Project #3

Huiyu Wang
604–592–364

1 Filters

On top of the given 17 filters, we add 12 Gabor filters with size of 15 and orientations of 0, 30, 60, 90, 120 and 150. In addition, we add 2 first order gradient filters with different direction than the given ones and a 1×1 filter. Totally, we have 32 filters. Fig. 1 shows all of the filters. Note here we use the same filters as in the example to make the result comparable. Adding more filters (e.g. using more sizes and directions of gabor filters) will result in better performance in acceptable time consumption.
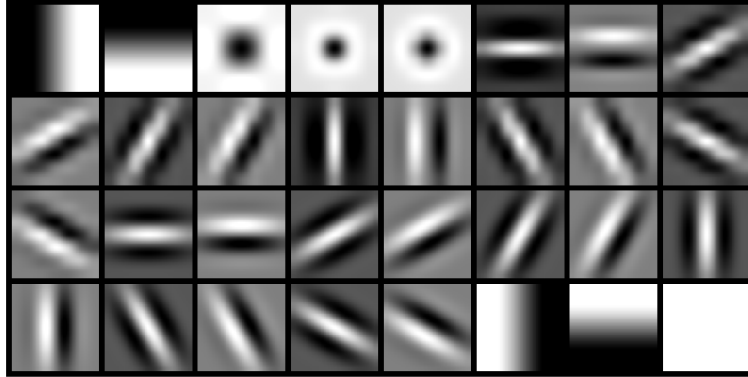

Figure 1: All of the 32 filters (resized)

2 Results

The initial T is set to be 0.1 and the decreasing coefficient is set to 0.96. Choosing smaller T leads to narrower probability distributions and lower errors. We use 15 bins and assign

them with weigthts: [8, 7, 6, 5, 4, 3, 2, 1, 2, 3, 4, 5, 6, 7, 8]. To accelerate the computation, we just consider [0, 7] gray intensity range for each pixel. We also crop and resize the sizes of original images to be 256×256. The synthesized images are also of size 256×256 and gray intensity range [0, 7].

2.1   Fur

The result using 24 filters out of all 32 filters is good enough (the weighted error is not decreasing). The chosen filters are 3, 20, 2, 12, 1, 32, 6, 31, 22, 30, 27, 16, 8, 26, 4, 19, 28, 29, 23, 10, 14, 24, 25, 21. Figure 2 shows the curve of the average weighted error per bin over the number of filters used for synthesis. Figure 3 shows the original image (of size 256×256 and gray intensity range [0, 7]) and the synthesized images.
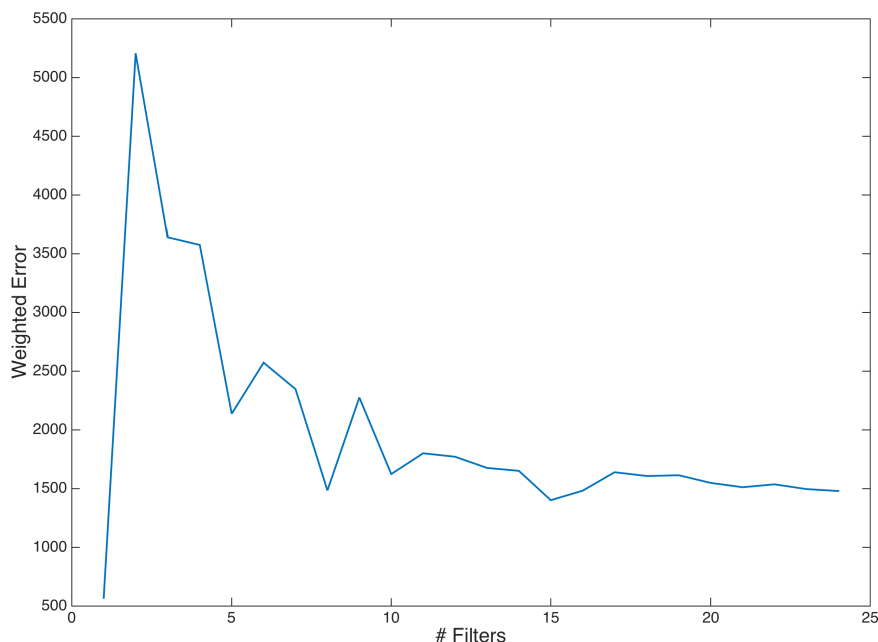

Figure 2: Error over the number of filters used (fur)

(a) Original   (b) 1 filter   (c) 3 filters

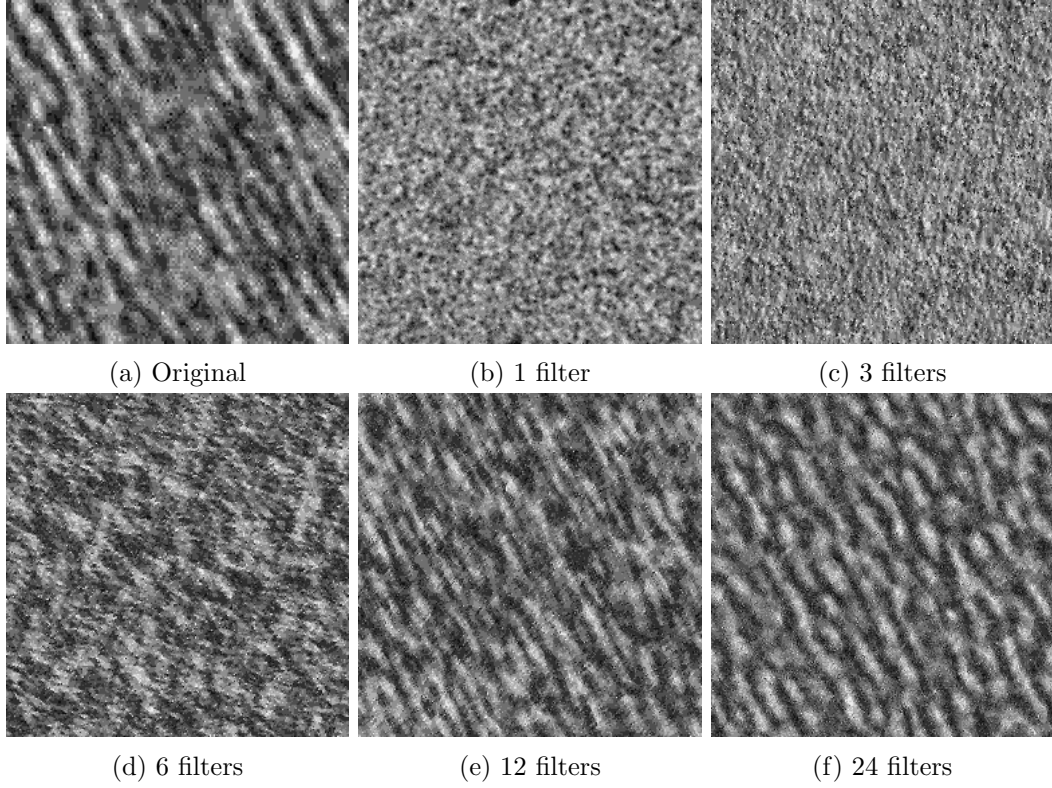(d) 6 filters   (e) 12 filters   (f) 24 filters

Figure 3: Synthesized Images (fur)

2.2 Stucco

The result using 24 filters out of all 32 filters is good enough (the weighted error is not decreasing). The chosen filters are 32, 4, 26, 16, 3, 14, 1, 2, 22, 30, 28, 31, 20, 12, 6, 10, 19, 8, 5, 17, 24, 15, 7, 13, 29. Figure 4 shows the curve of the average weighted error per bin over the number of filters used for synthesis. Figure 5 shows the original image (of size 256×256 and gray intensity range $[0, 7]$) and the synthesized images.
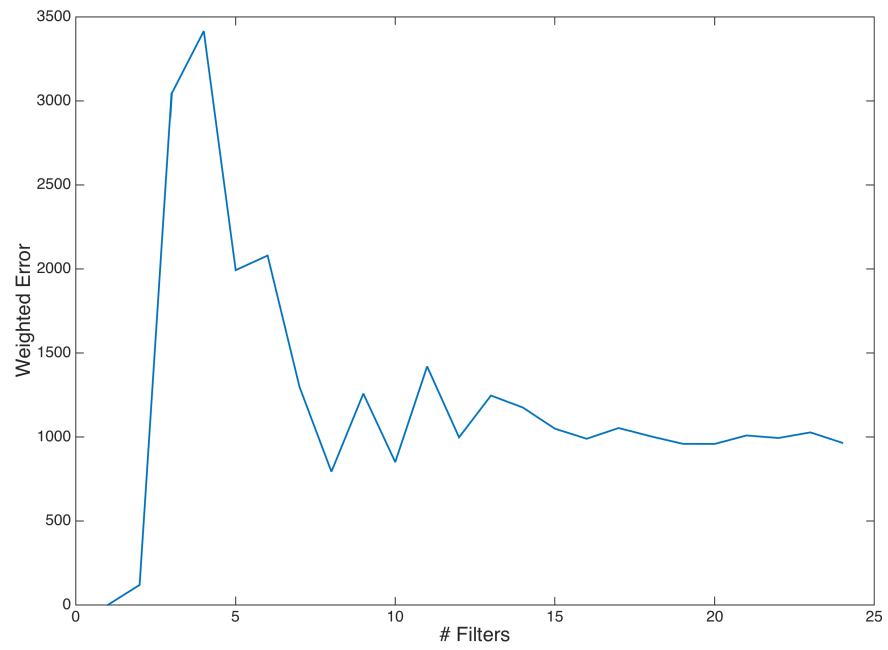
Figure 4: Error over the number of filters used (stucco)

4

| (a) Original | (b) 1 filter | (c) 3 filters |

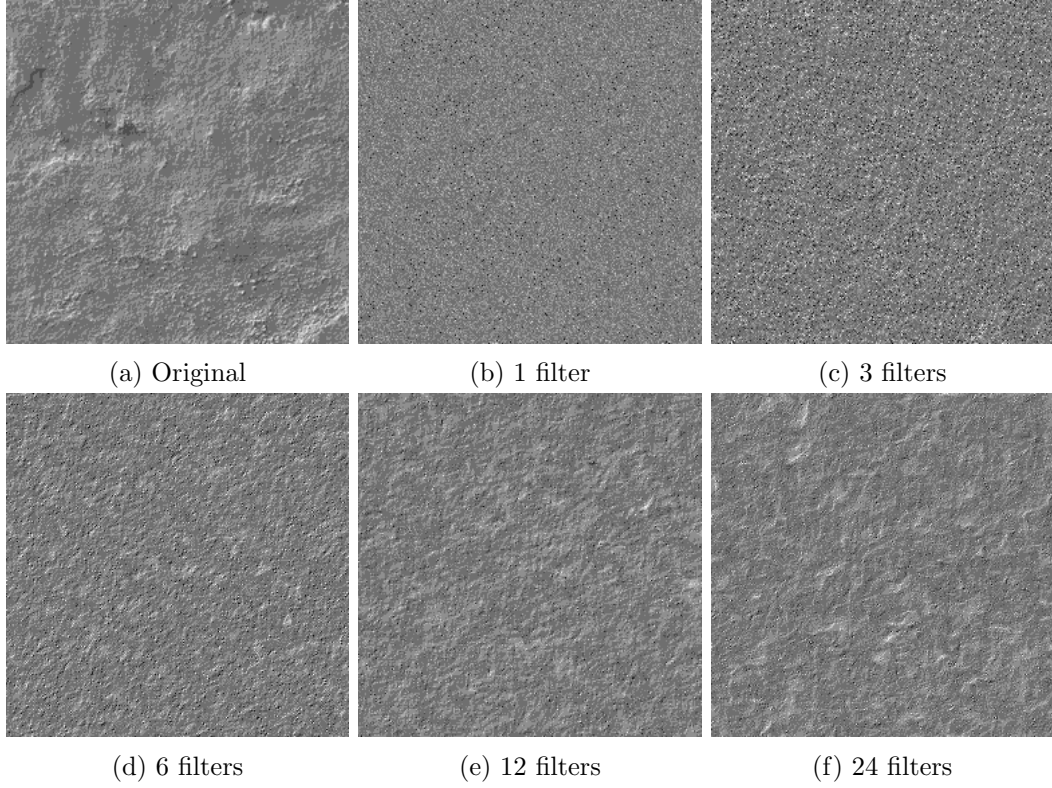| (d) 6 filters | (e) 12 filters | (f) 24 filters |

Figure 5: Synthesized Images (stucco)

2.3 Grass

The result using 24 filters out of all 32 filters is good enough (the weighted error is not decreasing). The chosen filters are 3, 32, 19, 6, 2, 5, 10, 30, 8, 16, 4, 12, 31, 25, 27, 14, 23, 26, 1, 22, 21, 13, 11, 9. Figure 6 shows the curve of the average weighted error per bin over the number of filters used for synthesis. Figure 7 shows the original image (of size 256×256 and gray intensity range $[0, 7]$) and the synthesized images.
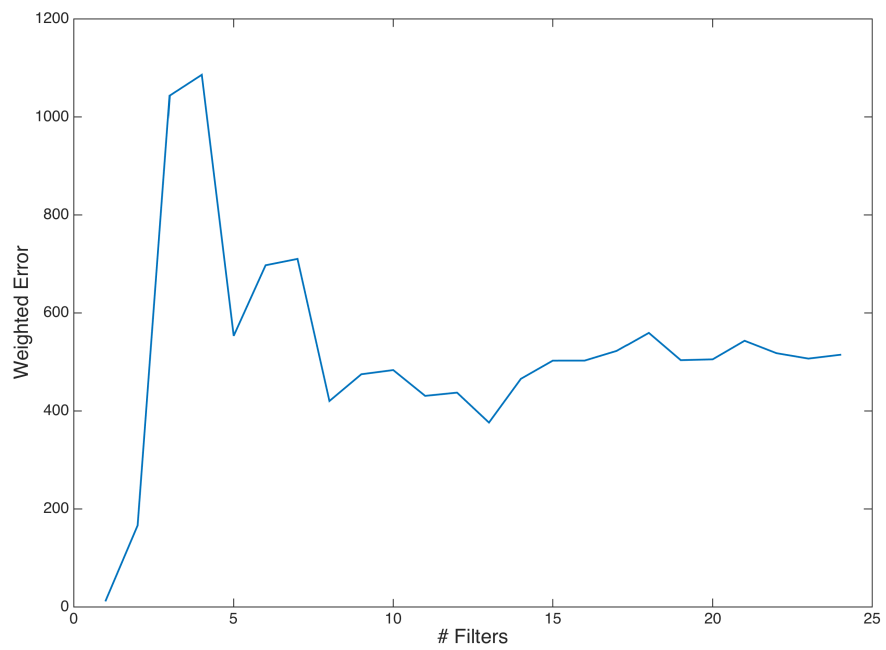
Figure 6: Error over the number of filters used (grass)

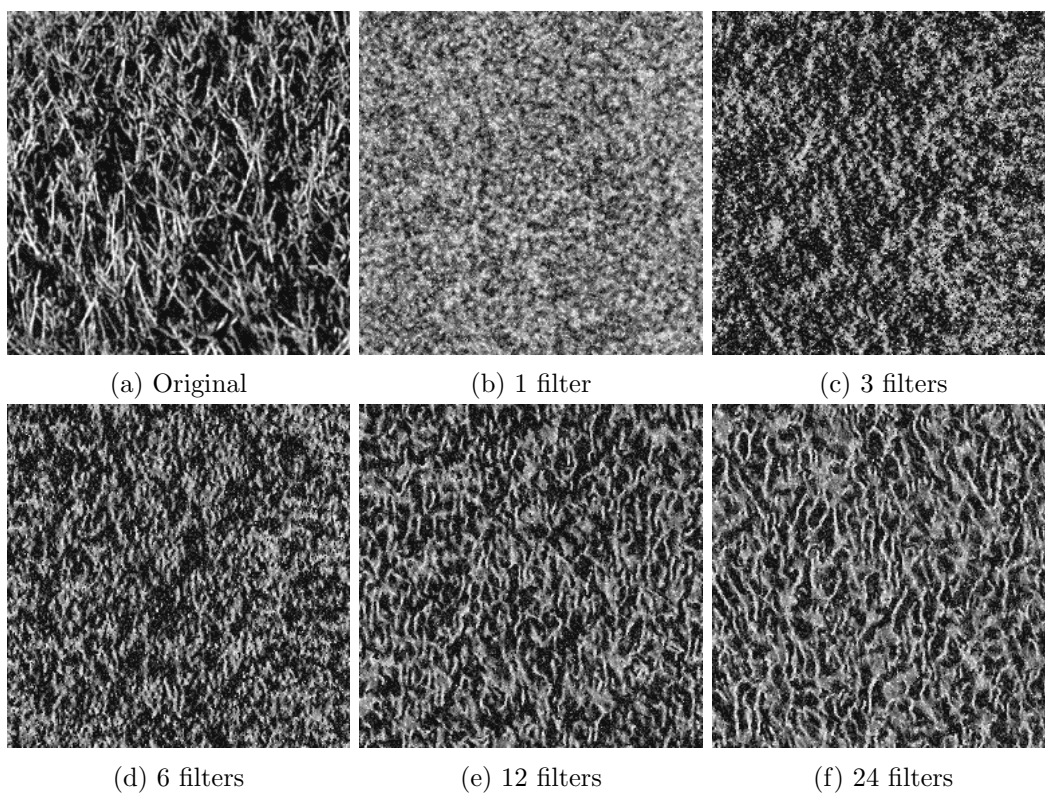(a) Original   (b) 1 filter   (c) 3 filters

(d) 6 filters   (e) 12 filters   (f) 24 filters

Figure 7: Synthesized Images (grass)