Görüntü İşleme

Bilgisayar Mühendisliği, Yıldız Teknik Üniversitesi

Ödev 1

Şilan Fidan Vural

18011096

GÖRÜNTÜ İŞLEME ÖDEV 1

1) lena.pgm

GAUSSIAN FİLTRELERİ

k=3x3 σ = 1


```
3x3 boyutunda ve sigmasi 1 olan kernel
0.075114 0.123841 0.075114
0.123841 0.204180 0.123841
0.075114 0.123841 0.075114
```

k=3x3 σ = 2


```
3x3 boyutunda ve sigmasi 2 olan kernel
0.101868 0.115432 0.101868
0.115432 0.130801 0.115432
0.101868 0.115432 0.101868
```

k=3x3 σ = 4


```
3x3 boyutunda ve sigmasi 4 olan kernel
0.108797 0.112250 0.108797
0.112250 0.115813 0.112250
0.108797 0.112250 0.108797
```

k=5x5 σ = 1


```
5x5 boyutunda ve sigmasi 1 olan kernel
0.002969 0.013306 0.021938 0.013306 0.002969
0.013306 0.059634 0.098320 0.059634 0.013306
0.021938 0.098320 0.162103 0.098320 0.021938
0.013306 0.059634 0.098320 0.059634 0.013306
0.002969 0.013306 0.021938 0.013306 0.002969
```

k=5x5 σ = 2


```
5x5 boyutunda ve sigmasi 2 olan kernel
0.023247 0.033824 0.038328 0.033824 0.023247
0.033824 0.049214 0.055766 0.049214 0.033824
0.038328 0.055766 0.063191 0.055766 0.038328
0.033824 0.049214 0.055766 0.049214 0.033824
0.023247 0.033824 0.038328 0.033824 0.023247
```

k=5x5 σ = 4


```
5x5 boyutunda ve sigmasi 4 olan kernel
0.035204 0.038664 0.039891 0.038664 0.035204
0.038664 0.042464 0.043812 0.042464 0.038664
0.039891 0.043812 0.045203 0.043812 0.039891
0.038664 0.042464 0.043812 0.042464 0.038664
0.035204 0.038664 0.039891 0.038664 0.035204
```

k=7x7 σ = 1


```
7x7 boyutunda ve sigmasi 1 olan kernel
0.000020 0.000239 0.001073 0.001769 0.001073 0.000239 0.000020
0.000239 0.002917 0.013071 0.021551 0.013071 0.002917 0.000239
0.001073 0.013071 0.058582 0.096585 0.058582 0.013071 0.001073
0.001769 0.021551 0.096585 0.159241 0.096585 0.021551 0.001769
0.001073 0.013071 0.058582 0.096585 0.058582 0.013071 0.001073
0.000239 0.002917 0.013071 0.021551 0.013071 0.002917 0.000239
0.000020 0.000239 0.001073 0.001769 0.001073 0.000239 0.000020
```

k=7x7 σ = 2


```
7x7 boyutunda ve sigmasi 2 olan kernel
0.004922 0.009196 0.013380 0.015162 0.013380 0.009196 0.004922
0.009196 0.017181 0.024998 0.028326 0.024998 0.017181 0.009196
0.013380 0.024998 0.036371 0.041214 0.036371 0.024998 0.013380
0.015162 0.028326 0.041214 0.046702 0.041214 0.028326 0.015162
0.013380 0.024998 0.036371 0.041214 0.036371 0.024998 0.013380
0.009196 0.017181 0.024998 0.028326 0.024998 0.017181 0.009196
0.004922 0.009196 0.013380 0.015162 0.013380 0.009196 0.004922
```

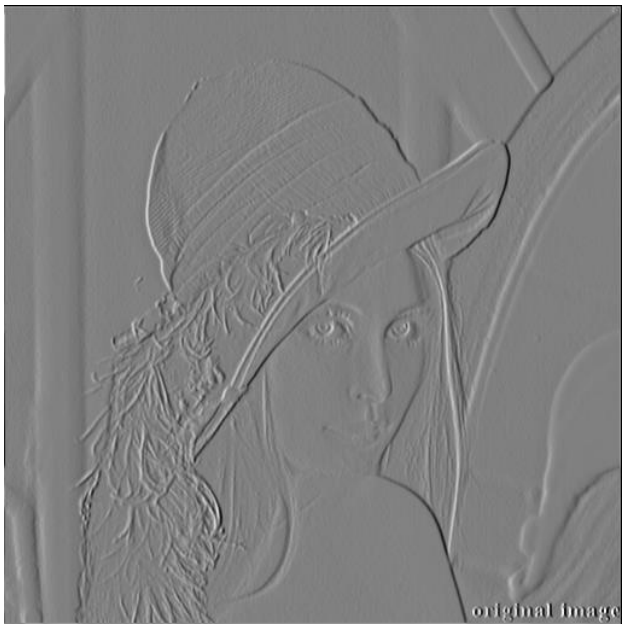
k=7x7 σ = 4

```
7x7 boyutunda ve sigmasi 4 olan kernel
0.014760 0.017256 0.018952 0.019554 0.018952 0.017256 0.014760
0.017256 0.020175 0.022157 0.022861 0.022157 0.020175 0.017256
0.018952 0.022157 0.024335 0.025108 0.024335 0.022157 0.018952
0.019554 0.022861 0.025108 0.025905 0.025108 0.022861 0.019554
0.018952 0.022157 0.024335 0.025108 0.024335 0.022157 0.018952
0.017256 0.020175 0.022157 0.022861 0.022157 0.020175 0.017256
0.014760 0.017256 0.018952 0.019554 0.018952 0.017256 0.014760
```

Lena resimlerini incelediğimizde Kernel değeri arttıkça resimlerin bulanıklığının arttığını görmekteyiz. Yine aynı şekilde sigma değeri arttıkça da bulanıklık artmaktadır.

ORİJİNAL GÖRÜNTÜLERE SOBEL FİLTRELERİ

Sobel x



Sobel y

Sobel xy

Orijinal Lena resimlerine uygulanan Sobel x, Sobel y ve Sobel xy resimlerini incelediğimizde Sobel x filtresi dikey olan kenarları tespit ederken Sobel y filtresinin yatay olan kenarları tespit ettiğini görmekteyiz. Sobel xy filtresi ise her iki filtrenin birleşimi şeklinde kenarları bulmaktadır.

GAUSSIAN FİLTRESİ UYGULANMIŞ GÖRÜNTÜLERE SOBEL FİLTRELERİ

Sırasıyla görüntüler Sobel x, Sobel y ve Sobel xy şeklinde eklenmiştir.

- k=3x3 ve σ=1 için Sobel filtreleri

Sobel x Sobel y Sobel xy

- k=3x3 ve σ=2 için Sobel filtreleri

- k=3x3 ve σ=4 için Sobel filtreleri

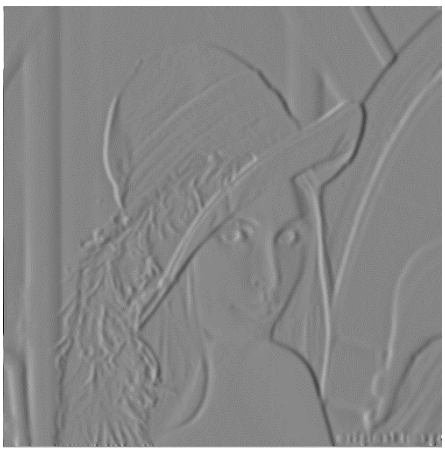
- k=5x5 ve σ=1 için Sobel filtreleri

- k=5x5 ve σ=2 için Sobel filtreleri

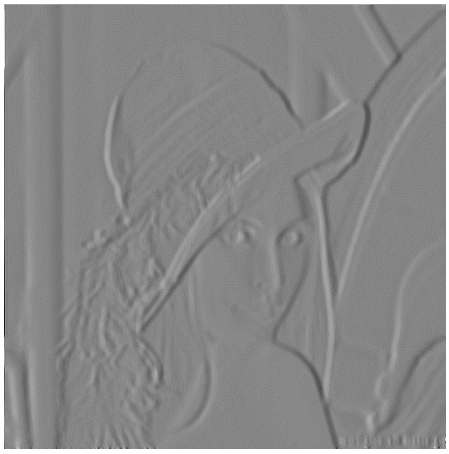
- k=5x5 ve σ=4 için Sobel filtreleri

- k=7x7 ve σ=1 için Sobel filtreleri

- k=7x7 ve σ=2 için Sobel filtreleri



- k=7x7 ve σ=4 için Sobel filtreleri



Şu ana kadar hem orijinal resme hem de bulanıklaştırılmış resimlere uygulanan Sobel filtresinin çıktıları verilmiştir. Bu çıktıları incelediğimizde orijinal resme uygulanan Sobel filtresinin çıktıları ile bulanıklaştırılmış resme uygulanan Sobel filtresi çıktıları birbirlerinden farklıdır. Orijinal resme uygulanan Sobel filtresinde kenarlar tespit edilmiştir ancak bazı kenar olmayan bölgeler de kenar olarak bulunmuştur. Bulanıklaştırdıktan sonra uygulanan Sobel filtrelerinde de kenarlar bulunmaktadır ancak ek olarak kenar olmayan kısımlar artık kenar olarak bulunmamaktadır. Ancak bulanıklaştırma işlemini de ne kadar yapacağımıza dikkat etmemiz gerekir. Örneğin k=7x7 ve σ=4 için Sobel xy kısmına baktığımızda aslında kenar olan yerleri kenar olarak bulamamaktadır.

GAUSSIAN FİLTRESİ UYGULANMIŞ GÖRÜNTÜLERE LAPLACIAN FİLTRELERİ

Sırasıyla görüntüler Laplacian Kernel 1 ve Laplacian Kernel 2 şeklinde eklenmiştir.

- k=3x3 ve σ=1 için Laplacian filtreleri

- k=3x3 ve σ=2 için Laplacian filtreleri

- k=3x3 ve σ=4 için Laplacian filtreleri

- k=5x5 ve σ=1 için Laplacian filtreleri

- k=5x5 ve σ=2 için Laplacian filtreleri


- k=5x5 ve σ=4 için Laplacian filtreleri


- k=7x7 ve σ=1 için Laplacian filtreleri

- k=7x7 ve σ=2 için Laplacian filtreleri

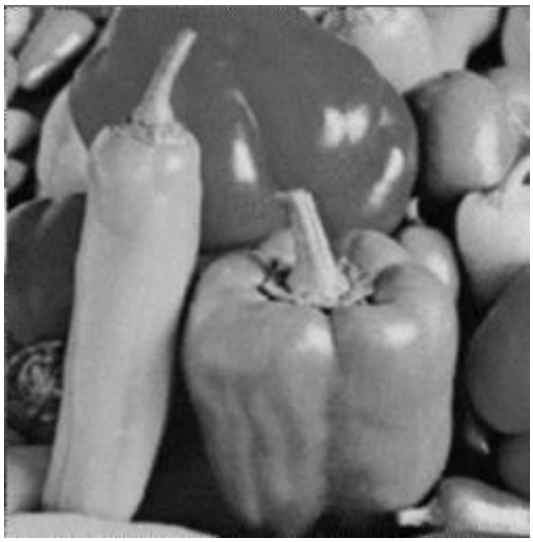
- k=7x7 ve σ=4 için Laplacian filtreleri

Laplacian filtresi ve Sobel filtresinin görüntülerine bakarsak onların da farklılıklarını görebilmekteyiz. Sobel filtrelerinde hem x hem y yönündeki kenarları bulabilirken Laplacian filtresi ise tek geçişte kenar algılamaktadır. Laplacian filtresi resmin ikinci türevini hesaplar ve böylece bitişik piksel değerlerindeki değişimin anlık mı yoksa bir ilerlemeden dolayı mı olduğunu belirler.

2) fruit.pgm

GAUSSIAN FİLTRELERİ

k=3x3 σ = 1



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0.123841 0.204180 0.123841
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0.002969 0.013306 0.021938 0.013306 0.002969
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k=5x5 σ = 2

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5x5 boyutunda ve sigmasi 2 olan kernel
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0.001769 0.021551 0.096585 0.159241 0.096585 0.021551 0.001769
0.001073 0.013071 0.058582 0.096585 0.058582 0.013071 0.001073
0.000239 0.002917 0.013071 0.021551 0.013071 0.002917 0.000239
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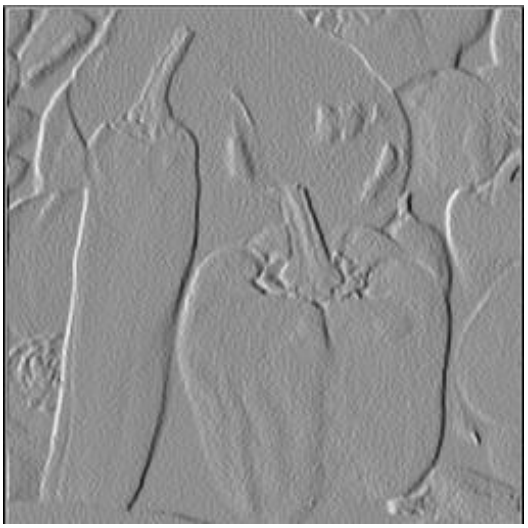
0.015162 0.028326 0.041214 0.046702 0.041214 0.028326 0.015162
0.013380 0.024998 0.036371 0.041214 0.036371 0.024998 0.013380
0.009196 0.017181 0.024998 0.028326 0.024998 0.017181 0.009196
0.004922 0.009196 0.013380 0.015162 0.013380 0.009196 0.004922
```

k=7x7 σ = 4

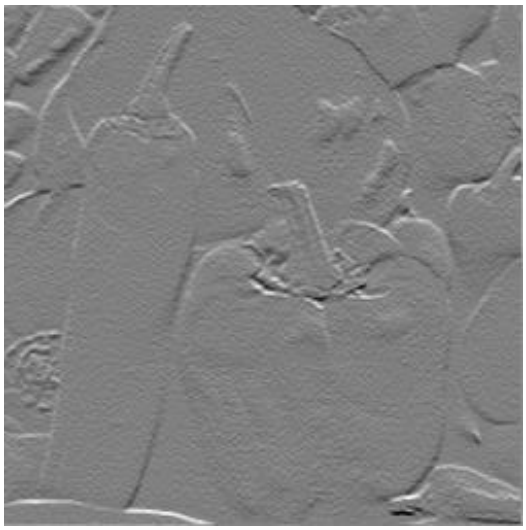
```
7x7 boyutunda ve sigmasi 4 olan kernel
0.014760 0.017256 0.018952 0.019554 0.018952 0.017256 0.014760
0.017256 0.020175 0.022157 0.022861 0.022157 0.020175 0.017256
0.018952 0.022157 0.024335 0.025108 0.024335 0.022157 0.018952
0.019554 0.022861 0.025108 0.025905 0.025108 0.022861 0.019554
0.018952 0.022157 0.024335 0.025108 0.024335 0.022157 0.018952
0.017256 0.020175 0.022157 0.022861 0.022157 0.020175 0.017256
0.014760 0.017256 0.018952 0.019554 0.018952 0.017256 0.014760
```

ORİJİNAL GÖRÜNTÜLERE SOBEL FİLTRELERİ

Sobel x



Sobel y



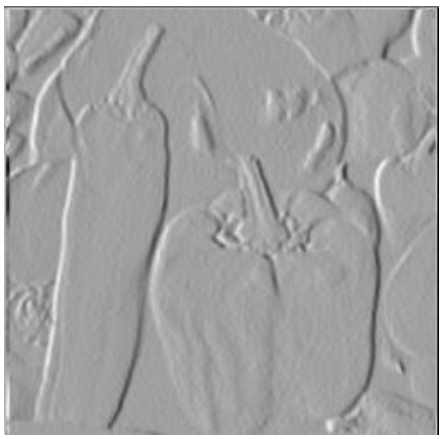
Sobel xy

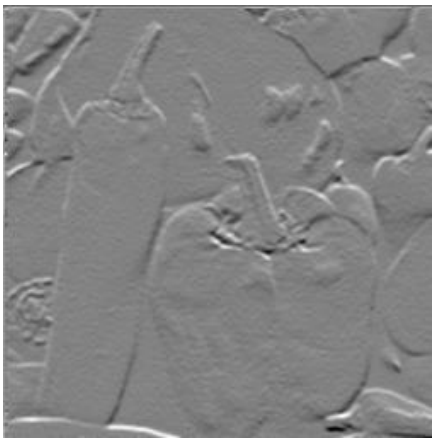
GAUSSIAN FİLTRESİ UYGULANMIŞ GÖRÜNTÜLERE SOBEL FİLTRELERİ

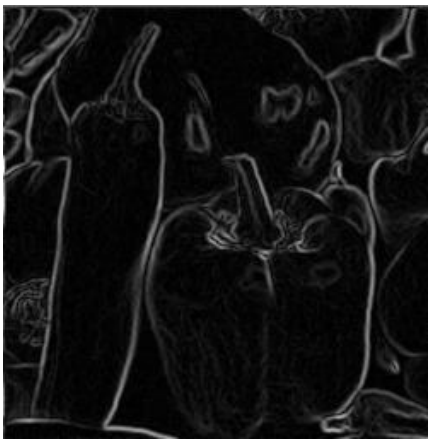
Sırasıyla görüntüler Sobel x, Sobel y ve Sobel xy şeklinde eklenmiştir.

- k=3x3 ve σ=1 için Sobel filtreleri

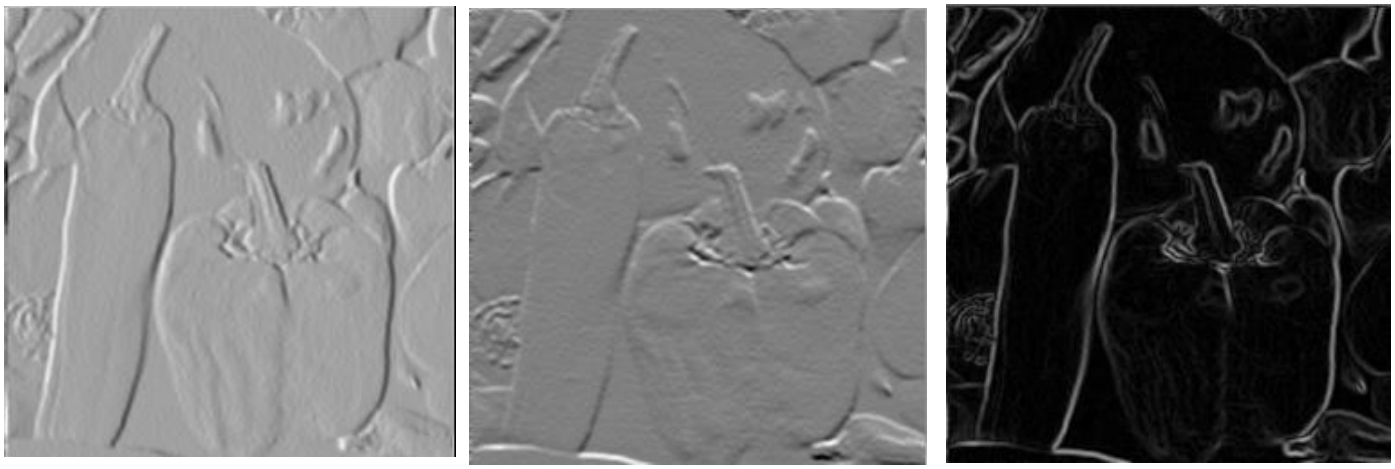
Sobel x Sobel y Sobel xy



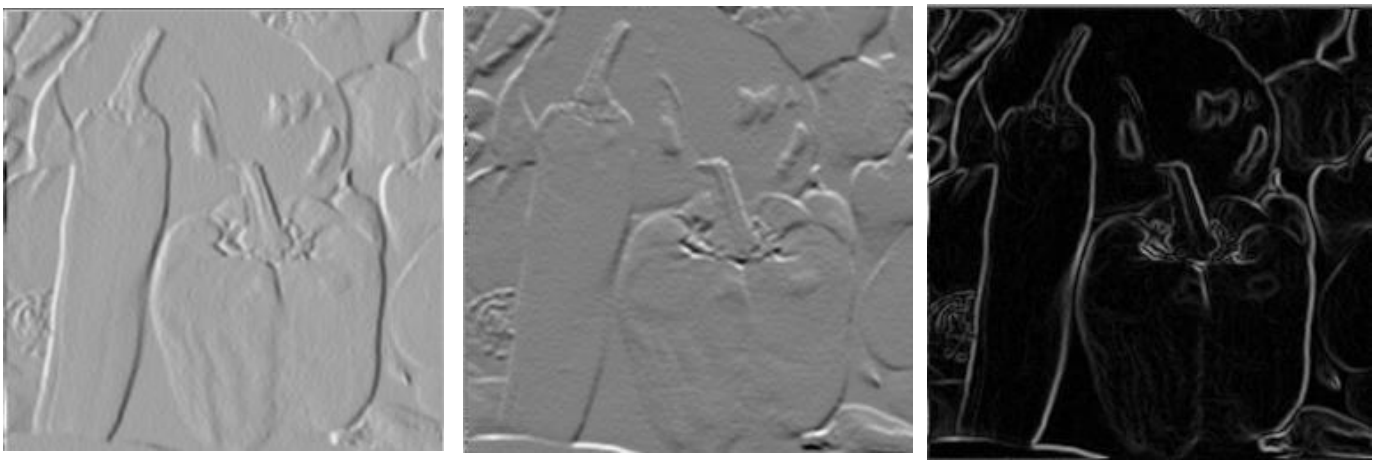




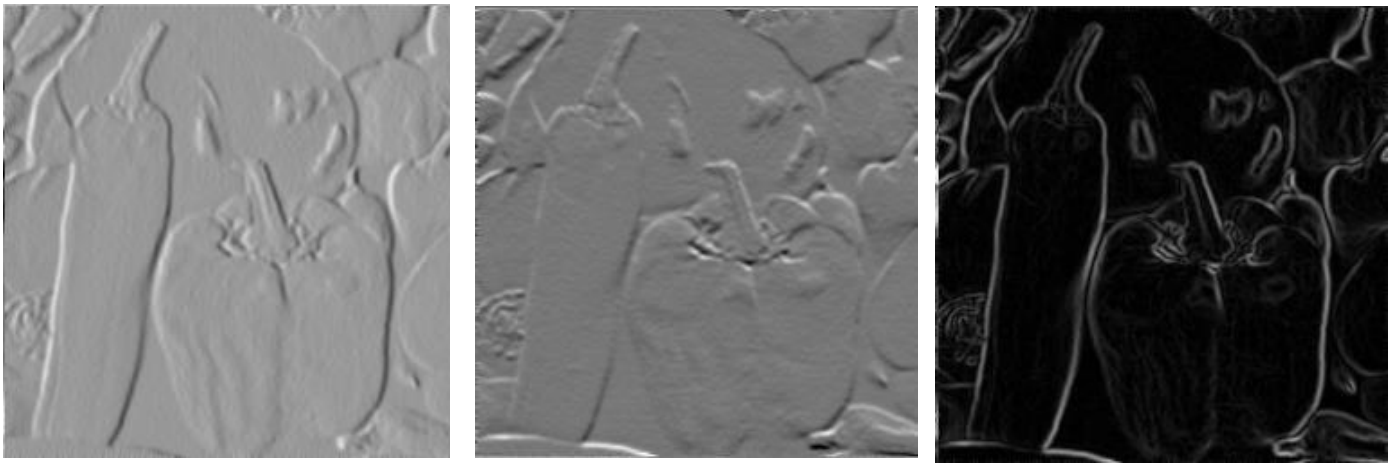
- k=3x3 ve σ=2 için Sobel filtreleri



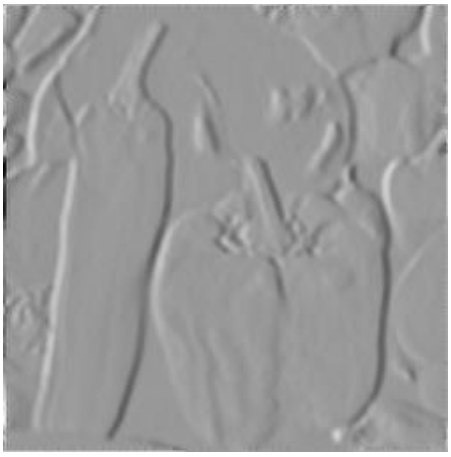
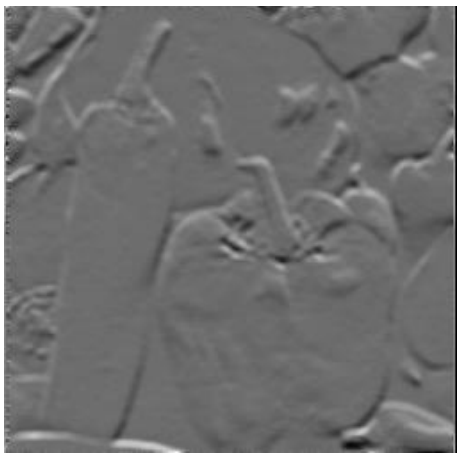
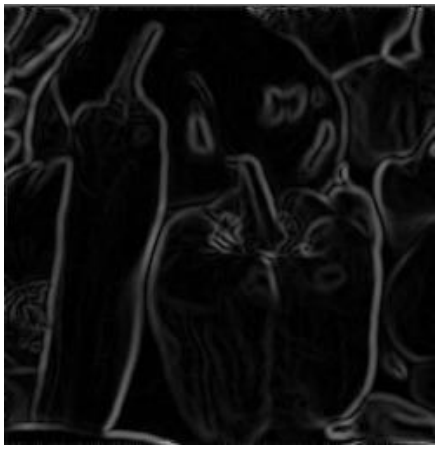
- k=3x3 ve σ=4 için Sobel filtreleri



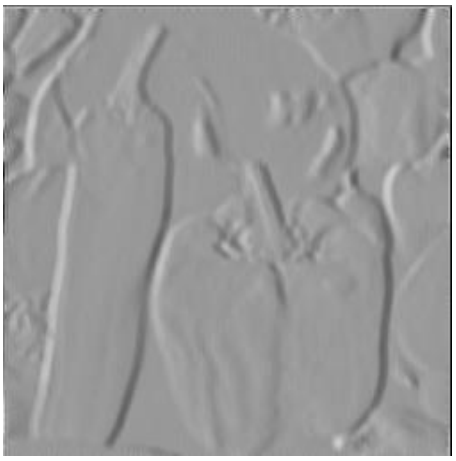
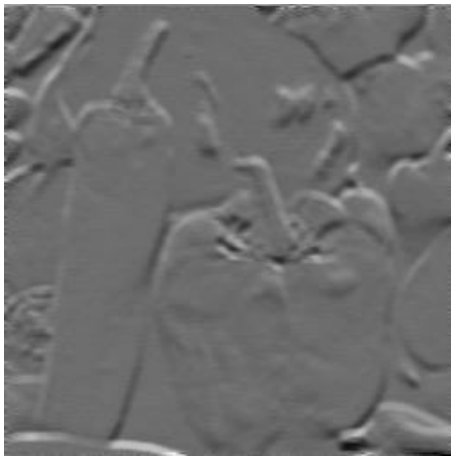
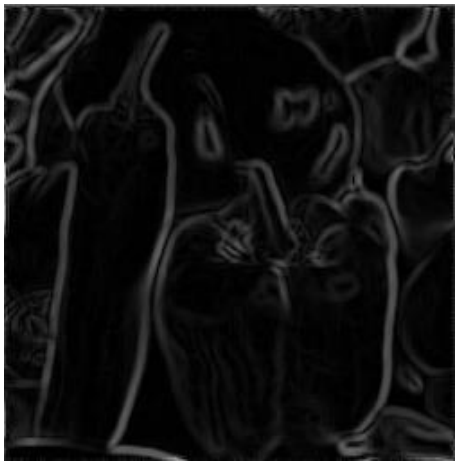
- k=5x5 ve σ=1 için Sobel filtreleri



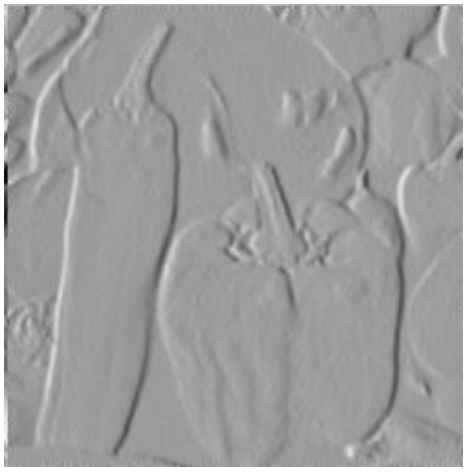
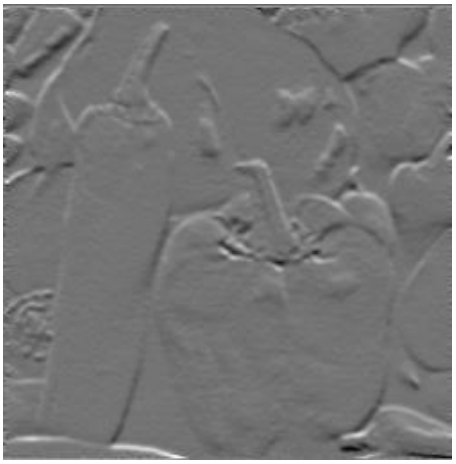
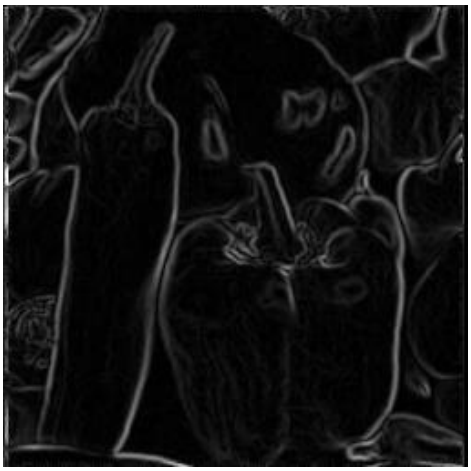
- k=5x5 ve σ=2 için Sobel filtreleri

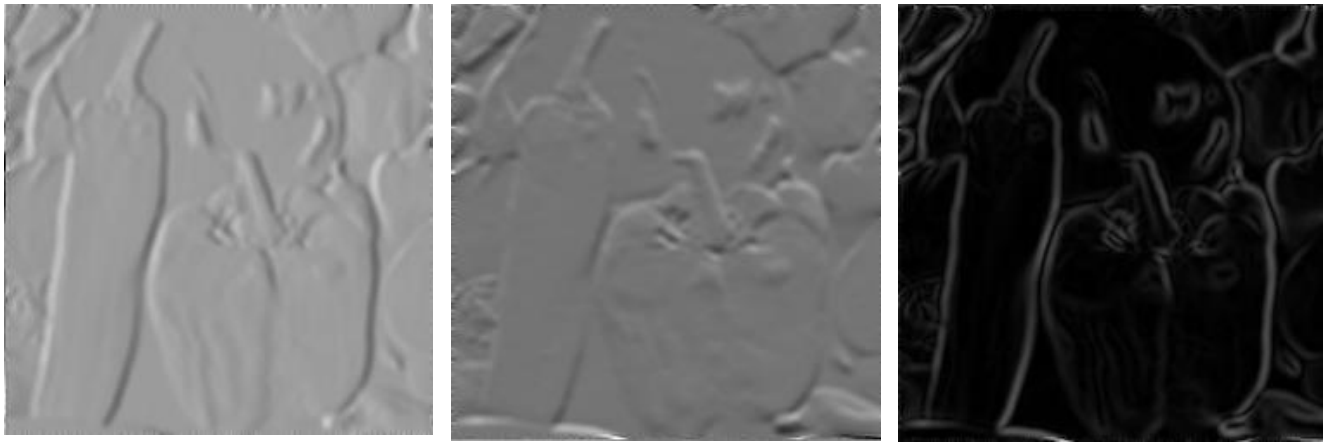
- k=5x5 ve σ=4 için Sobel filtreleri

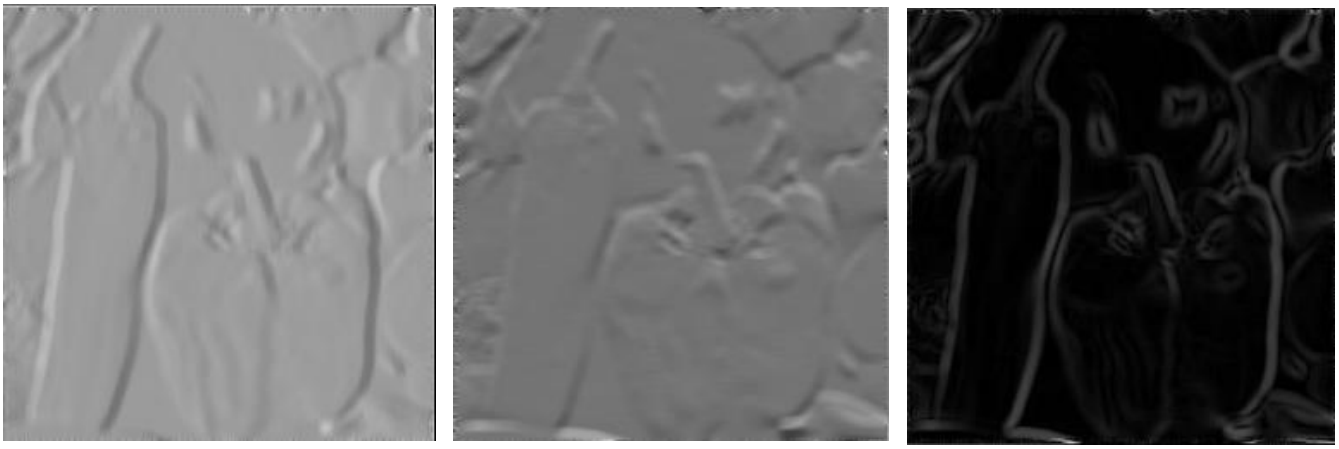
- k=7x7 ve σ=1 için Sobel filtreleri

- k=7x7 ve σ=2 için Sobel filtreleri



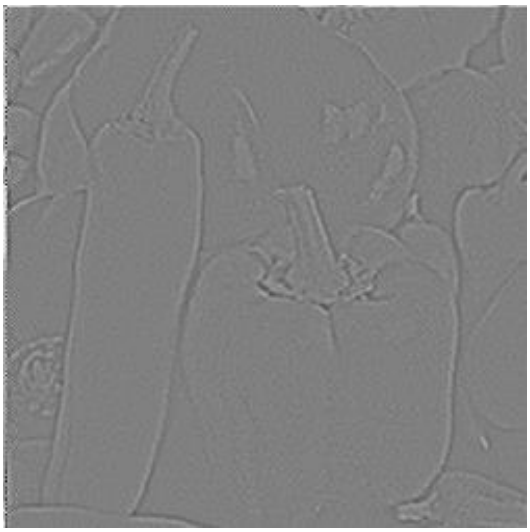
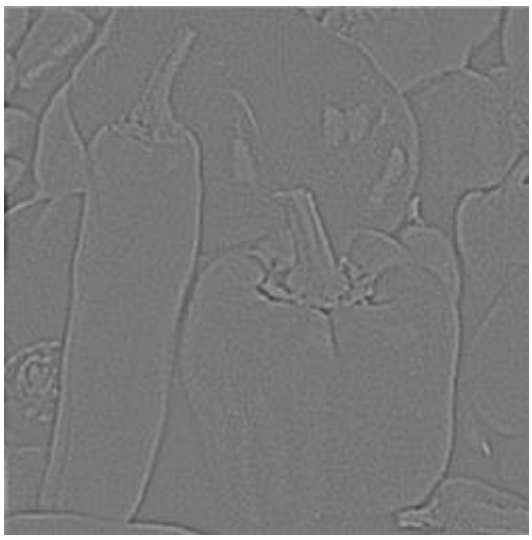
- k=7x7 ve σ=4 için Sobel filtreleri



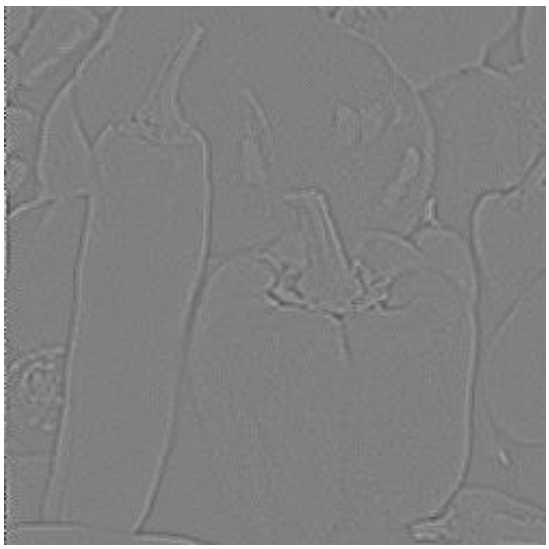
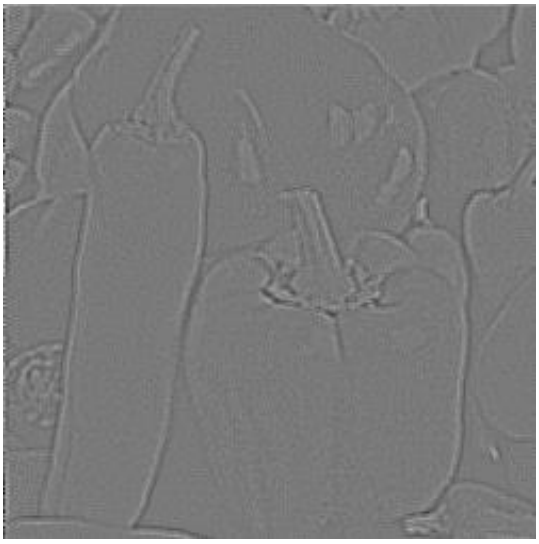
GAUSSIAN FİLTRESİ UYGULANMIŞ GÖRÜNTÜLERE LAPLACIAN FİLTRELERİ

Sırasıyla görüntüler Laplacian Kernel 1 ve Laplacian Kernel 2 şeklinde eklenmiştir.

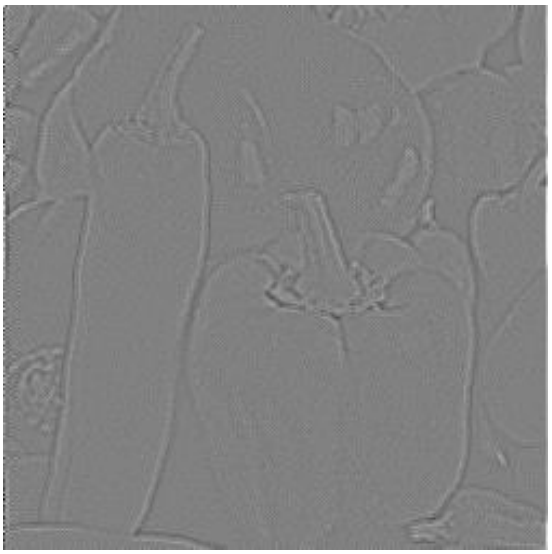
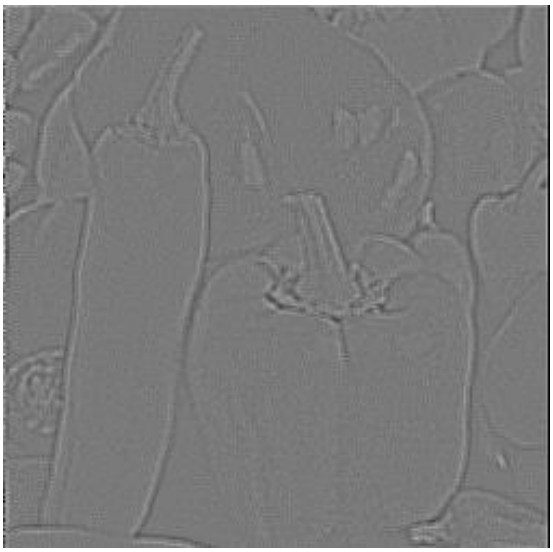
- k=3x3 ve σ=1 için Laplacian filtreleri

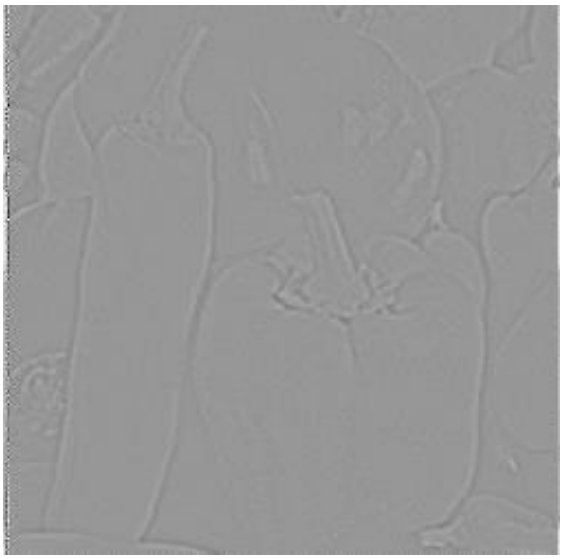
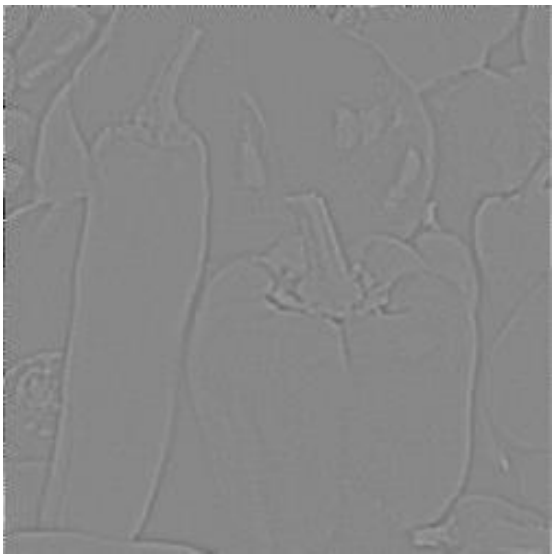
- k=3x3 ve σ=2 için Laplacian filtreleri

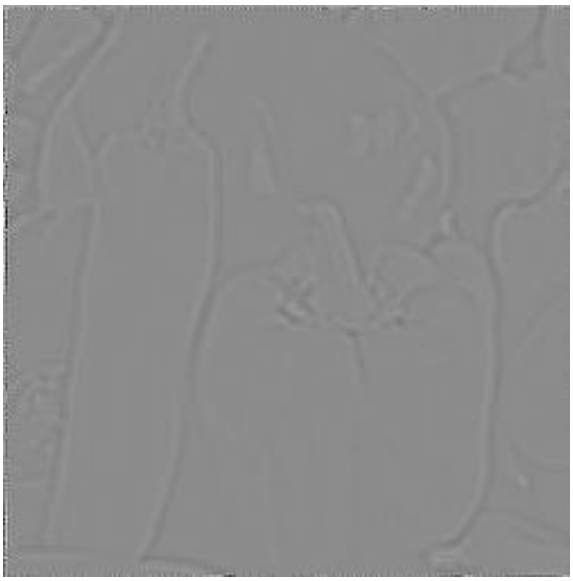
- k=3x3 ve σ=4 için Laplacian filtreleri

- k=5x5 ve σ=1 için Laplacian filtreleri

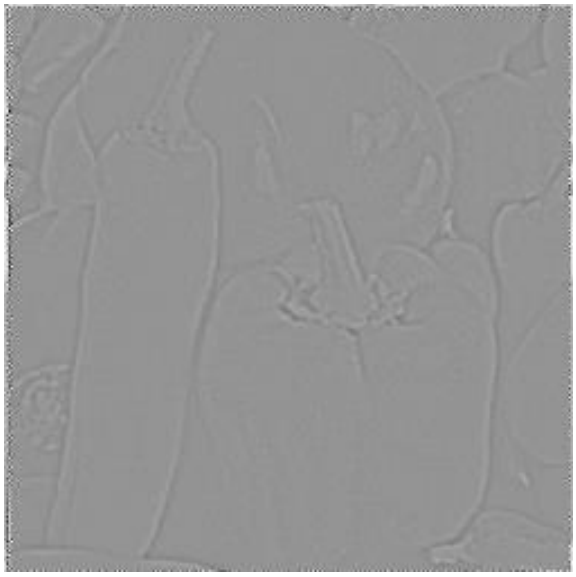



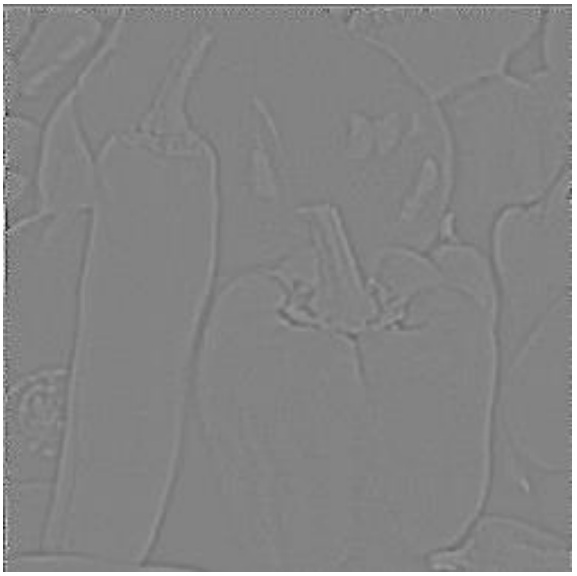
- k=5x5 ve σ=2 için Laplacian filtreleri

- k=5x5 ve σ=4 için Laplacian filtreleri


- k=7x7 ve σ=1 için Laplacian filtreleri





- k=7x7 ve σ=2 için Laplacian filtreleri

- k=7x7 ve σ=4 için Laplacian filtreleri

3) coins.ascii.pgm

GAUSSIAN FİLTRELERİ

k=3x3 σ = 1

```
3x3 boyutunda ve sigmasi 1 olan kernel
0.075114 0.123841 0.075114
0.123841 0.204180 0.123841
0.075114 0.123841 0.075114
```

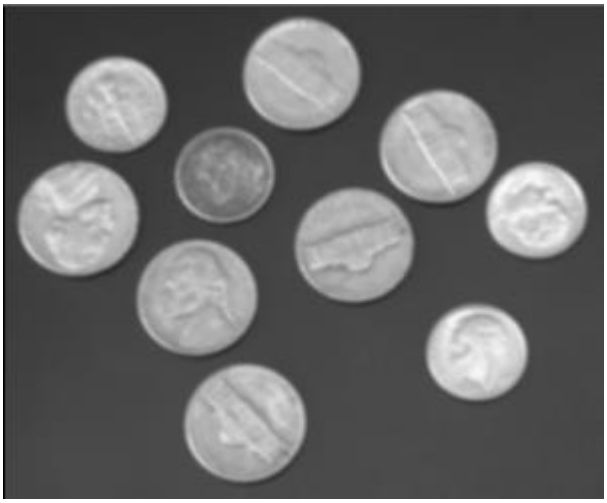
k=3x3 σ = 2

```
3x3 boyutunda ve sigmasi 2 olan kernel
0.101868 0.115432 0.101868
0.115432 0.130801 0.115432
0.101868 0.115432 0.101868
```

k=3x3 σ = 4

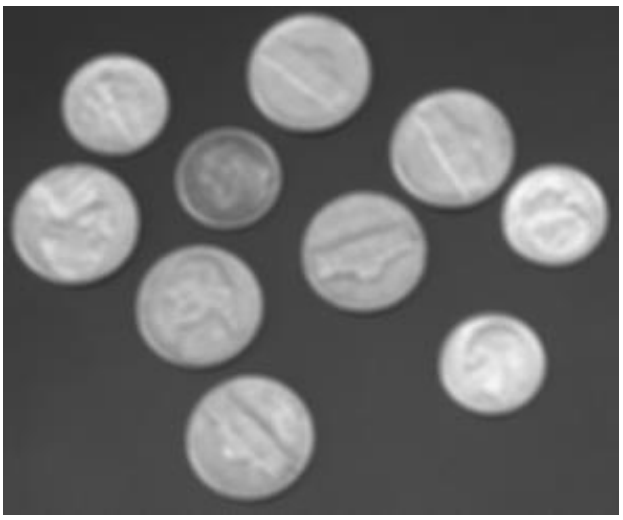
```
3x3 boyutunda ve sigmasi 4 olan kernel
0.108797 0.112250 0.108797
0.112250 0.115813 0.112250
0.108797 0.112250 0.108797
```

k=5x5 σ = 1



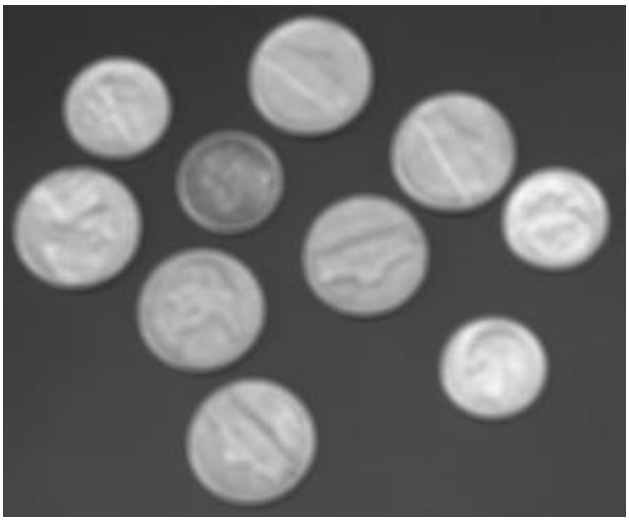
```
5x5 boyutunda ve sigmasi 1 olan kernel
0.002969 0.013306 0.021938 0.013306 0.002969
0.013306 0.059634 0.098320 0.059634 0.013306
0.021938 0.098320 0.162103 0.098320 0.021938
0.013306 0.059634 0.098320 0.059634 0.013306
0.002969 0.013306 0.021938 0.013306 0.002969
```

k=5x5 σ = 2



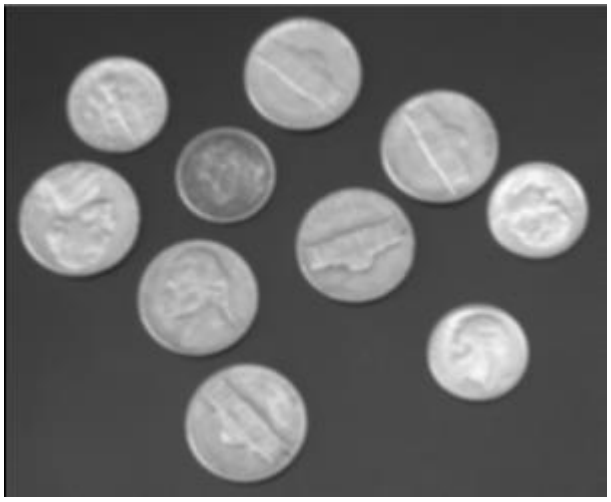
```
5x5 boyutunda ve sigmasi 2 olan kernel
0.023247 0.033824 0.038328 0.033824 0.023247
0.033824 0.049214 0.055766 0.049214 0.033824
0.038328 0.055766 0.063191 0.055766 0.038328
0.033824 0.049214 0.055766 0.049214 0.033824
0.023247 0.033824 0.038328 0.033824 0.023247
```

k=5x5 σ = 4



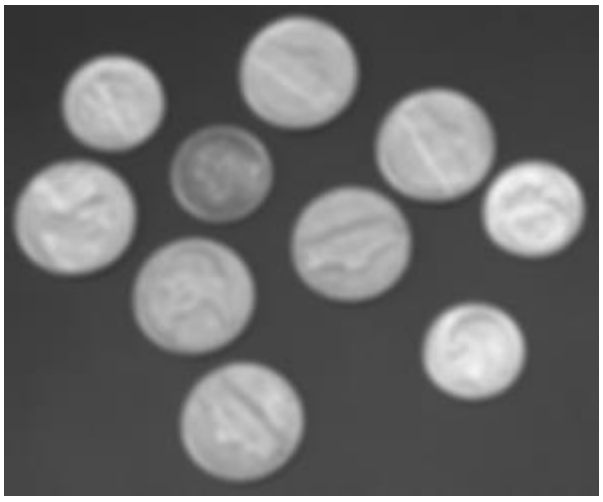
```
5x5 boyutunda ve sigmasi 4 olan kernel
0.035204 0.038664 0.039891 0.038664 0.035204
0.038664 0.042464 0.043812 0.042464 0.038664
0.039891 0.043812 0.045203 0.043812 0.039891
0.038664 0.042464 0.043812 0.042464 0.038664
0.035204 0.038664 0.039891 0.038664 0.035204
```

k=7x7 σ = 1



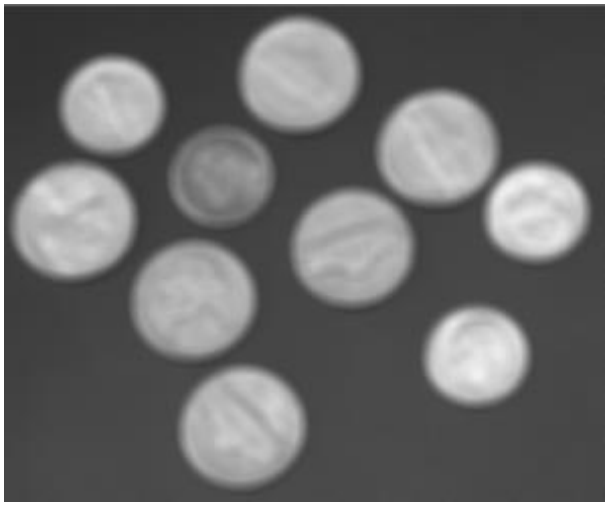
```
7x7 boyutunda ve sigmasi 1 olan kernel
0.000020 0.000239 0.001073 0.001769 0.001073 0.000239 0.000020
0.000239 0.002917 0.013071 0.021551 0.013071 0.002917 0.000239
0.001073 0.013071 0.058582 0.096585 0.058582 0.013071 0.001073
0.001769 0.021551 0.096585 0.159241 0.096585 0.021551 0.001769
0.001073 0.013071 0.058582 0.096585 0.058582 0.013071 0.001073
0.000239 0.002917 0.013071 0.021551 0.013071 0.002917 0.000239
0.000020 0.000239 0.001073 0.001769 0.001073 0.000239 0.000020
```

k=7x7 σ = 2



```
7x7 boyutunda ve sigmasi 2 olan kernel
0.004922 0.009196 0.013380 0.015162 0.013380 0.009196 0.004922
0.009196 0.017181 0.024998 0.028326 0.024998 0.017181 0.009196
0.013380 0.024998 0.036371 0.041214 0.036371 0.024998 0.013380
0.015162 0.028326 0.041214 0.046702 0.041214 0.028326 0.015162
0.013380 0.024998 0.036371 0.041214 0.036371 0.024998 0.013380
0.009196 0.017181 0.024998 0.028326 0.024998 0.017181 0.009196
0.004922 0.009196 0.013380 0.015162 0.013380 0.009196 0.004922
```

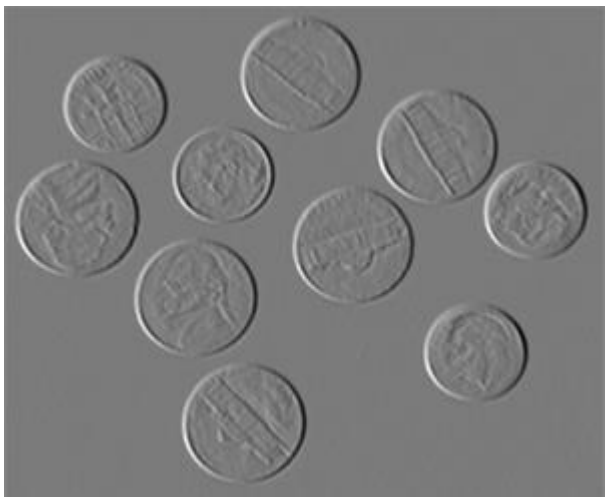
k=7x7 σ = 4



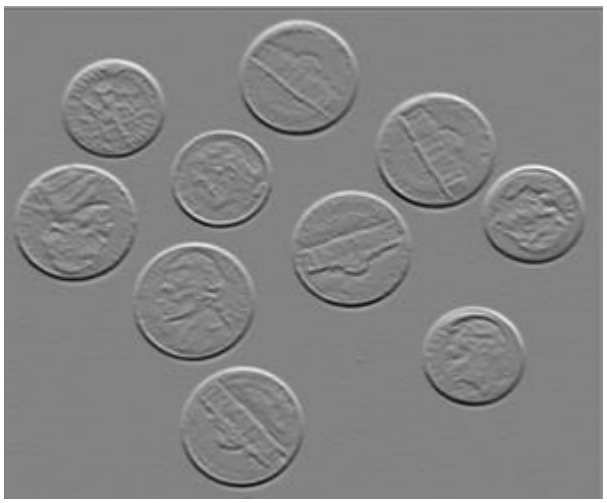
```
7x7 boyutunda ve sigmasi 4 olan kernel
0.014760 0.017256 0.018952 0.019554 0.018952 0.017256 0.014760
0.017256 0.020175 0.022157 0.022861 0.022157 0.020175 0.017256
0.018952 0.022157 0.024335 0.025108 0.024335 0.022157 0.018952
0.019554 0.022861 0.025108 0.025905 0.025108 0.022861 0.019554
0.018952 0.022157 0.024335 0.025108 0.024335 0.022157 0.018952
0.017256 0.020175 0.022157 0.022861 0.022157 0.020175 0.017256
0.014760 0.017256 0.018952 0.019554 0.018952 0.017256 0.014760
```

ORİJİNAL GÖRÜNTÜLERE SOBEL FİLTRELERİ

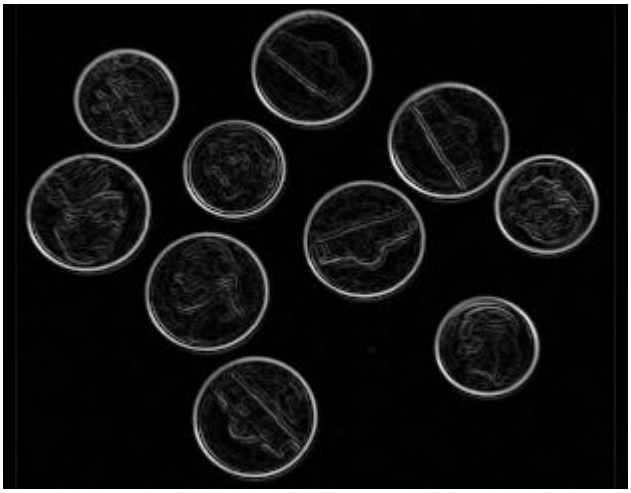
Sobel x



Sobel y



Sobel xy

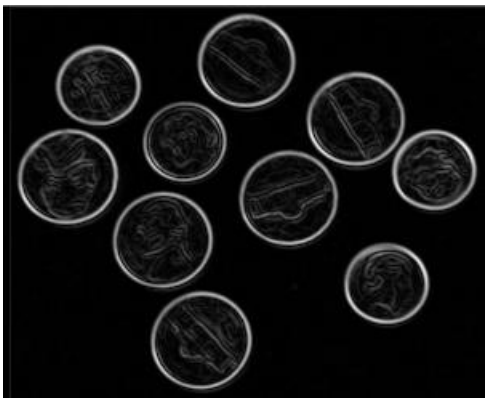


GAUSSIAN FİLTRESİ UYGULANMIŞ GÖRÜNTÜLERE SOBEL FİLTRELERİ

Sırasıyla görüntüler Sobel x, Sobel y ve Sobel xy şeklinde eklenmiştir.

- k=3x3 ve σ=1 için Sobel filtreleri

Sobel x Sobel y Sobel xy

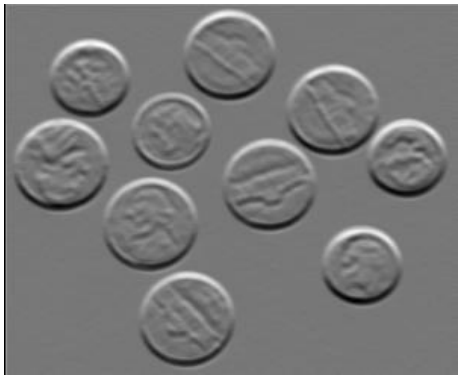
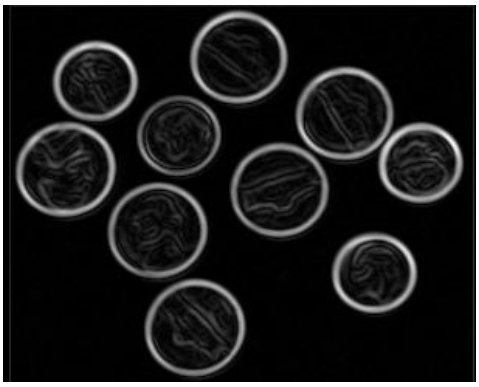


- k=3x3 ve σ=2 için Sobel filtreleri

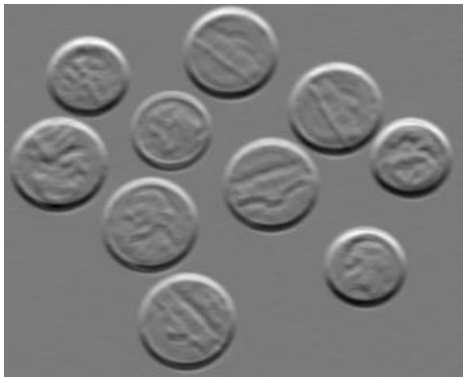
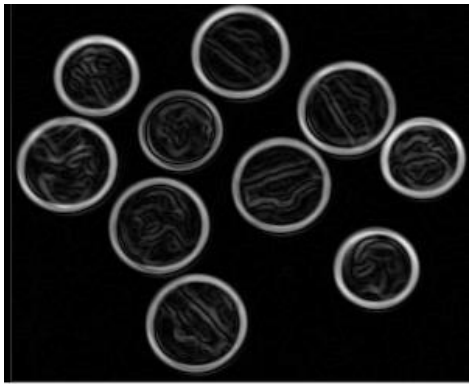
- k=3x3 ve σ=4 için Sobel filtreleri

- k=5x5 ve σ=1 için Sobel filtreleri

- k=5x5 ve σ=2 için Sobel filtreleri

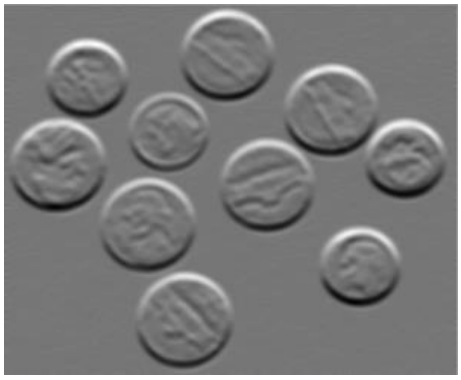
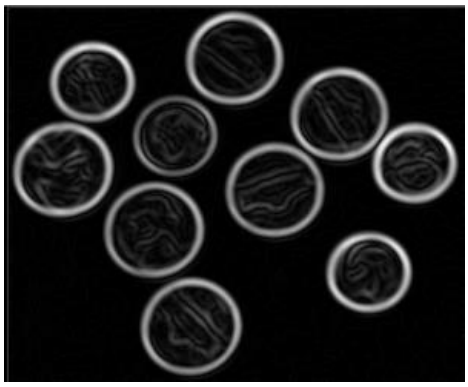
- k=5x5 ve σ=4 için Sobel filtreleri

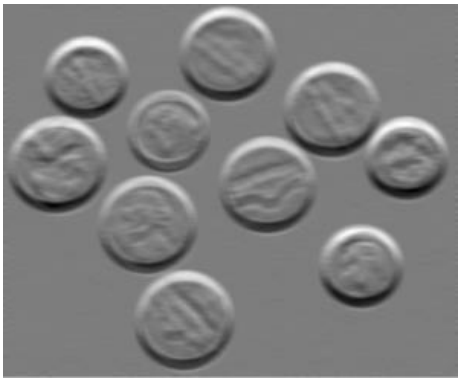
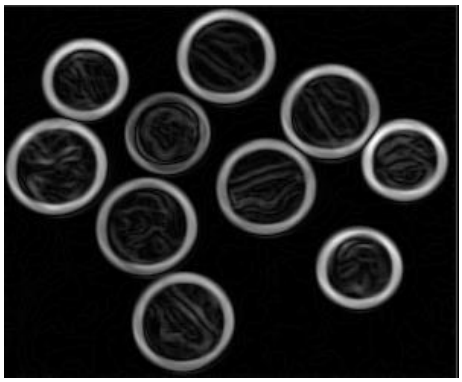
- k=7x7 ve σ=1 için Sobel filtreleri



- k=7x7 ve σ=2 için Sobel filtreleri

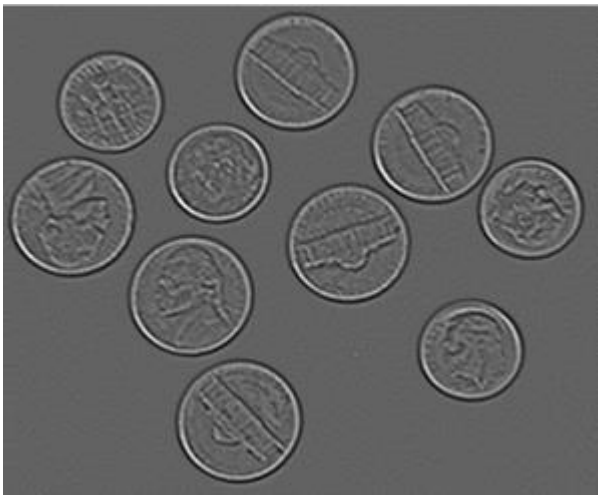
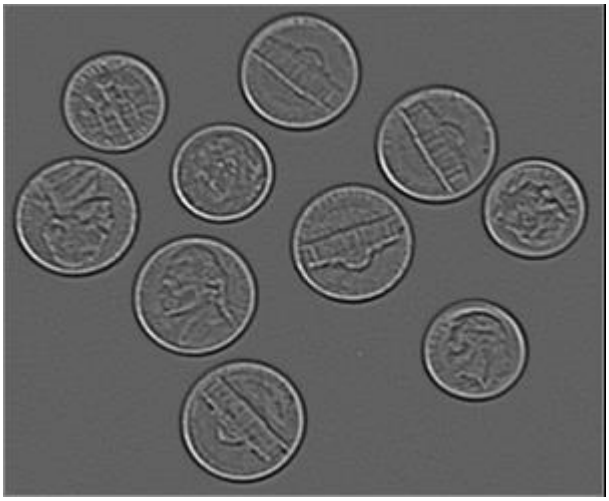
- k=7x7 ve σ=4 için Sobel filtreleri

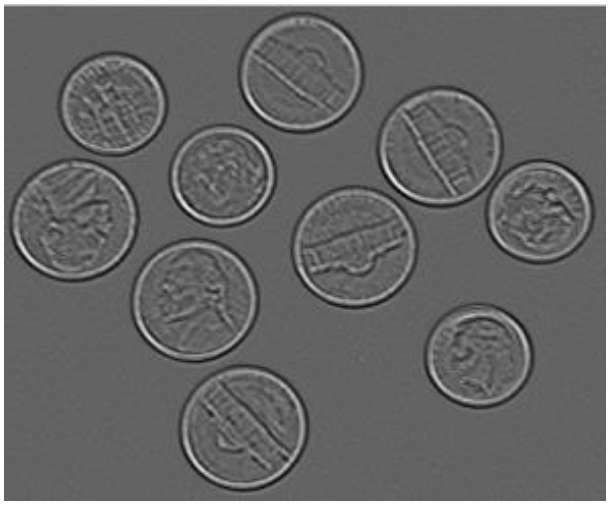
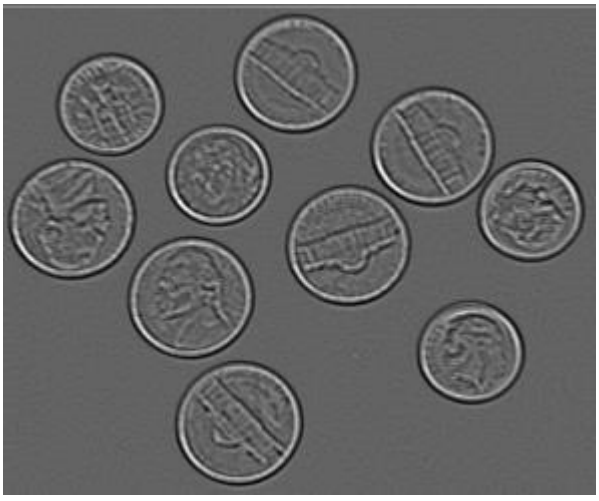
GAUSSIAN FİLTRESİ UYGULANMIŞ GÖRÜNTÜLERE LAPLACIAN FİLTRELERİ

Sırasıyla görüntüler Laplacian Kernel 1 ve Laplacian Kernel 2 şeklinde eklenmiştir.

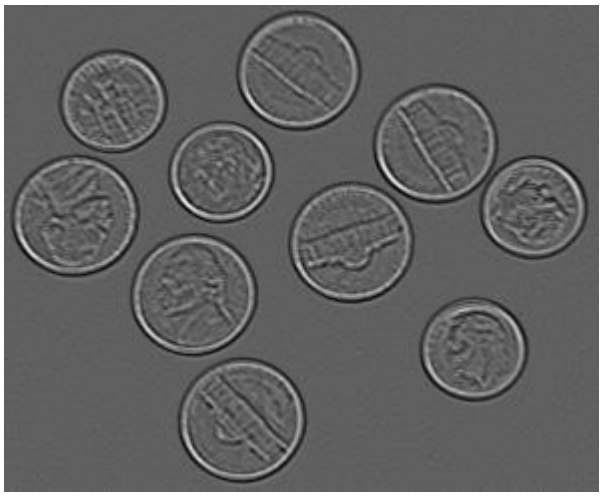
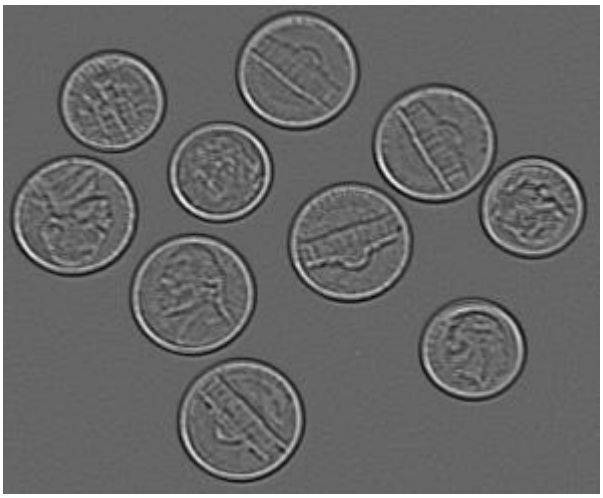
- k=3x3 ve σ=1 için Laplacian filtreleri

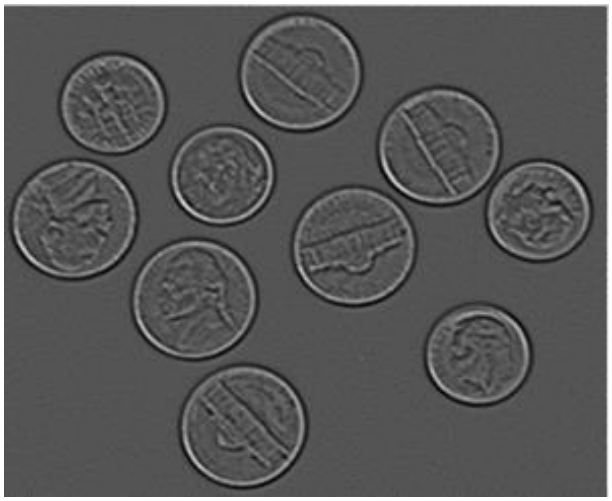
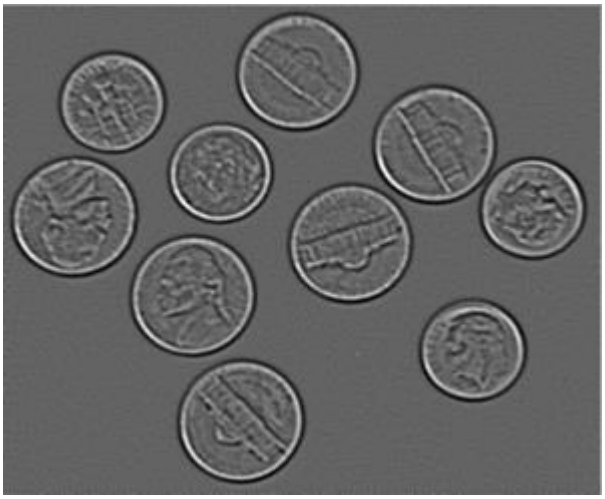
- k=3x3 ve σ=2 için Laplacian filtreleri

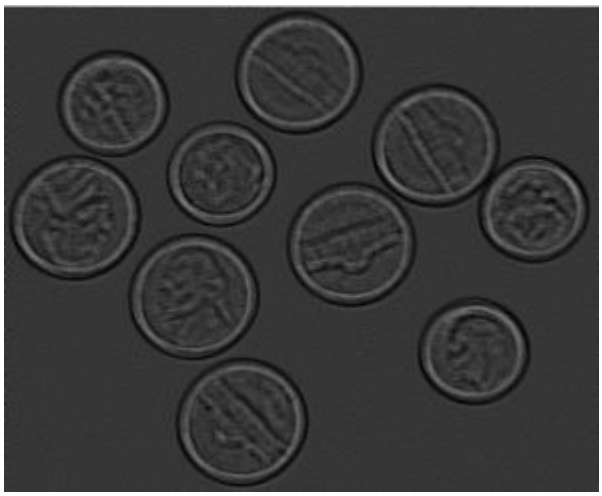
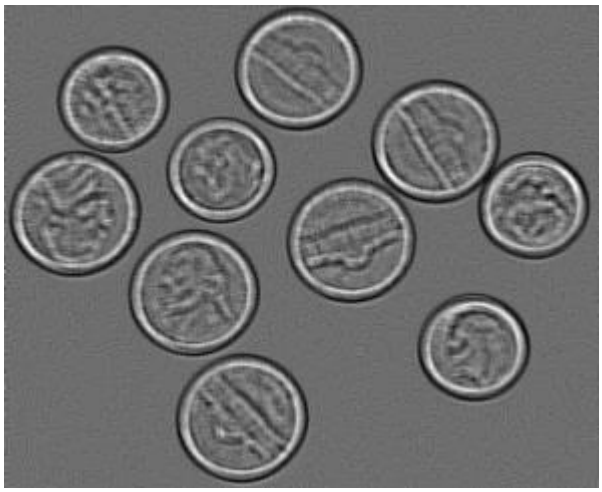
- k=3x3 ve σ=4 için Laplacian filtreleri

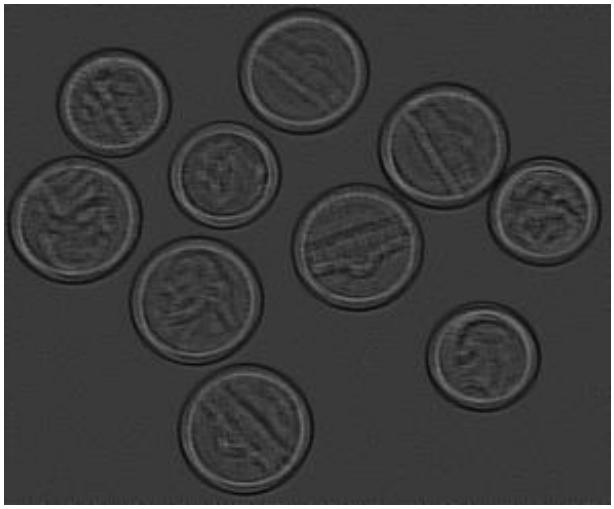
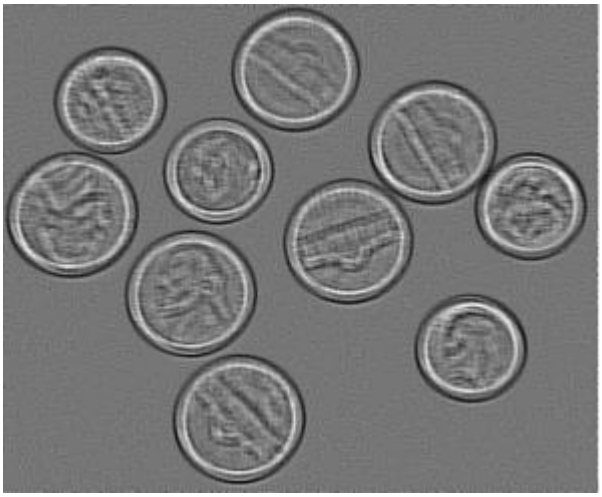
- k=5x5 ve σ=1 için Laplacian filtreleri

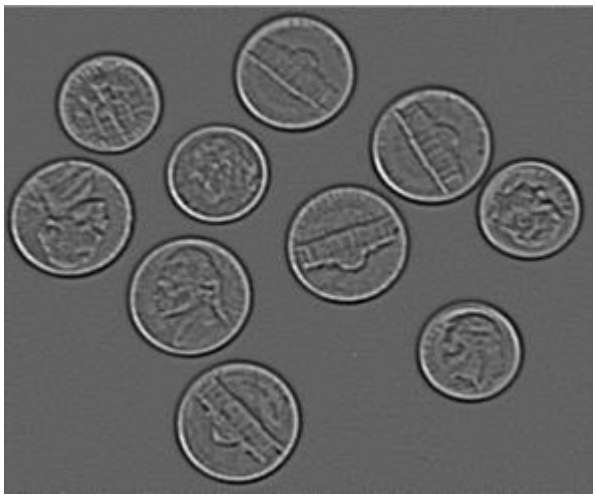
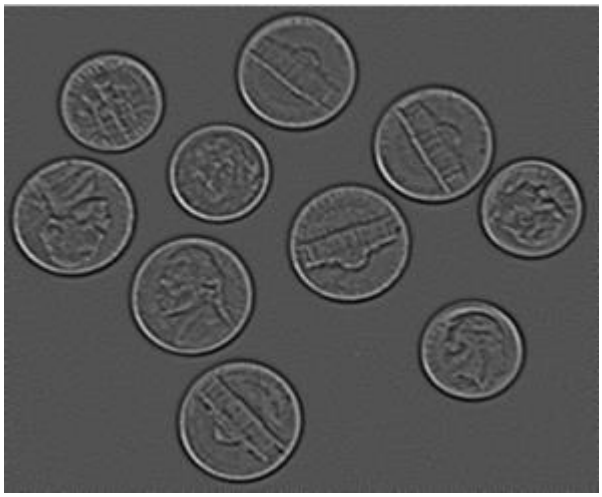
- k=5x5 ve σ=2 için Laplacian filtreleri

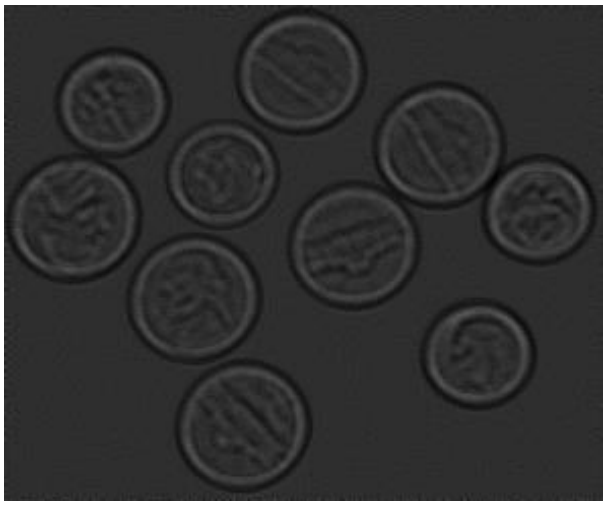
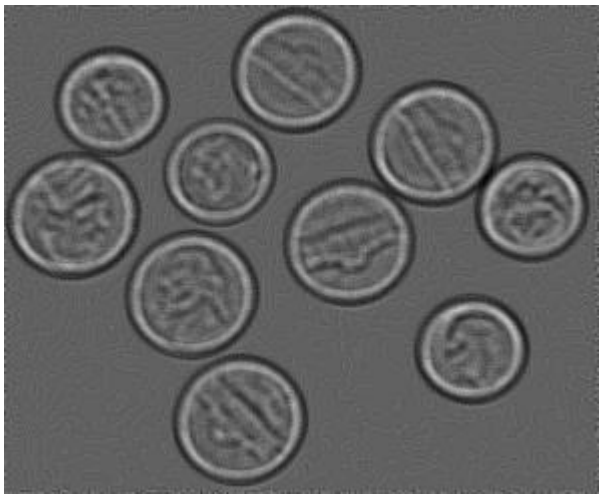
- k=5x5 ve σ=4 için Laplacian filtreleri

- k=7x7 ve σ=1 için Laplacian filtreleri

- k=7x7 ve σ=2 için Laplacian filtreleri

- k=7x7 ve σ=4 için Laplacian filtreleri