SVD_demo 10/8/2016 for ECE-S511

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Matlab solution of example on pg 6-7 of Week 4 Part A

define matrix

```
H  =[-1 2; 0 -1; 1 0]

HHT  = H*H'
HTH = H'*H


[R, D1]= eig(HHT)
R = R(:, [3 2 1])
D = D1;
D(1,1) = D1(3,3);
D(3,3) = D1(1,1);
D

[Q, D2]=eig(HTH)

Q = Q(:, [2 1])
DD = D2;
DD(1,1)  = D2(2,2);
DD(2,2) = D2(1,1);
DD
S = R'*H*Q


H =

    -1     2
     0    -1
     1     0


HHT =

     5    -2    -1
    -2     1     0
    -1     0     1


HTH =
```

```
     2    -2
    -2     5


R =

    0.4082   -0.0000   -0.9129
    0.8165    0.4472    0.3651
    0.4082   -0.8944    0.1826


D1 =

   -0.0000         0         0
         0    1.0000         0
         0         0    6.0000


R =

   -0.9129   -0.0000    0.4082
    0.3651    0.4472    0.8165
    0.1826   -0.8944    0.4082


D =

    6.0000         0         0
         0    1.0000         0
         0         0   -0.0000


Q =

   -0.8944   -0.4472
   -0.4472    0.8944


D2 =

     1     0
     0     6


Q =

   -0.4472   -0.8944
    0.8944   -0.4472


DD =

     6     0
     0     1
```

```
S =

   -2.4495         0
   -0.0000    1.0000
    0.0000   -0.0000
```

using Matlab

[U,S,V] = svd(X) produces a diagonal matrix S, of the same dimension as X and with nonnegative diagonal elements in decreasing order, and unitary matrices U and V so that X = U*S*V'.

```
           S = svd(X) returns a vector containing the singular values.
```

```
 [U,S,V] = svd(H)
```

```
U =

    0.9129   -0.0000    0.4082
   -0.3651    0.4472    0.8165
   -0.1826   -0.8944    0.4082
```

```
S =

    2.4495         0
         0    1.0000
         0         0
```

```
V =

   -0.4472   -0.8944
    0.8944   -0.4472
```

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