

문제 1

1 / 1점

Calculate the amount of memory required to store a Full HD color video (frame rate=15fps, 3channels, intensity level=256, number of pixels: 640X480) whose length is 1 hour.

(Unit MUST be included in your answer)

----- < 학생이 제출한 답안 > -----

((15 frames / second) * (3 channels) * (8bits / channels) * (3600 seconds / seconds) * (640*480 pixels))bits

Compute a normalized histogram for the input image. Assume dynamic range of the input is from 0~31, and the number of bins is 8.

0	1	2	3	4	5	6	7
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31
24	25	26	27	28	29	30	31
24	25	26	27	28	29	30	31

----- < 학생이 제출한 답안 > -----

$$32/8 = 4,$$

$$\text{total pixel: } 8*6 = 48$$

$$[0-3] \ 0,1,2,3 \rightarrow 4/48$$

$$[4-7] \ 4,5,6,7 \rightarrow 4/48$$

$$[8-11] \ 8,9,10,11 \rightarrow 4/48$$

$$[12-15] \ 12,13,14,15 \rightarrow 4/48$$

$$[16-19] \ 16,17,18,19 \rightarrow 4/48$$

$$[20-23] \ 20,21,22,23 \rightarrow 4/48$$

$$[24-27] \ 24,25,26,27 \rightarrow 12/48$$

$$[28-31] \ 28,29,30,31 \rightarrow 12/48$$

Perform spatial filtering on the pixels of the image whose value is in bold.

5	10	15	20	25
30	35	40	45	50
55	60	65	70	75
80	85	90	95	100
105	110	115	120	130

0	0	0
1/3	1/3	1/3
0	0	0

----- < 학생이 제출한 답안 > -----

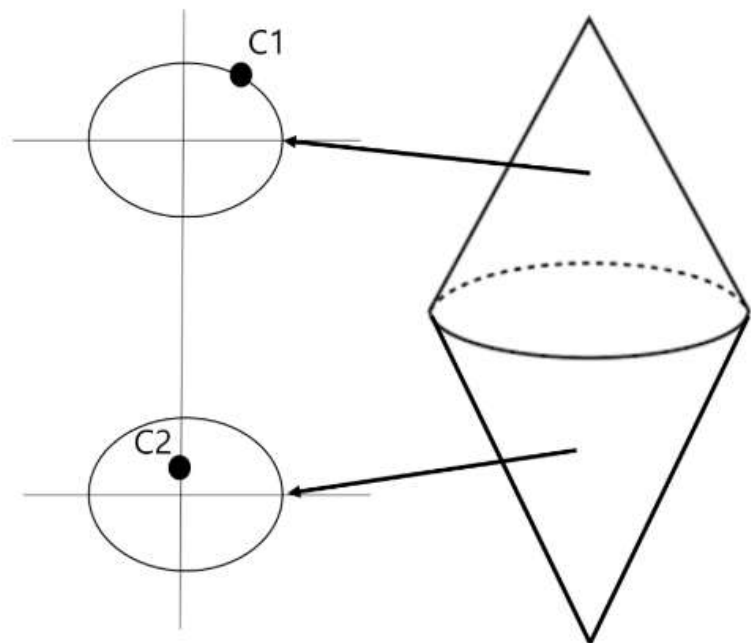
$$(10*0)+(15*0)+(20*0)+(35*1/3)+(40*1/3)+(45*1/3)+(60*0)+(65*0)+(70*0)=120/3=40$$

$$(15*0)+(20*0)+(25*0)+(40*1/3)+(45*1/3)+(50*1/3)+(65*0)+(70*0)+(75*0)=135/3=45$$

$$(35*0)+(40*0)+(45*0)+(60*1/3)+(65*1/3)+(70*1/3)+(85*0)+(90*0)+(95*0)=195/3=65$$

$$(40*0)+(45*0)+(50*0)+(65*1/3)+(70*1/3)+(75*1/3)+(85*0)+(90*0)+(95*0)=210/3=70$$

Compare Hue, Saturation, and Intensity value of C1 and C2 shown below.



----- < 학생이 제출한 답안 > -----

Hue: $C1 < C2$

Saturation: $C1 > C2$

Intensity: $C1 > C2$

Obtain the magnitude of gradient of the pixels in bold in the input image by using two kinds of Sobel mask. When you calculate magnitude of gradient, use $\text{mag}(\nabla f) = |g_x| + |g_y|$.

Input	Sobel mask1	Sobel mask 2																																											
<table><tr><td>5</td><td>5</td><td>5</td><td>5</td><td>5</td></tr><tr><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td></tr><tr><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td></tr><tr><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td></tr><tr><td>15</td><td>15</td><td>15</td><td>15</td><td>15</td></tr></table>	5	5	5	5	5	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	15	15	15	15	15	<table><tr><td>-1</td><td>-2</td><td>-1</td></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>2</td><td>1</td></tr></table>	-1	-2	-1	0	0	0	1	2	1	<table><tr><td>-1</td><td>0</td><td>1</td></tr><tr><td>-2</td><td>0</td><td>2</td></tr><tr><td>-1</td><td>0</td><td>1</td></tr></table>	-1	0	1	-2	0	2	-1	0	1
5	5	5	5	5																																									
10	10	10	10	10																																									
10	10	10	10	10																																									
10	10	10	10	10																																									
15	15	15	15	15																																									
-1	-2	-1																																											
0	0	0																																											
1	2	1																																											
-1	0	1																																											
-2	0	2																																											
-1	0	1																																											

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Sobel mask1: sum=20

```
-5 -10 -5
 0  0  0
10 20 10
=> g_y:
20 20
 0  0
```

Sobel mask2: sum=0

```
-5  0 -5
-20 0 20
-10 0 10
=> g_x:
0 0
0 0
```

$\text{mag}(\nabla f) =$

```
20 20
 0  0
```

Explain the role of double-thresholding in Canny edge detector. (In other words, what is the result of double-thresholding in Canny edge detector?)

----- < 학생이 제출한 답안 > -----

```
< void Canny(InputArray image, OutputArray edges, double threshold1, double threshold2, ... ); >
```

Edges are categorized with threshold1, and threshold2 by double-thresholding in Canny edge detector.

Canny 에지 검출에서 double-thresholding은 두 임계값(threshold1, threshold2)을 기준으로 edge를 강한 에지, 약한 에지, 비에지로 분류된다.

The threshold value for classifying and determining the edge mainly is threshold2. If threshold2 is set too high, the edge is not detected well, and if threshold1 is set too low, unintended edges are detected.

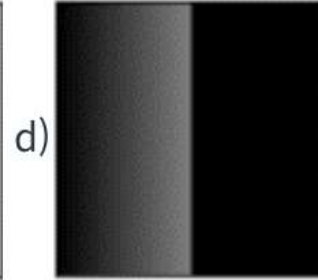
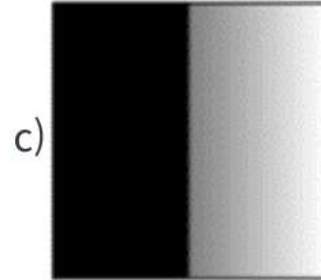
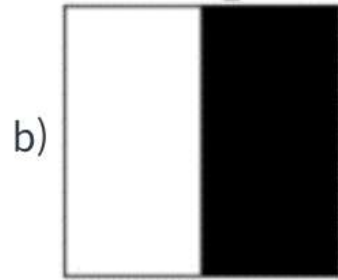
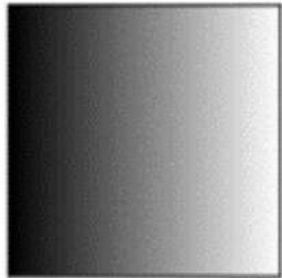
실질적으로 edge를 분류 및 판단하는 임계값은 threshold2다. edge 주변도 edge일 확률이 높다는 점을 이용했을 때, threshold2에 의해 판단된 edge와, 그 인접한 부분을 edge로 판단할 때 threshold1이 사용된다.

threshold2를 너무 높게 설정하면 edge가 잘 검출되지 않고, threshold1이 너무 낮게 설정되면 의도하지 않은 edge까지 모두 검출되기 때문에 적절한 값을 입력하는 것이 중요하다.

Which one is the result of excecuting threshold() on the input image? You should also explain why.

`cv.threshold(img,127,255,cv.THRESH_TOZERO)`

Original Image



----- < 학생이 제출한 답안 > -----

c

You didn't explain why

Perform erosion on the input image by using the following structure element.

0	0	0	0	0
0	0	1	0	0
0	1	1	1	0
0	0	1	0	0
0	1	1	1	0

Input image

0	0	0
1	1	1
0	0	0

Structure element

----- < 학생이 제출한 답안 > -----

```
0 0 0 0 0
0 0 0 0 0
0 0 1 0 0
0 0 0 0 0
0 0 1 0 0
```