

## Feedback — Homework 9

[Help](#)

You submitted this quiz on **Wed 4 Jun 2014 6:41 AM UTC**. You got a score of **9.00** out of **9.00**.

### Question 1

Consider the 8-level midrise uniform quantizer covered in the lecture. The quantization boundaries are at  $0, \pm\Delta, \pm2\Delta, \dots$ , and the quantization levels are at  $\pm \frac{1}{2} \Delta, \pm \frac{3}{2} \Delta, \dots$ . For an input of value  $3.8\Delta$ , after quantization, the result will be

| Your Answer   |   | Score       | Explanation |
|---|---|-------------|-------------|
| <input checked="" type="radio"/> $\frac{7}{2} \Delta$ | ✓ | 1.00        |             |
| <input type="radio"/> $-\frac{3}{2} \Delta$           |   |             |             |
| <input type="radio"/> $-\frac{5}{2} \Delta$           |   |             |             |
| <input type="radio"/> $\frac{9}{2} \Delta$            |   |             |             |
| Total   |   | 1.00 / 1.00 |             |

### Question 2

(Yes or No) Can we perform non-uniform quantization using a uniform quantizer?

| Your Answer                          |   | Score       | Explanation |
|--------------------------------------|---|-------------|-------------|
| <input checked="" type="radio"/> Yes | ✓ | 1.00        |             |
| <input type="radio"/> No             |   |             |             |
| Total                                |   | 1.00 / 1.00 |             |

### Question 3

Which of the following statements regarding Vector Quantization (VQ) are correct? Check all that apply.

| Your Answer  | Score          | Explanation |
|--|----------------|-------------|
| <input checked="" type="checkbox"/> VQ can be considered as a pattern matching technique.          | ✓ 0.25         |             |
| <input checked="" type="checkbox"/> Codebook design is an iterative procedure.                     | ✓ 0.25         |             |
| <input type="checkbox"/> The codevectors in VQ are of lower-dimensionality than the input vectors. | ✓ 0.25         |             |
| <input type="checkbox"/> The designed codebook is unique irrespective of the training vectors.     | ✓ 0.25         |             |
| Total  | 1.00 /<br>1.00 |             |

## Question 4

For a given image of fixed resolution, how is the number of bits resulted from Vector Quantization (VQ) related to the vector size and the number of codevectors?

| Your Answer   | Score          | Explanation |
|---|----------------|-------------|
| <input type="radio"/> Smaller vector size leads to fewer bits; fewer codevectors lead to fewer bits           |                |             |
| <input checked="" type="radio"/> Larger vector size leads to fewer bits; fewer codevectors lead to fewer bits | ✓ 1.00         |             |
| <input type="radio"/> Smaller vector size leads to fewer bits; more codevectors lead to fewer bits            |                |             |
| <input type="radio"/> Larger vector size leads to fewer bits; more codevectors lead to fewer bits             |                |             |
| Total   | 1.00 /<br>1.00 |             |

## Question 5

Which of the following options are isometries? Check all that apply

| Your Answer  | Score       | Explanation |
|--|-------------|-------------|
| <input checked="" type="checkbox"/> identity   | ✓ 0.25      |             |
| <input checked="" type="checkbox"/> flipping about the diagonal  | ✓ 0.25      |             |
| <input checked="" type="checkbox"/> reflection about the mid-vertical axis                                   | ✓ 0.25      |             |
| <input checked="" type="checkbox"/> the concatenation of rotation by 90 degrees with rotation by -90 degrees | ✓ 0.25      |             |
| Total  | 1.00 / 1.00 |             |

## Question 6

In a lossy image compression technique such as JPEG, from which of the following does the loss come from?

| Your Answer  | Score       | Explanation |
|--|-------------|-------------|
| <input checked="" type="radio"/> Quantization of transformation coefficients | ✓ 1.00      |             |
| <input type="radio"/> Dividing an image into blocks                          |             |             |
| <input type="radio"/> Run-length coding of quantized coefficients            |             |             |
| <input type="radio"/> Transformation of image blocks                         |             |             |
| Total  | 1.00 / 1.00 |             |

## Question 7

In this problem you will get hands-on experience in JPEG image compression. Follow the instructions below to complete this problem. (1) Download the original 8-bit grayscale image [here](#), and load it into a MATLAB array. (2) Perform JPEG compression by using the MATLAB function "imwrite". For the purpose of this problem, you need to specify 5 input arguments. The first argument is the MATLAB array containing the input image; the second argument is a string specifying the output file name; the third argument is 'jpg' (including the single quotes); the fourth argument is the string 'quality' (including the single quotes); and the last argument is a number that specifies the quality level used for compression. The quality level is an integer between 0 and 100.

For this step, set the quality level to be 75 (the default value). After the function "imwrite" is invoked, a new JPEG image will be created in the location that was specified by you. (3) Load the newly created JPEG image into a MATLAB array. Compute the PSNR between the JPEG compressed image and the original image. Note that the image loaded into MATLAB is of type 'uint8' (i.e., 8-bit integer). In order to compute the PSNR, you need to convert these arrays into 'double'. (4) Repeat steps (2) and (3) with the quality level set at 10. Enter the PSNR values corresponding to the JPEG images at quality level 75 and 10, respectively. Enter the numbers to 2 decimal points.

**You entered:**

76.04  
26.44

| Your Answer |   | Score       | Explanation |
|-------------|---|-------------|-------------|
| 76.04       | ✓ | 1.50        |             |
| 26.44       | ✓ | 1.50        |             |
| Total       |   | 3.00 / 3.00 |             |

