Mètode QR per a valors i vectors propis

Table of Contents

EXERCICI 7

Matriu Inicial

```
A=[1 2 1 2; 2 2 -1 1; 1 -1 1 1; 1 1 1 1];
```

1er. pas del mètode

[P,H] = hess(A) produces a Hessenberg matrix H and a unitary matrix P so that A = P*H*P' and P'*P = eye(size(A)).

```
[P,H]=hess(A)
V=P; h=H;
```

```
P =
    1.0000         0         0         0
         0   -0.8165    0.0000   -0.5774
         0   -0.4082   -0.7071    0.5774
         0   -0.4082    0.7071    0.5774
H =
    1.0000   -2.8577    0.7071    0.5774
   -2.4495    2.0000   -1.1547   -0.0000
         0   -1.1547    0.0000   -0.8165
         0         0   -0.8165    2.0000
```

2on. pas del mètode

Mètode QR de Francis per a obtenir vaps i veps de matrius

```
iteracions = 200; % Nombre màxim de iteracions %
format compact
for k=1:iteracions
    [Q,R] = qr(H);
        H = R*Q;
        V = V*Q;   % canvi de base és  V*H*V'
    error=norm(tril(H,-1),'inf');
    if (error < 0.0000005) break, end;
end
```

Valors propis

```
disp(' ')
disp(' valors propis ')
vaps = diag(H)
disp(' vectors propis ')
veps = V
disp(' matriu reduïda ')
H
```

```
 valors propis
vaps =
    4.4495
    2.3028
   -1.3028
   -0.4495
 vectors propis
veps =
   -0.6409    0.1927   -0.4944    0.5547
   -0.6409   -0.5252    0.5563   -0.0623
   -0.1176    0.7721    0.6089    0.1387
   -0.4057    0.3015   -0.2744   -0.8180
 matriu reduïda
H =
    4.4495   -0.1151   -0.0247    0.7493
    0.0000    2.3028    0.0962   -0.3249
         0   -0.0000   -1.3028    0.5566
         0         0   -0.0000   -0.4495
```

Matlab

```
[VV,S]=eig(A)
```

```
VV =
   -0.6409   -0.5017   -0.2859    0.1581
   -0.6409    0.5677   -0.2859   -0.5588
   -0.1176    0.5877   -0.5194    0.7647
   -0.4057   -0.2839    0.7528    0.2794
S =
    4.4495         0         0         0
         0   -1.3028         0         0
         0         0   -0.4495         0
         0         0         0    2.3028
```

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