

# CS 663 Home Work Assignment 2

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## Contents

<b>1</b>	<b>Question 7</b>	<b>2</b>
1.1	Actual Images . . . . .	2
1.2	Images After adding guassian Noise with $\sigma = 5$ . . . . .	2
1.3	Images After adding guassian Noise with $\sigma = 10$ . . . . .	3
1.4	Bilateral filtered images . . . . .	3
1.4.1	Barbora . . . . .	3
1.4.2	kodak . . . . .	4
<b>2</b>	<b>Comments</b>	<b>4</b>

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## 1 Question 7

### 1.1 Actual Images



(a) Barbara image



(b) Kodak image

### 1.2 Images After adding gaussian Noise with $\sigma = 5$



(a) Barbara image with gaussian noise of  $\sigma = 5$



(b) kodak image with gaussian noise of  $\sigma = 5$

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### 1.3 Images After adding gaussian Noise with $\sigma = 10$



(a) Barbara image with gaussian noise of  $\sigma = 10$



(b) kodak image with gaussian noise of  $\sigma = 10$

### 1.4 Bilateral filtered images

#### 1.4.1 Barbora



(a)  $\sigma_s = 2, \sigma_r = 2, \sigma = 5$



(b)  $\sigma_s = 0.1, \sigma_r = 0.1, \sigma = 5$



(c)  $\sigma_s = 3, \sigma_r = 15, \sigma = 5$



(a)  $\sigma_s = 2, \sigma_r = 2, \text{sigma} = 10$



(b)  $\sigma_s = 0.1, \sigma_r = 0.1, \text{sigma} = 10$



(c)  $\sigma_s = 3, \sigma_r = 15, \text{sigma} = 10$

#### 1.4.2 kodak



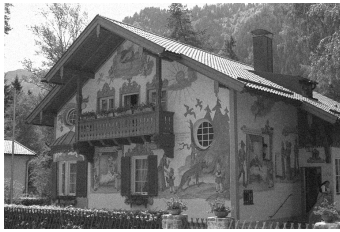
(a)  $\sigma_s = 2, \sigma_r = 2, \text{sigma} = 5$



(b)  $\sigma_s = 0.1, \sigma_r = 0.1, \text{sigma} = 5$



(c)  $\sigma_s = 3, \sigma_r = 15, \text{sigma} = 5$



(a)  $\sigma_s = 2, \sigma_r = 2, \text{sigma} = 10$



(b)  $\sigma_s = 0.1, \sigma_r = 0.1, \text{sigma} = 10$



(c)  $\sigma_s = 3, \sigma_r = 15, \text{sigma} = 10$

## 2 Comments

When we add Gaussian noise to the image the image will get blurred higher the  $\sigma$  of the noise more will be the blur in the image, To remove the Gaussian noise we are using bilateral filtering

In bilateral filtering there are two factors which will combine decide extent of filtering,  $\sigma_s$  defines the size of window of consideration if  $\sigma_s$  is low then we will only consider a small window so in the case when  $\sigma_s = 0.1$  we can observe that there is a almost no change after applying bilateral filter and when  $\sigma_s = 3$  and  $\sigma_r = 15$  the effect will be considerable and  $\sigma_r$  will penalise the large difference in intensities so noise will reduced significantly when  $\sigma_r$  is high, we can see that when  $\sigma_s = 3$  and  $\sigma_r = 15$  the effect of Gaussian is minimized by highest amount compared to others