Calculate the amount of memory required to store a Full HD color video (frame rate=30fps, 3channels, intensity level=256, number of pixels: 1920X1080) whose length is 1 hour.

(Unit MUST be included in your answer)

----- < 학생이 제출한 답안 > -----

((30 frames / second) * (3 channels) * (8bits / channels) * (3600 seconds / seconds) * (1920*1080 pixels))bits

What is the x coordinate and y coordinate of the pixel marked in red?

----- < 학생이 제출한 답안 > -----

(4,0)

Explain the effect of gamma transform when i)gamma is below 1, and ii)gamma is above 1.

----- < 학생이 제출한 답안 > -----

when gamma is below 1(gamma <1), Dark side of image will be detailed.

감마가 1보다 작으면, 어두운 부분의 디테일이 살아난다.
when gamma is above 1(gamma >1), Bright side of image will be detailed.

감마가 1보다 크면, 밝은 부분의 디테일이 살아난다.

Compute a normalized histogram for the input image. Assume dynamic range of the input is from 0~31, and the number of bins is 4.

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 > -----

32/4 = 8,

total pixel: 8*6 = 48

[0-7] 8/48
[8-15] 8/48
[16-23] 8/48
[24-31] 24/48

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

----- < 학생이 제출한 답안 > -----

$(15+40+65)/3 =$ **40** $(20+45+70)/3 =$ **45**

$(40+65+90)/3 =$ **65** $(45+70+95)/3 =$ **70**

Compare Hue, Saturation, and Intensity value of C1 and C2 shown below.
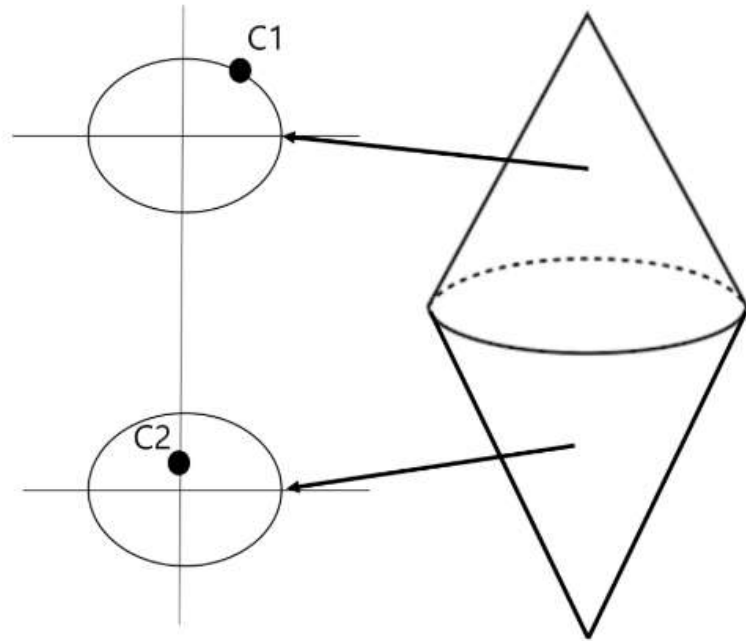
----- < 학생이 제출한 답안 > -----

Hue: C1 < C2
Saturation: C1 > C2
Intensity: C1 > C2

The code is written to display R-channel of 'lena.png'. Modify all the errors in the code.

```
int main()
{
    Mat src = imread("lena.png", 0);

    imshow("R", yuvChannels[0]);

    waitKey(0);
    return 0;
}
```

----- < 학생이 제출한 답안 > -----

imread("lena.png", 0) means read image by grayscale. So it should be imread("lena.png", 1) or imread("lena.png") to read image by color.

우선, imread("lena.png", 0)은 lena.png 파일을 흑백사진(grayscale)로 받아오겠다는 의미이므로 컬러 이미지를 불러오려면 imread("lena.png", 1) or imread("lena.png") 로 고쳐야 한다.

There are any definition of yuvChannels.

yuvChannels에 대한 정의가 없다. (Syntax error)

Use to split() to devide R, G, B channels, and since the order in opencv is [G, B, R], it shoule be yuvChannels[2].

만약 채널을 분리하려면 split() 함수를 써야하며, opencv에서는 G, B, R 순서이므로 yuvChannels[2]로 써야한다.

문제 8   0 / 1점

Explain how to apply spartial filtering, intensity transformation, and histogram equalization on a color image.

----- < 학생이 제출한 답안 > -----

Spartial filterling:

Intensity transformation:

histogram equalization: 히스토그램 평활화로,

모두 각 이미지를 붏

Perform white balancing of the image below using gray-world assumption. Assume dynamic range of the input is from 0~31, and the average value as 16.

20	20	20	20
20	20	20	20
25	25	25	25
25	25	25	25

----- < 학생이 제출한 답안 > -----

(20*8 + 25*8) / 16= 360/16 = 22.5

multiply 22.5/16 each pixels.

문제 10

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 $mag(\nabla f) = |g\_x| + |g\_y|$.

Input					Sobel mask1			Sobel mask 2		
5	5	5	5	5	-1	-2	-1	-1	0	1
10	**10**	**10**	10	10	0	0	0	-2	0	2
10	**10**	**10**	10	10	1	2	1	-1	0	1
10	10	10	10	10						
15	15	15	15	15						

----- < 학생이 제출한 답안 > -----

20+0 = 20

How should we change 5th parameters to obtain more lines?

void **HoughLines**(InputArray **image**, OutputArray **lines**, double **rho**, double **theta**, int **threshold**, double **srn**=0, double **stn**=0)

----- < 학생이 제출한 답안 > -----

decrease 5th parameters(threshold)

Compare the basic method and Ostu's method. Show their differences and commonalities.

----- < 학생이 제출한 답안 > -----
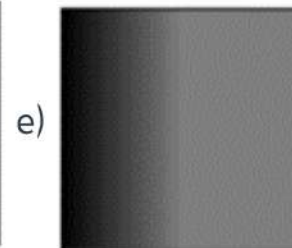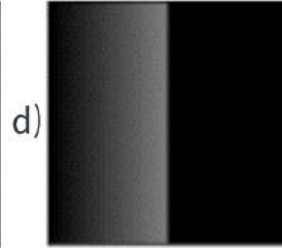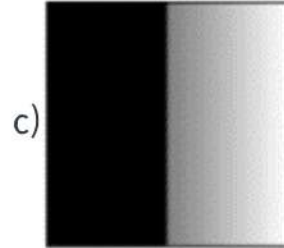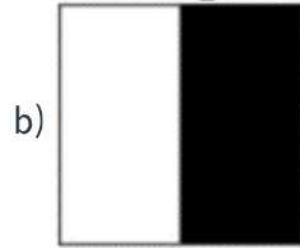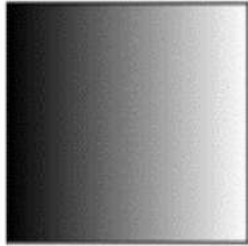
일반적인 방법은 사용자가 임의의 값을 선택하여 그 임계값 기준으로 이미지의 픽셀을 비교하여 구분을 하는데, Ostu's method를 사용하게 되면 이를 자동으로 적절한 임의의 값을 찾으므로 더 효율적으로 이미지를 변환할 수 있다.
두 방법 모두 임의의 값을 기준으로 이미지를 변환한다.

Which one is the result of excecuting threshold() on the input image?

cv.threshold(img,127,255,cv.THRESH_BINARY_INV)

Original Image

a) b) c) d) e)

- ○ a

- ● b

- ○ c

- ○ d

- ○ e

Assume you have a background image on the top. Perform pixel-based background subtraction with threshold as 10. For pixels corresponding to moving object, set those pixels as 255. Set other pixels as 0.

1	1	1	1	1
1	1	1	1	1
1	1	1	1	1

Background

5	6	7	8	9
10	12	12	13	14
15	16	17	18	19

Current frame

----- < 학생이 제출한 답안 > -----

0 0 0 0 0
0 255 255 255 255
255 255 255 255 255

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	0	0	0	0

Input image

0	0	0
0	1	0
0	1	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