

ECE 311 Lab 6

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April 20, 2017

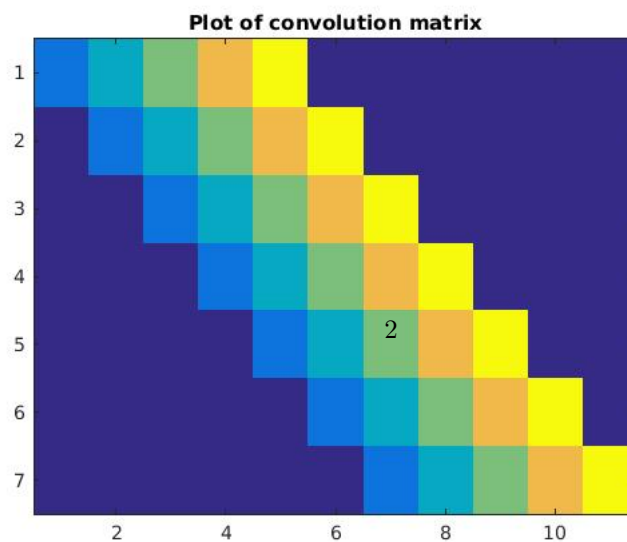
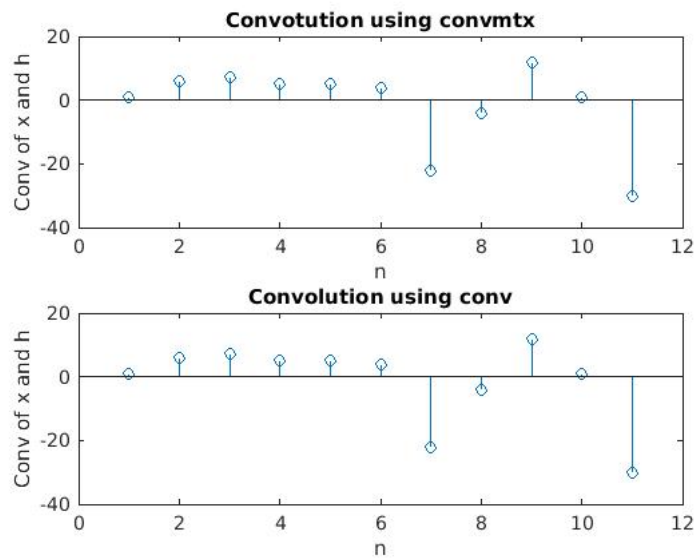
```

1 x = [ 1 4 -4 -3 2 5 -6];
  h = [1 2 3 4 5];
3 a = convmtx(h,length(x));
  figure;
5 imagesc(a);
  title('Plot of convolution matrix');
7
  cx = x*a;
9 c = conv(x,h);

11 figure;
  subplot(211);
13 stem(cx);
  title('Convolution using convmtx');
15 ylabel('Conv of x and h');
  xlabel('n');
17 subplot(212);
  stem(c);
19 title('Convolution using conv');
  ylabel('Conv of x and h');
21 xlabel('n');

```

report1.m



$$\begin{aligned}
A &= U\Sigma V^H \\
A^H A &= V\Sigma^H U^H U \Sigma V^H \\
&= V\Sigma^H \Sigma V^H \\
A^H AV &= V\Sigma^H \Sigma = V\Sigma^2
\end{aligned}$$

```

1 clear all;
2 clc;
3 A = [1,4,-2
      3,11,5
      7,7,7];
5 AH = A';
7
9 AAH = A*AH;
10 AHA = AH*A;
11
12 [V1,D1,W1] = eig(AAH);
13 [V2,D2,W2] = eig(AHA);
14
15 [U3,S3,V3] = svd(A);
16
17 V1
18 V2
19 W1
20 W2
21 U3
22 V3

```

report2.m

```

V1 =
    -0.7504    -0.6434     0.1513
     0.5334    -0.4543     0.7135
    -0.3903     0.6161     0.6841

V2 =
    -0.7939     0.4438     0.4155
     0.0563    -0.6268     0.7772
     0.6054     0.6404     0.4726

W1 =
    -0.7504    -0.6434     0.1513
     0.5334    -0.4543     0.7135
    -0.3903     0.6161     0.6841

W2 =
    -0.7939     0.4438     0.4155
     0.0563    -0.6268     0.7772
     0.6054     0.6404     0.4726

U3 =
    -0.1513    -0.6434    -0.7504
    -0.7135    -0.4543     0.5334
    -0.6841     0.6161    -0.3903

V3 =
    -0.4155     0.4438    -0.7939
    -0.7772    -0.6268     0.0563
    -0.4726     0.6404     0.6054

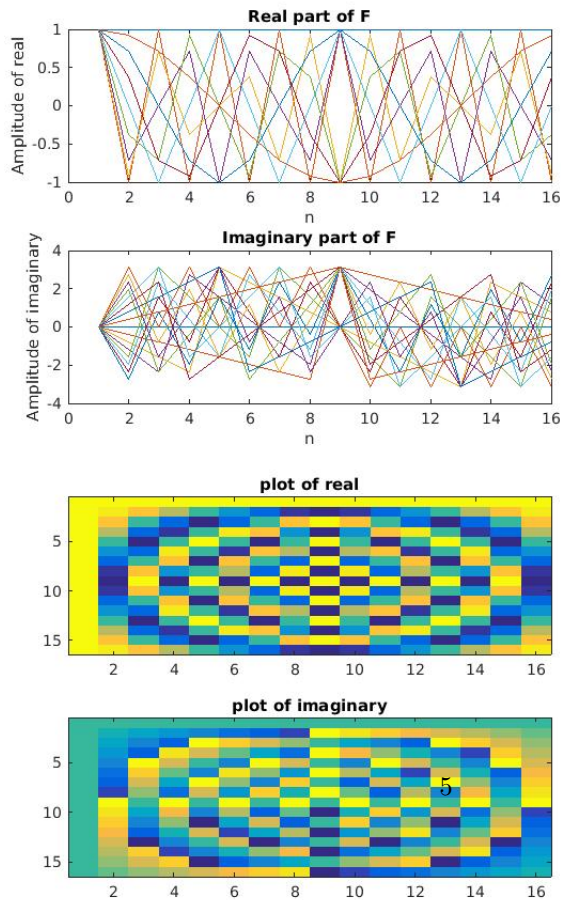
```

```

1  clc;
2  clear all;
3  x = [1 1 4 -4 -3 2 5 -6 3 2 4 -2 5 9 -8 4]';
4  F = dftmtx(length(x));
5  X = F*x;
6  r = real(F);
7  a = angle(F);
8  figure;
9  subplot(211);
10 plot(r);
11 title('Real part of F');
12 ylabel('Amplitude of real');
13 xlabel('n');
14 subplot(212);
15 plot(a);
16 title('Imaginary part of F');
17 xlabel('n');
18 ylabel('Amplitude of imaginary');
19
20 figure;
21 subplot(211);
22 imagesc(r);
23 title('plot of real');
24 subplot(212);
25 imagesc(a);
26 title('plot of imaginary');

```

report4.m



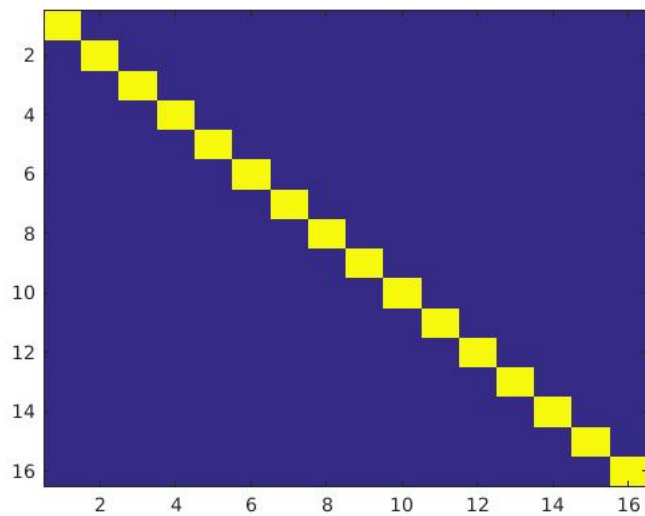
```

1  clc;
   clear all;
3  x = [1 1 4 -4 -3 2 5 -6 3 2 4 -2 5 9 -8 4]';
   F = dftmtx(length(x));
5  Fh = (1/length(x))*F';
   A = Fh*F;
7  figure;
   subplot(211);
9  plot(abs(A));
   subplot(212);
11 plot(angle(A));

13 figure;
   imagesc(abs(A));

```

report5.m



```

1 clc;
2 clear all;
X = loadImages('yalefaces');
4 Y = compMeanVec(X);
Z = reshape(Y,[60,80]);
6 imagesc(Z);
colormap gray

```

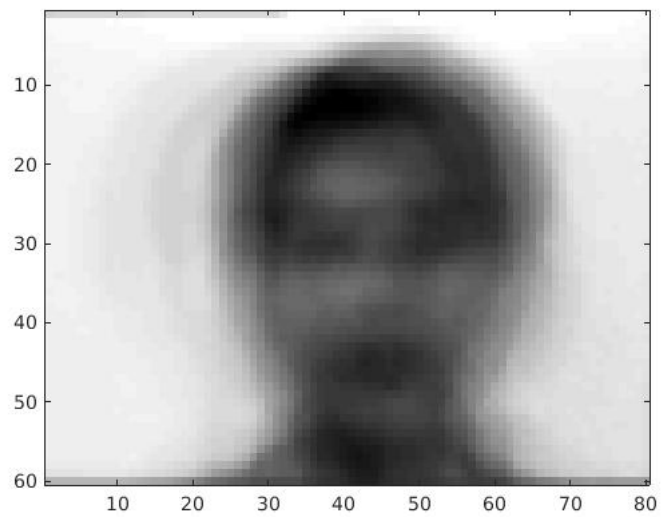
report6.m

```

1 function [ Y ] = compMeanVec( X )
3 sum = zeros(1,4800);
for i=1:165
5     sum = sum + X(i,:);
end
7 sum = sum/165;
Y = sum;
9 end

```

compMeanVec.m



```

clc;
clear all;
X= loadImages('yalefaces');
Y = compMeanVec(X);
X_hat = zeros(165,4800);
for i=1:165
    X_hat(i,:) = X(i,:) - Y;
end
R = (X_hat')*(X_hat);
[U,S,V] = svd(R);
s = svd(R);
figure;
s = s(1:100,1);
plot(s);
title('Plot of first 100 eigenvalues');

figure;
imagesc(reshape(U(1,:),[60,80]));
title('1st eigenvector');

figure;
imagesc(reshape(U(2,:),[60,80]));
title('2nd eigenvector');

figure;
imagesc(reshape(U(3,:),[60,80]));
title('3rd eigenvector');

figure;
imagesc(reshape(U(4,:),[60,80]));
title('4th eigenvector');

figure;
imagesc(reshape(U(50,:),[60,80]));
title('50th eigenvector');

figure;
imagesc(reshape(U(100,:),[60,80]));
title('100th eigenvector');

```

report7.m

