

Gaurav Venkatesh  
28826069  
EECS 101

### Homework3

Consider a region growing method that uses the homogeneity measure

$$H(R_i) = \text{TRUE} \quad \text{if} \quad \sigma_i^2 \leq 1$$

$$H(R_i) = \text{FALSE} \quad \text{if} \quad \sigma_i^2 > 1$$

where  $\sigma_i^2$  is the sample variance of the pixels in region  $R_i$ . Assume that the method starts with the upper left pixel and always attempts to grow to a new connected pixel (assuming eight neighbors) whose gray level is closest to the average of the gray levels of the current region. For the grayscale image below, find the first region that will be generated using this algorithm (grow from the upper left pixel until  $H(R_1)$  is FALSE). Circle this region in the image and compute the mean and sample variance of the region. For each step in the region growing process, write down the pixel values in the current region and their mean and variance.

Assume that the sample variance  $\sigma_i^2$  of a region  $R_i$  is defined by

$$\sigma_i^2 = \frac{1}{N} \sum_j (I_j - \mu)^2$$

where  $N$  is the number of pixels in  $R_i$ ,  $I_j$  are the pixel values in  $R_i$ , and  $\mu$  is the mean of the pixel values in  $R_i$ . The sum is over the pixels in  $R_i$ . The gray-level image is

```

      8   8  14  10  11
     12   9  12  10  10
     12  10 12  12   8
     14  11  8   9  11
  
```

In order to start this problem we will take the upper left pixel of value 8 as part of  $R_1$ .

```

      8   8  14  10  11
     12   9  12  10  10
     12  10 12  12   8
     14  11  8   9  11
  
```

Step number	Pixels part of the image	Mean	Variance
1	[8]	8	0
2	[8,8]	8	0

3	[8,8,9]	8.33	0.33
4	[8,8,9,10]	8.75	0.72
5	[8,8,9,10,8]	8.6	0.8
6	[8,8,9,10,8,9]	8.67	0.67
7	[8,8,9,10,8,9,8]	8.57	0.62
8	[8,8,9,10,8,9,8,10]	8.75	0.786
9	[8,8,9,10,8,9,8,10,10]	8.89	0.86
10	[8,8,9,10,8,9,8,10,10,10]	9	.89
11	[8,8,9,10,8,9,8,10,10,10,11]	9.16	1.16(not part of image)

8

8

14

10

11

12

9

12

10

10

12

10

12

12

8

14

11

8

9

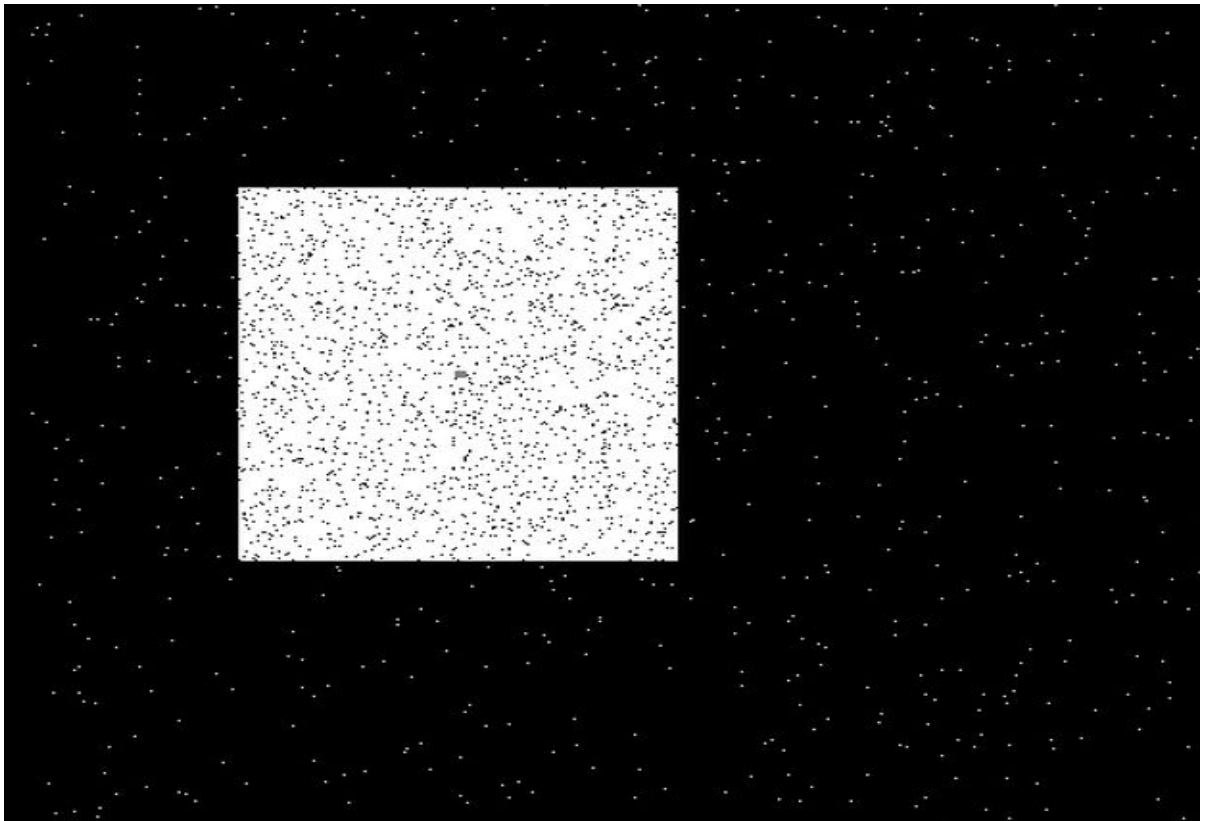
11

8	8		10	
	9		10	10
	10			8
	11	8	9	

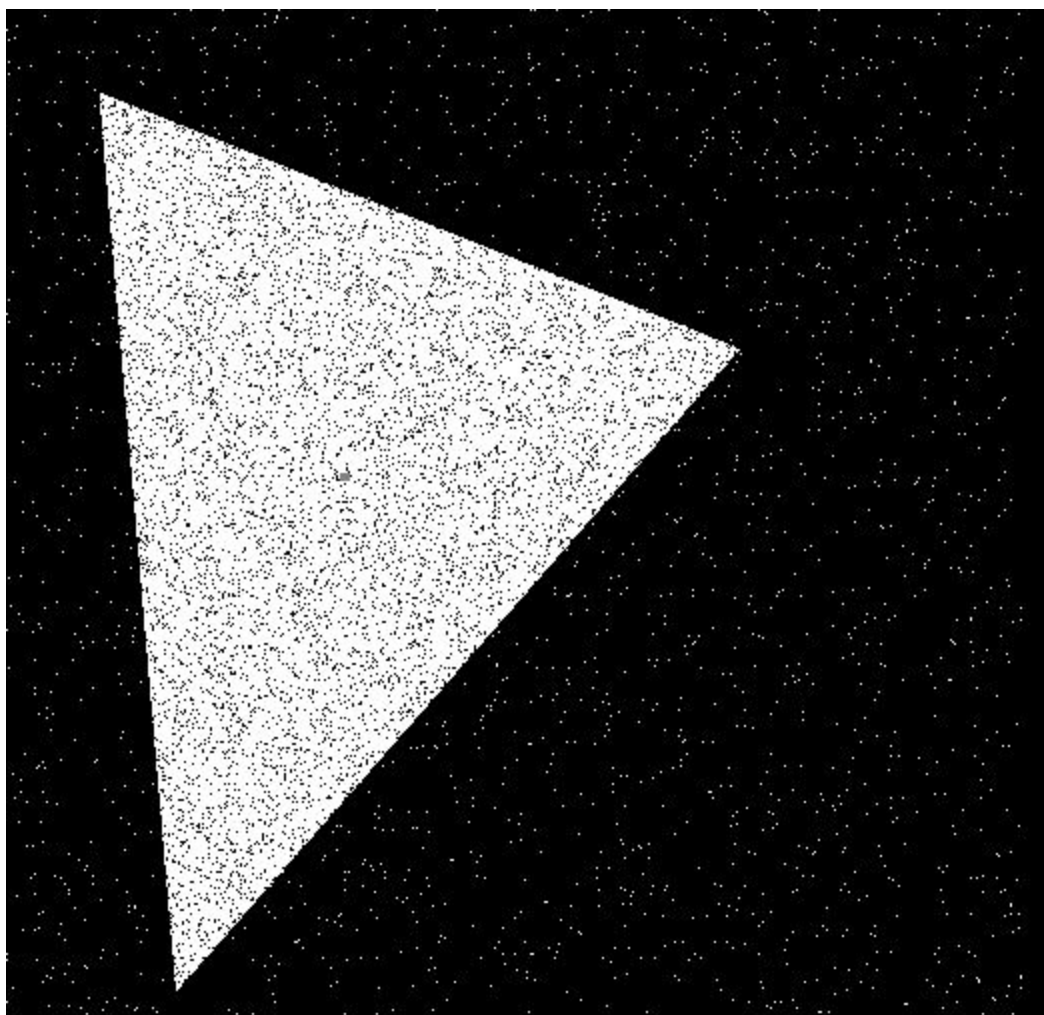
The table above would be the resulting image.

2.

1.



2.



3.

