CS 663 - Fundamentals of Digital Image Processing
Assignment 2

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1 Edge-preserving Smoothing using Bilateral Filtering

1.1 2/data/barbara.mat

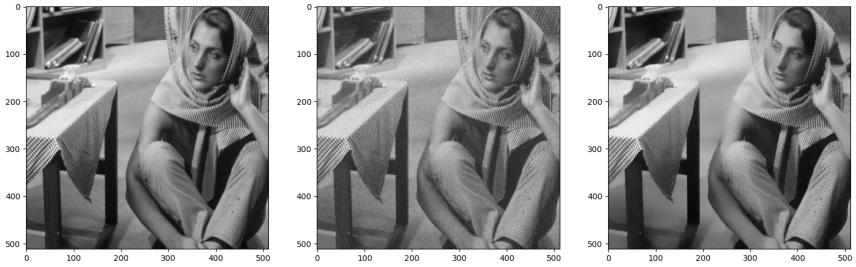

Figure 1: Original — Corrupted — Filtered

Optimal parameters:

$$\sigma^*_{space} = 1.4$$
$$\sigma^*_{intensity} = 10.2$$

RMSD for noisy image = 4.992
Optimal RMSD for filtered image = 3.276

Other RMSD values:

(i) $0.9\sigma^*_{space} : RMSD = 3.281$

(ii) $1.1\sigma^*_{space} : RMSD = 3.279$

(iii) $0.9\sigma^*_{intensity} : RMSD = 3.293$

(iv) $1.1\sigma^*_{intensity} : RMSD = 3.298$

1.2 2/data/grass.png

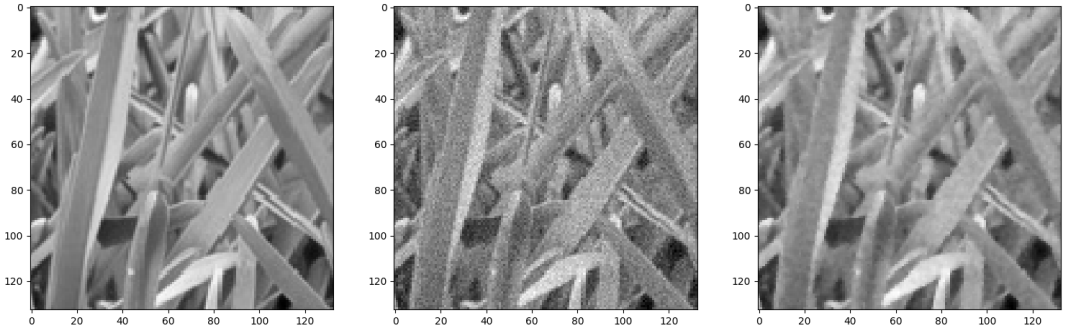

Figure 2: Original — Corrupted — Filtered

Optimal parameters:

$$\sigma^*_{space} = 0.729$$
$$\sigma^*_{intensity} = 0.18$$

RMSD for noisy image = 0.0462

Optimal RMSD for filtered image = 0.0289

Other RMSD values:

(i) $0.9\sigma^*_{space} : RMSD = 0.0294$

(ii) $1.1\sigma^*_{space} : RMSD = 0.0294$

(iii) $0.9\sigma^*_{intensity} : RMSD = 0.029$

(iv) $1.1\sigma^*_{intensity} : RMSD = 0.0289$

1.3 2/data/honeyCombReal.png

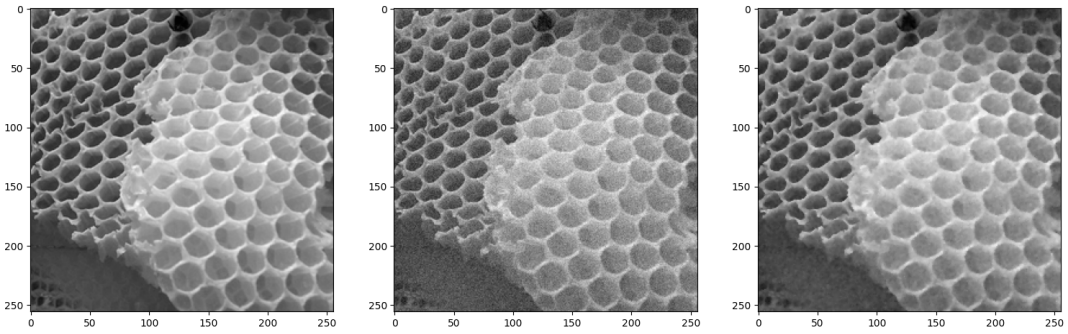

Figure 3: Original — Corrupted — Filtered

Optimal parameters:

$$\sigma^*_{space} = 0.88$$
$$\sigma^*_{intensity} = 0.16$$

RMSD for noisy image = 0.0495

Optimal RMSD for filtered image = 0.0284

Other RMSD values:

(i) $0.9\sigma^*_{space} : RMSD = 0.0288$

(ii) $1.1\sigma^*_{space} : RMSD = 0.0284$

(iii) $0.9\sigma^*_{intensity} : RMSD = 0.0286$

(iv) $1.1\sigma^*_{intensity} : RMSD = 0.0285$

2 Gaussian mask

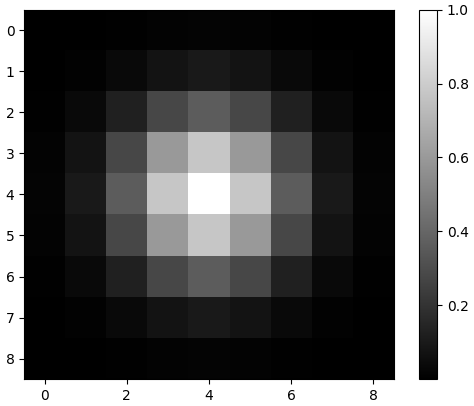

Figure 4: For barbara.mat

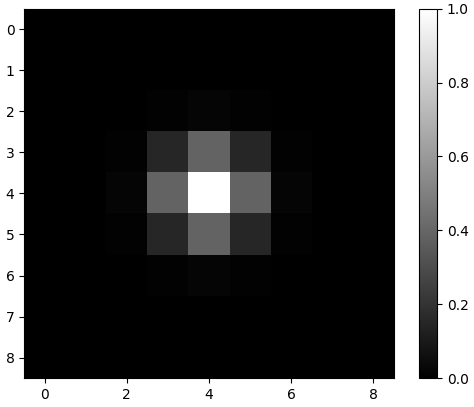

Figure 5: For grass.png

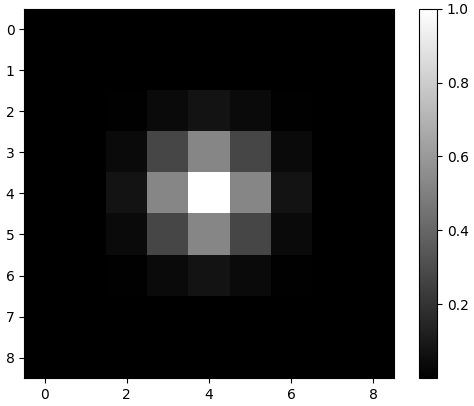

Figure 6: For honeyCombReal.png