interpolation in image processing? (10 pts)

- 1. It is a method of deleting pixels from an image when it is downsized.
- 2. It is a method of adding noise to an image.
- 3. It is a method of constructing new data points based on known data points to fill gaps in pixel data during image resizing.
- 4. It is a method of converting an image from color to black and white.
- 5. None of the above

Answer:

(6) Which type of image interpolation has the fastest execution time? (10 pts)

- 1. Bilinear
- 2. Distorted
- 3. Bicubic
- 4. Nearest Neighbor

Answer:

(7) How many neighboring pixels are referenced in bilinear interpolation to estimate the value of a new pixel?? (10 pts)

- 1.1
- 2.16
- 3.4
- 4.8

Answer:

(8) Which of the following is the correct algorithm for performing image convolution? (10 pts)

- 1. For each pixel in the image frame, multiply it with its corresponding kernel value, sum the products, and set the current pixel to this value.
- 2. For each pixel in the kernel, visit each pixel in the image, multiply their values, sum the products, and set the current pixel to this value.
- 3. For each row in the image, visit each pixel in the row, apply the kernel values to the neighboring pixels, and set the current pixel to this value.
- 4. For each row in the kernel, visit each pixel in the row, apply the kernel values to the neighboring pixels, and set the current pixel to this value.

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(9) Which one of the following kernels can be used to blur an image? Explain Why? (10 pts)

$$(A) \begin{bmatrix} 1 & 0 & -1 \\ 1 & 0 & -1 \\ 1 & 0 & -1 \end{bmatrix} (B) \begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix} (C) \begin{bmatrix} 1/9 & 1/9 & 1/9 \\ 1/9 & 1/9 & 1/9 \\ 1/9 & 1/9 & 1/9 \end{bmatrix} (D) \begin{bmatrix} 0 & -1 & 0 \\ -1 & 5 & -1 \\ 0 & -1 & 0 \end{bmatrix}$$

Answer:	

(10) Fill in the missing comments for each OpenCV function in the Sobel pipeline, explaining the purpose of each step. The (10 pts - 1 pt each)

Comment = # # img = cv2.imread('Graphics/face_conv.png') # gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY) # kernelOne = np.array([[1, 2, 1], [2, 4, 2], [1, 2, 1]],dtype=np.float32) / 16 # filterOneImage = cv2.filter2D(KernelOne, cv2.CV_64F, gray) # # kernelX = np.array([[-1, 0, 1], [-2, 0, 2], [-1, 0, 1]], dtype=np.float64)# # KernelY = np.array([[-1, -2, -1], [0, 0, 0], [1, 2, 1]], dtype=np.float64)# imageX = cv2.filter2D(filter0neImage, cv2.CV_64F, kernelX) # imageY = cv2.filter2D(filterOneImage, cv2.CV_64F, kernelY) # Compute the magnitude of the gradients of imageX and imageY mag = cv2.magnitude(imageX, imageY) # val, thresh = cv2.threshold(mag, 100, 200, cv2.THRESH_BINARY) #

plt.imshow(thresh, cmap='gray')