

2020 Computer Vision Final Exam ID:

“나는 하나님과 사람 앞에서 한 점 부끄럼 없이 시험에 응하였음을 확인합니다”

“I hereby testify before God and men that all of the answers are my own, and I have taken the exam to the best of my ability without resorting to unethical conduct”

Signature _____

1. Assume that you have a video whose frame rate is 25fps. What is the time interval between two adjacent frames? (1pt)

2. Suppose you have a 1-channel matrix whose name is 'image'. Write down a code to access a pixel value whose x coordinate is 100 and y coordinate is 200. (1pt)

3. Perform 3X3 median filtering on the pixel in bold. (1pt)

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	14	13	12	28	29	30	31
24	25	26	27	28	29	30	31
24	25	26	27	28	29	30	31

4. Suppose you have a histogram for an image whose resolution is 20X20. By using the normalized histogram, calculate the probability of a pixel having the value between 0~3. (1pt)

1st bin(0~3): 160
2nd bin(4~7): 40
3rd bin(8~11):50
4th bin(12~15):50
5th bin(16~19):50
6th bin(20~23):50
7th bin(24~27):0
8thbin(28~31:0

5. Explain how you can change input image (left) to the output image (right) (1pt)



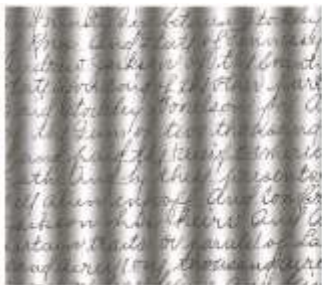
6. How should we change 3rd parameter to obtain more edges? (1pt)

Void Canny(InputArray image, OutputArray edges, double threshold1, double threshold2, int apertureSize=3, bool L2gradient = false)

7. How should we change 5th parameters to obtain less lines? (1pt)

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

8. Explain how you can successfully extract character regions on the input image. (1pt)



9. Assume you have a background image on the left. Perform pixel-based background subtraction to the image on the right with threshold as 10. For pixels corresponding to moving object, set those pixels as 255. Set other pixels as 0. (1pt)

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

5	6	7	8	9
10	12	12	13	14
15	16	17	18	19
20	21	22	23	24
25	26	27	28	29

10. Perform erosion and dilation on the input image by using the following structure element (2pts).

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

0	1	0
1	1	1
0	1	0

Erosion result	Dilation result																																																		
<table><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>																										<table><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>																									

11. Calculate the integral image of the input image. (1pt)

1	1	1	1	1
1	3	7	2	1
1	8	4	1	1
1	2	3	5	1
1	1	1	1	1

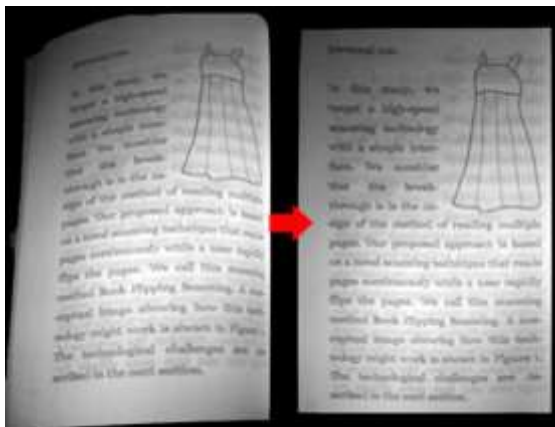
12. Explain the meaning of the last two parameters. (1pt)

```
void cv::CascadeClassifier::detectMultiScale ( InputArray image,
                                              std::vector< Rect > & objects,
                                              std::vector< int > & numDetections,
                                              double scaleFactor = 1.1,
                                              int minNeighbors = 3,
                                              int flags = 0,
                                              Size minSize = Size(),
                                              Size maxSize = Size())
```

13. Perform histogram back-projection for the current image (on the right). The ROI is set as bold rectangle area on the left. Assume dynamic range of image is from 0 to 7, and set the number of bins as 8. (1pt)

	1	1	1	1	1			1	1	1	1	1	
	1	1	3	4	1			1	3	4	2	2	
	1	2	3	5	1			1	3	3	5	2	
	1	2	2	2	1			1	1	1	1	2	
	1	2	2	2	2			1	1	1	1	1	

14. Explain how you can transform the left image to the right image using perspective transform. If you cannot, explain why. (2pts)



15. Suggest a computer program that can help our daily lives by using computer vision techniques. Explain the concept of the program and explain how the system is consisted. (4pts)