Homework-6

Question 1

Describe the result of detecting the template

1	2	1

in the image (all unspecified values are 0).

			4	4	4				
			1	2	1				

a. with non-normalized cross correlations matching.

b. with normalized cross correlations matching.

Question 2

1	2		2	2		8	9		11	20		100	100
7	3		2	2		11	10		40	30		100	100
A			B			C			D			E	

A,B,C,D,E above are 5 small windows in an image. Our goal is to use template matching to detect the following pattern:

1	2
4	3

I

If the technique of non-normalized cross correlation is used, which pattern gives the best match value?

Answer:

II

If the technique of normalized cross correlation is used, which pattern gives the best match value?

Answer:

Note:

You are only asked to consider the case in which the pattern is on top of each of the five alternatives. This means that in each case you need only compute 5 values.

Question 3

Consider the following image:

	$x=0$	$x=1$	$x=2$	$x=3$	$x=4$
$y=0$	1	0	0	0	0
$y=1$	0	0	0	0	0
$y=2$	0	1	1	1	0
$y=3$	0	2	2	2	0
$y=4$	0	0	0	0	0
$y=5$	0	0	0	0	0

1.

Compute its integral image.

Answer:

	$x=0$	$x=1$	$x=2$	$x=3$	$x=4$
$y=0$					
$y=1$					
$y=2$					
$y=3$					
$y=4$					
$y=5$					

2.

Use the integral image calculated in 1 to compute the sum of pixels in the following rectangles:

Rectangle 1: $x_1 = 1, y_1 = 1, x_2 = 4, y_2 = 2$.

Rectangle 2: $x_1 = 1, y_1 = 1, x_2 = 2, y_2 = 2$.

Rectangle 3: $x_1 = 3, y_1 = 1, x_2 = 4, y_2 = 2$.

Show your computations.

Answer:

3.

How many rectangles inside the image have even width?

Answer:

4.

Suppose the given image is the only positive example in a learning task, and there is only one negative example, an image with all zero pixels. Consider the Haar feature computed over the Rectangle 1 above, where the left values (Rectangle 2) are all -1, and the right values (Rectangle 3) are all 1. What is the threshold associated with this feature?

Answer: