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Devon Quaternik

Problem 1

```
No, a is not separable.
Yes, b is separable.

HCOL =

   -1.0000
   -2.0000
   -1.0000


HROW =

   -1.0000   -2.0000   -1.0000

No, c is not separable.
Yes, d is separable.

HCOL =

   -1.3161
         0
    1.3161


HROW =

   -0.7598   -1.5197   -0.7598

No, e is not separable.
Yes, f is separable.

HCOL =

   -1.0000
   -1.0000
```

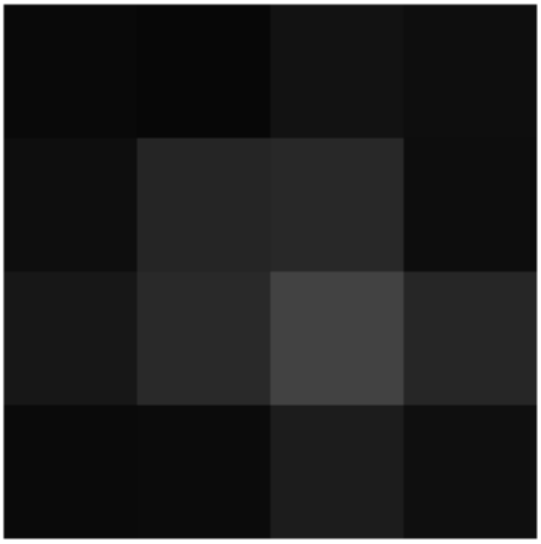
```
   -1.0000
   -1.0000
   -1.0000


HROW =

   -1.0000   -1.0000   -1.0000   -1.0000   -1.0000

Yes, g is separable.

HCOL =

   -1.1362
   -1.1362
   -1.1362


HROW =

   -0.8801   -0.8801   -0.8801   -0.8801   -0.8801
```

Problem 2

```
g =

     0     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0     0
     0     0    18    14     0     0     0     0     0     0     0
     0     0    10     6     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0     0
     0     0     0     0    63    49     0     0     0     0     0
     0     0     0     0    35    21     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0     0
     0     0     0    90   250   140     0     0     0     0     0
     0     0     0    50   130    60     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0     0
```

Problem 3

```
g =

     9     7    18    14
    14    37    40    13
    23    41    66    38
    10    11    28    15
```



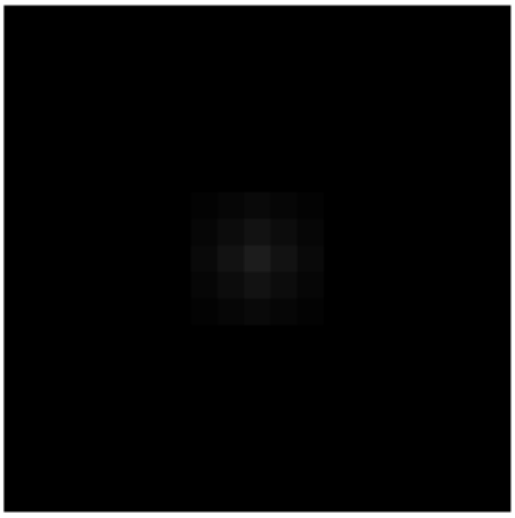
Problem 5

```
gmax =

    0.1111


gmin =

     0


gmax =

     5


gmin =

    -1
```

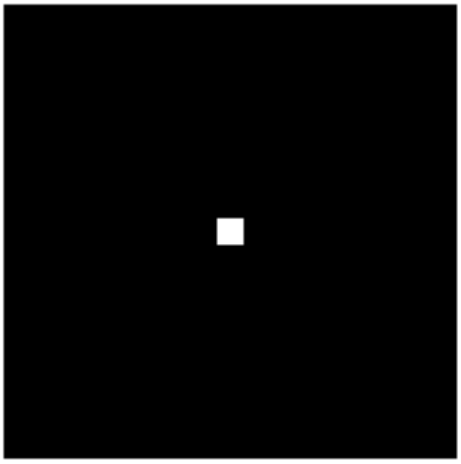
Because we are working with matrices, multiplying in different orders yields different results. Filter 2 is spreading the little brightness there is out before filter 1 is able to amplify it in part d. This is why you see a bright spot in part c, but only a gray here.

The image would look similar, but brighter. Because the filters are not changing, the effect on uniform images would be the same.

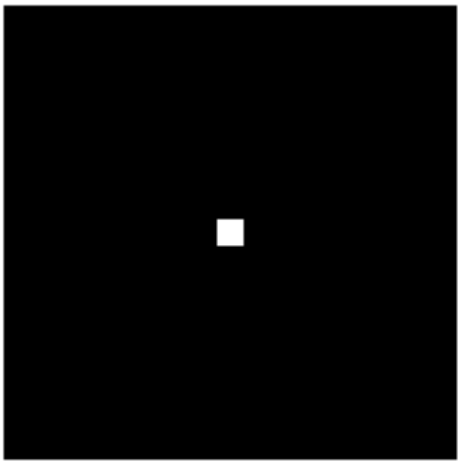
Part A



Part B



Part C



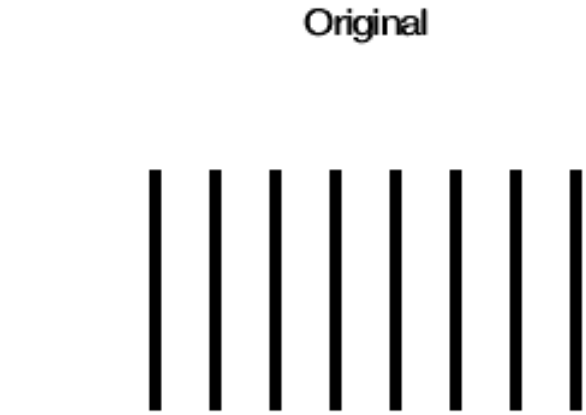
Part D

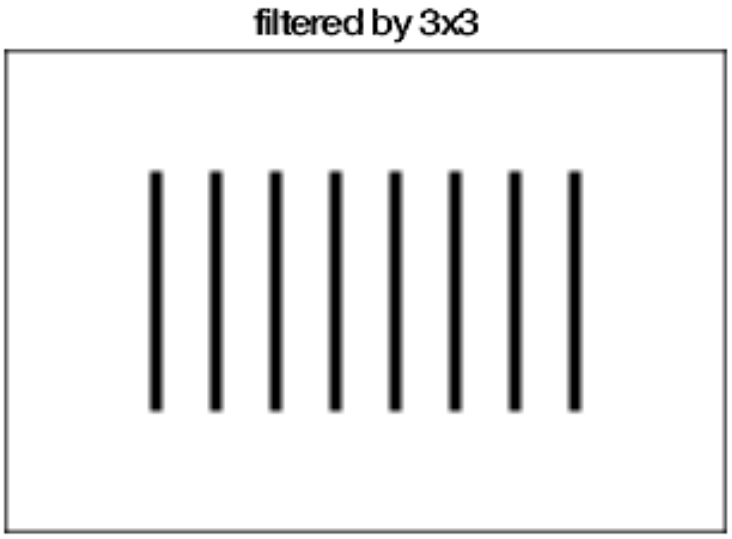
Problem 6

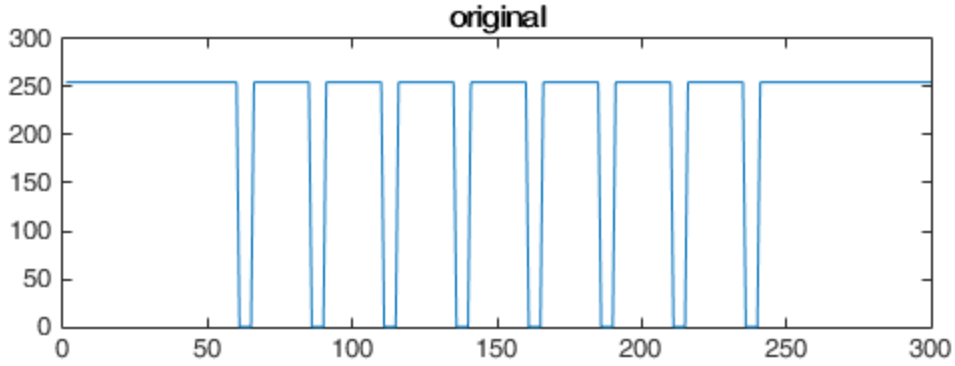
The smoothing filter widens the strips, but shrinks their darkest part. It lowers the contrast with the background by blurring the bars, extending the change over more pixesls.

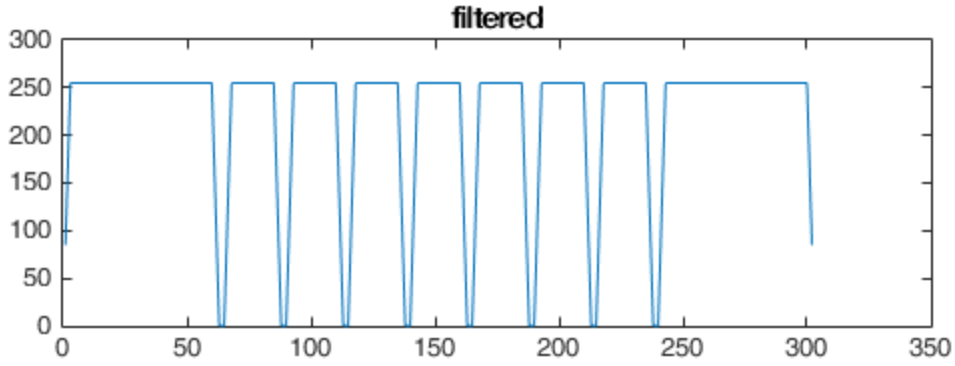
The bars are more well defined in part d than in part c because the 25x25 filter matches the spacing of the bars and spaces. This means that it wwill capture exactly 1 bar and average it, then move to the next step with only 1 bar in it. The 45 actually is capturing

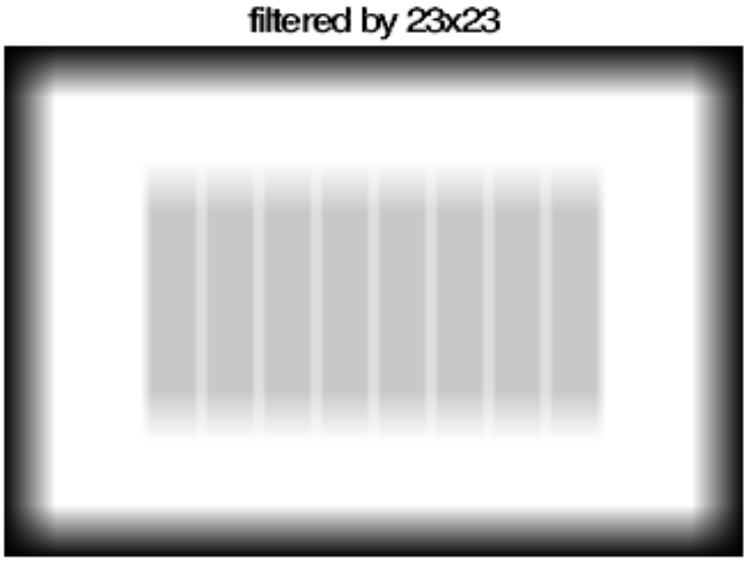
multiple bars, which when convoluted will have a peak that the other will not.

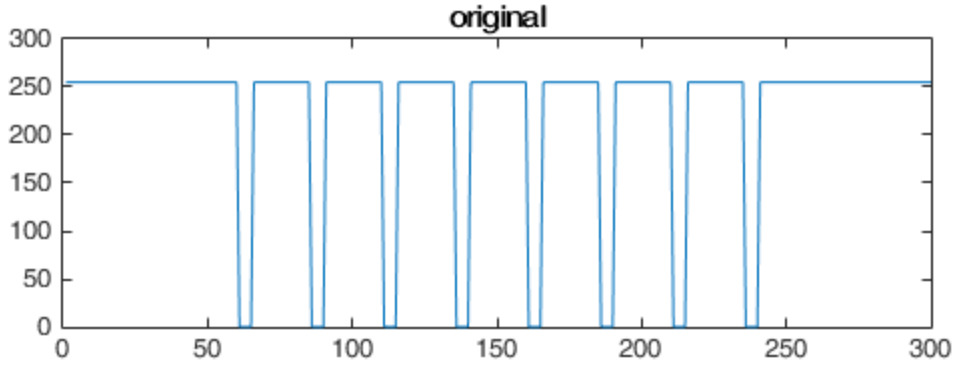


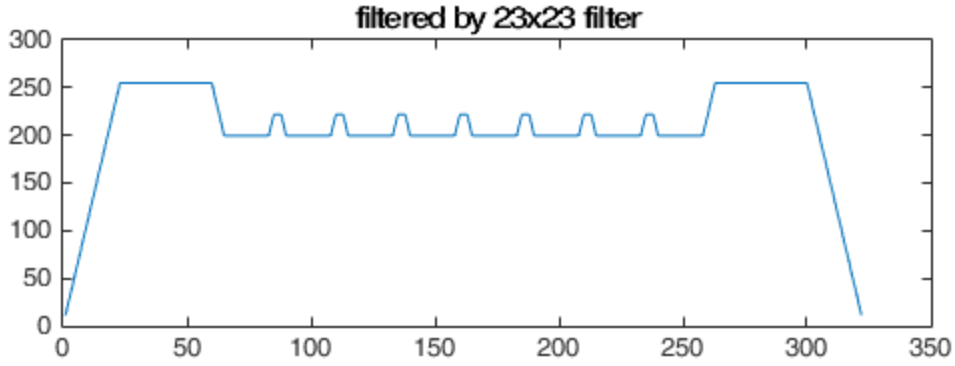



original
300
250
200
150
100
50
0
0
50
100
150
200
250
300

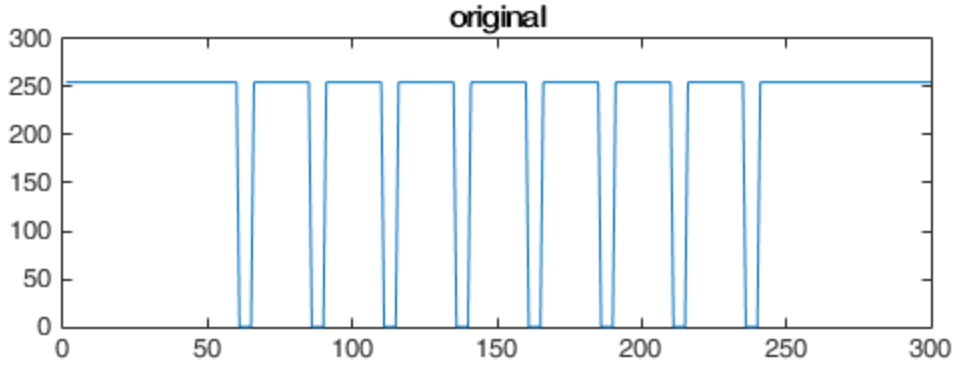

filtered
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350

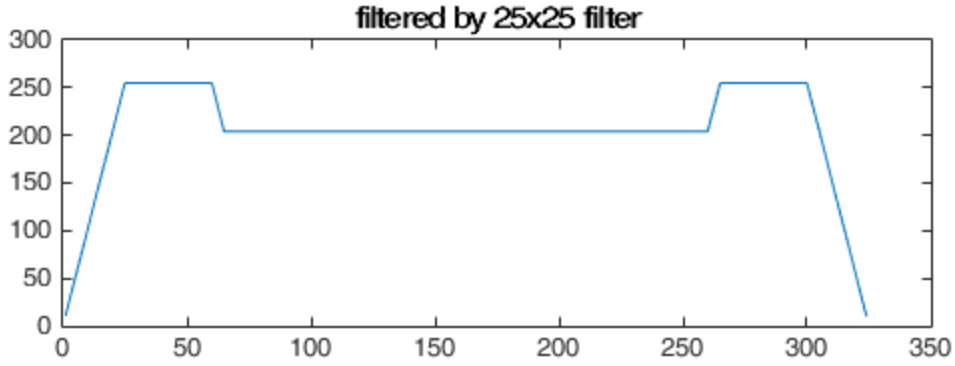

filtered by 23x23


original
300
250
200
150
100
50
0
0
50
100
150
200
250
300

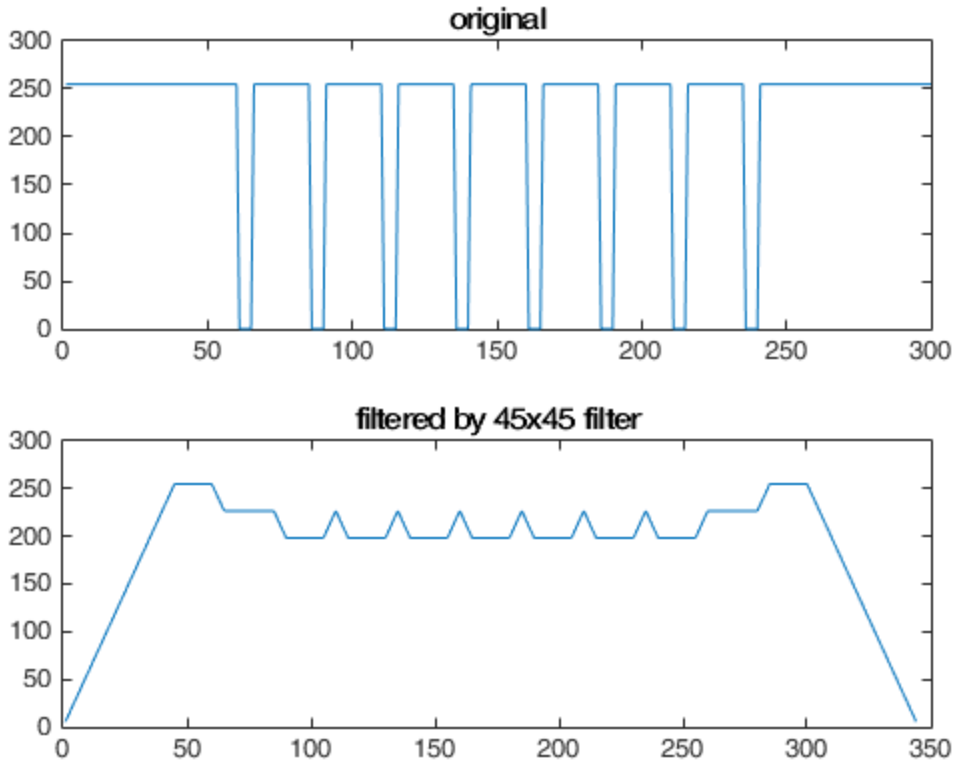

filtered by 23x23 filter
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350


filtered by 25x25


original
300
250
200
150
100
50
0
0
50
100
150
200
250
300


filtered by 25x25 filter
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350


filtered by 45x45

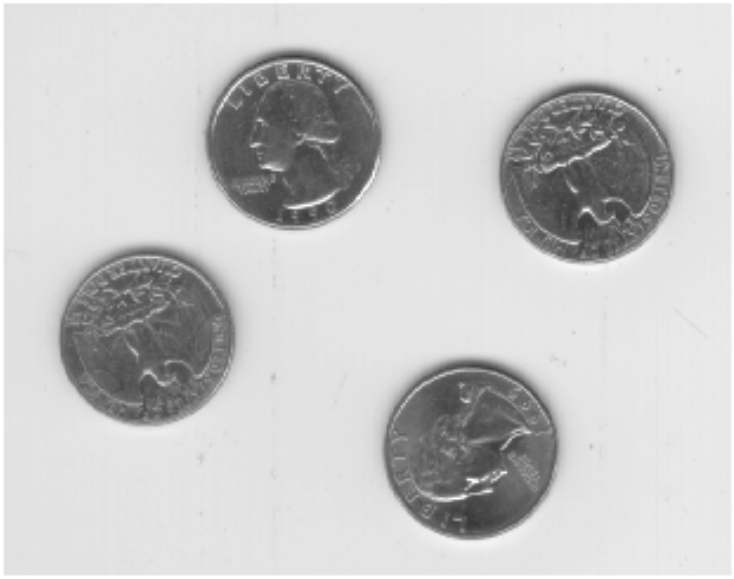


Problem 7

The noise in the background seems to be slightly more drawn out. Contrast is rasied on the edges of the quarters, especially in cc=0.4.You are more able to see lines in the background, whether real or not, as cc goes up.

For the second set of images, the image has not been reweighted and the filter has negative values. These negatives are being shifted by MATLAB to 0 and everything looks darker because of it.

original



α=0.2

∝=0.4

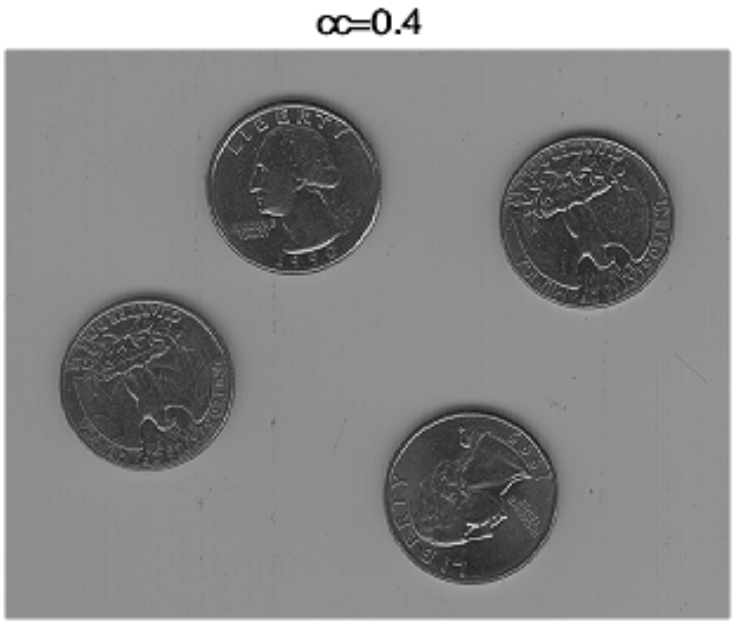
Original

α_c=0.2

α_c=0.4

original

$\alpha c=0.2$



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