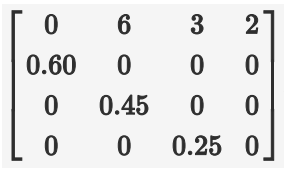
**Practical Assignment - IV**

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Ques. 1: Estimate the largest eigenvalue and the corresponding eigenvector for the matrix.



with an error tolerance 𝛜= 10 −10.

**Sol:**

**Program**

clc;

close all;

A = [ 0 6 3 2;

0.60 0 0 0;

0 0.45 0 0;

0 0 0.25 0];

e=eig(A);

u= [1;1;1;1];

n=length(u);

v=zeros(n,1);

eps=10^-10;

err=10;m1=1;m2=1;m3=1;

step = 1;

while err>eps

v=A\*u;

m2=max(abs(v));

sort(v,'descend');

m3=v(2,1);

ratio = m3/m2;

u=v/m2;

fprintf('\n step %5.9f',step);

disp('The corresponding eigenvector is:');

fprintf('\n %5.9f',u);

fprintf('\n ratio %5.9f',ratio);

err=abs(m1-m2);

m1=m2;

step = step+1;

end

fprintf('\n The greatest eigenvalue is %5.9f\n',m1);

disp('The corresponding eigenvector is:');

fprintf('\n %5.9f',u);

**Output :**

Ratio of λ2 \ λ1 for final iteration is : 0.298636717

The greatest eigenvalue is 2.009130042

The corresponding eigenvector is:

1.000000000

0.298636717

0.066887917

0.008322995

Eigenvalues found using Matlab:

>>>eig(A)

ans =

2.0091

-1.7857

-0.1117 + 0.1586i

-0.1117 - 0.1586i

Ques -2) Find largest eigenvalue of the matrix (given below) for eight significant digits



**Sol:**

**Program**

clc;

close all;

A = [10.995 -1.6348 1.2323 3.055;

2.2256 5.4029 1.3355 5.4342;

1.5794 1.1108 2.2963 -0.46759;

-3.7347 -2.447 -1.3122 -2.6939];

e=eig(A);

u= [1;1;1;1];

n=length(u);v=zeros(n,1);

eps=10^-8;

err=10;m1=1;m2=1;m3=1;

step = 1;

while err>eps v=A\*u;

m2=max(abs(v));

sort(v,'descend');

m3=v(2,1);

ratio = m3/m2;

u=v/m2;

fprintf('\n step %5.9f',step);

disp('The corresponding eigenvector is:');

fprintf('\n %5.9f',u);

fprintf('\n ratio %5.9f',ratio);

err=abs(m1-m2);

m1=m2;

step = step+1;

end

fprintf('\n The greatest eigenvalue is %5.9f\n',m1);

disp('The corresponding eigenvector is:');

fprintf('\n %5.9f',u);

**Output:**

Ratio of λ2 \ λ1 for final iteration is : 0.144900448

The greatest eigenvalue is 10.000372766

The corresponding eigenvector is:

1.000000000

0.144900448

0.247001993

-0.347667605

Eigenvalues found using Matlab:

>>>eig(A)

ans =

2.0091

-1.7857

-0.1117 + 0.1586i

-0.1117 - 0.1586i

**Note : Convergence Analysis**

Power Method is an iterative method used for finding eigenvalues. We assume that the matrix A has a dominant eigenvalue with corresponding dominant eigenvectors. Then we make an initial guess which must be a nonzero vector. Here, the initial guess is [1, 1, 1, 1]T for both the matrices. For obtaining the dominant eigenvalue in less iterations, the ratio between second largest and largest eigenvalue must be less than 1.

Here, |λ2| \ |λ1,| is coming less than 1 for both the matrices. So, for these matrices, less iterations are required and the method converges faster.