ARAB INTERNATIONAL UNIVERSITY
Faculty of Informatics & Communication Engineering

الجامعة العربية الدولية الخاصة
كلية الهندسة المعلوماتية والاتصالات

Course: Multimedia (MM)
Miterm 2017_1
Number of pages: 4

Total points: 20

Allowed Facilities: Calculator
Duration: 1.5 hours
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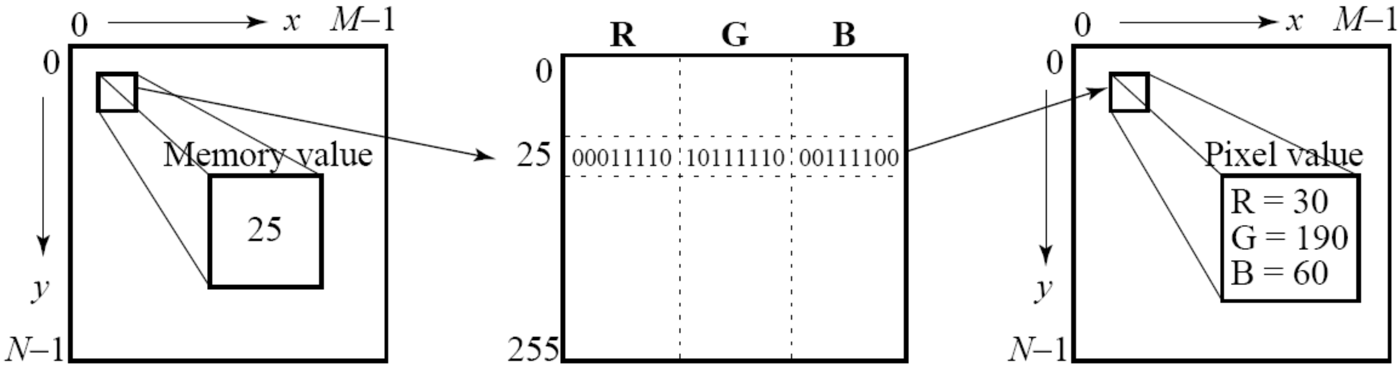
Answer on the same exam sheets

الإجابة على أوراق الأسئلة

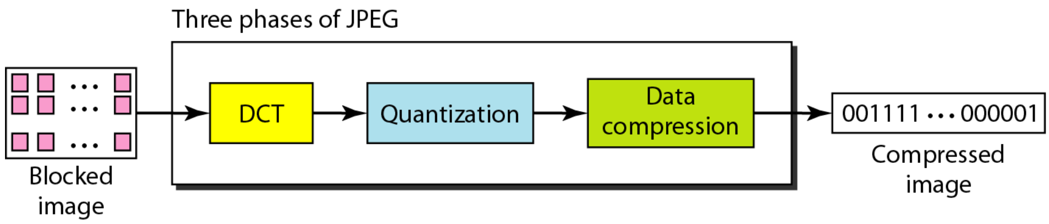
Q.1 [5 points]
Describe how 8-bit color images are stored and displayed using an illustrative figure.

The idea used in 8-bit color images is to store only the index, or code value, for each pixel. Then, e.g., if a pixel stores the value 25, the meaning is to go to row 25 in a color look-up table (LUT).



Color LUT for 8-bit color images.

Q.2 [5 points]
Draw a block diagram that shows the stages of the encoder for the JPEG compression, and the stages for JPEG decompression.



Q.3 [5 points]

- Consider the sub-image below, find the coefficient of the DCT at F(1, 0) and at F(0, 1).

------------- > y

50	50	0	0
50	50	0	0
0	0	0	0
0	0	0	0

x

$$F(u,v) = \frac{2C(u)C(v)}{\sqrt{MN}} \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} I(x\,,y) cos\left(\frac{(2x+1)u\pi}{2M}\right) cos\left(\frac{(2y+1)v\pi}{2N}\right) \quad \text{where } C(\xi) = \begin{cases} \frac{\sqrt{2}}{2} & if\ \xi = 0 \\ 1 & otherwise \end{cases}$$

$$F(1,0) = \frac{\sqrt{2}}{4} \sum_{x=0}^{3} \sum_{y=0}^{3} I(x\,,y) cos\left(\frac{(2x+1)\pi}{8}\right) = \frac{\sqrt{2}}{4} * (50) \left[\cos\left(\frac{\pi}{8}\right) + cos\left(\frac{3\pi}{8}\right) + \cos\left(\frac{\pi}{8}\right) + \cos\left(\frac{3\pi}{8}\right)\right]$$

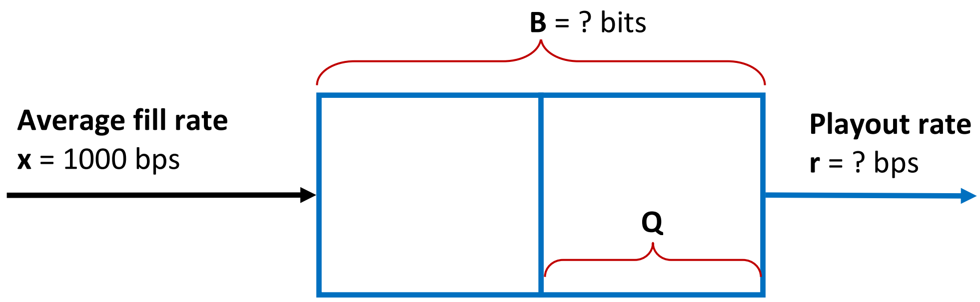
$$= 45.7$$

$$F(0,1) = \frac{\sqrt{2}}{4} \sum_{x=0}^{3} \sum_{y=0}^{3} I(x\,,y) cos\left(\frac{(2y+1)\pi}{8}\right) = \frac{\sqrt{2}}{4} * (50) \left[\cos\left(\frac{\pi}{8}\right) + cos\left(\frac{3\pi}{8}\right) + \cos\left(\frac{\pi}{8}\right) + \cos\left(\frac{3\pi}{8}\right)\right]$$

$$= 45.7$$

Q.4 [5 points]
Consider the simple model for streaming shown below. **B** is the size of the client's application buffer, and **Q** = 0.5 **B** denotes the number of bits that must be buffered before the client application begins playout. Also **r** denotes the video consumption rate. Assume that the server sends bits with an average rate **x** = 1000 bps, and this fill rate is less than the playout rate; In this case playout will alternate between periods of continuous playout and periods of freezing.

- Assume the initial freezing period = 100 seconds. Compute the buffer size **B**.
- What is the video consumption rate **r** so that the continuous playout period will be 500 seconds?



Client application buffer

During a playout period, the buffer starts with Q bits and decreases at rate r - x. Thus, after Q/(r - x) seconds after starting playback the buffer becomes empty. Thus, the continuous playout period is Q/(r - x) seconds. Once the buffer becomes empty, it fills at rate x for Q/x seconds, at which time it has Q bits and playback begins. Therefore, the freezing period is Q/x seconds.

The freezing period = Q/x = 100 seconds → Q = 1000 x 100 = 100,000 → **B** = $2\text{x}10^5$ bits
The continuous play out period = Q/(r - x) = 500 seconds → (r-x) = Q/500 = 200 → r = 1000+200 = 1200 bps

End of Questions