```matlab
function [s] = reverse(A,miu)
n=length(A);
x=diag(A);
y=zeros(n,1);y(2:n,1)=diag(A,1);
s=0;
q=x(1)-miu;
u=1e-10;
for k=1:n
    if q<0
        s=s+1;
    end
    if k<n
        if q==0
            q=abs(y(k+1))*u;
        end
        q=x(k+1)-miu-y(k+1)^2/q;
    end
end
end




function [lambda,a] = dichotomy(A,m)
l=-1*norm(A,inf);u=norm(A,inf);
kmax=1000;
for k=1:kmax
    r=(l+u)/2;
    if reverse(A,r)>=m
        l=l;
        u=r;
    else
        l=r;
        u=u;
    end
end
lambda=(l+u)/2;
a=Eigenvector(A,lambda,kmax);
end




function [v1]=Eigenvector(A,t,kmax)
n=length(A);
epsilon=1e-10;
[L,U,P]=lu(A-(t+epsilon)*eye(n));
z0=ones(n,1);
v1=utriangle(U,ltriangle(L,P*z0,n),n);
[x,i]=max(abs(v1));
x=v1(i);
x0=0;
v1=v1/x;
```

```matlab
k=1;
while k<kmax & abs(x0-x)>1e-5
    x0=x;
    z0=v1;
    v1=utriangle(U,ltriangle(L,P*z0,n),n);
    [x,i]=max(abs(v1));
    x=v1(i);
    v1=v1/x;
    k=k+1;
end
end


function [y] = utriangle(U,y,n)
for j=n:-1:2
    y(j)=y(j)/U(j,j);
    y(1:j-1)=y(1:j-1)-y(j)*U(1:j-1,j);
end
y(1)=y(1)/U(1,1);
end


function [b] = ltriangle(L,b,n)
for j=1:n-1
    b(j)=b(j)/L(j,j);
    b(j+1:n)=b(j+1:n)-b(j)*L(j+1:n,j);
end
b(n)=b(n)/L(n,n);
end


n=100;
A=diag(2*ones(1,n))+diag(-1*ones(1,n-1),-1)+diag(-1*ones(1,n-1),1);
[lambda_min,eigenvector_min]=dichotomy(A,1)
[lambda_max,eigenvector_max]=dichotomy(A,n)


lambda_min =

   9.6744e-04


eigenvector_min =

    0.0311
    0.0622
    0.0932
    0.1241
    0.1549
    0.1856
    0.2160
```

0.2463
0.2763
0.3061
0.3356
0.3647
0.3935
0.4219
0.4499
0.4774
0.5045
0.5312
0.5573
0.5828
0.6078
0.6322
0.6560
0.6792
0.7017
0.7235
0.7446
0.7650
0.7847
0.8036
0.8217
0.8391
0.8556
0.8713
0.8861
0.9001
0.9132
0.9255
0.9368
0.9473
0.9568
0.9654
0.9730
0.9797
0.9855
0.9903
0.9942
0.9971
0.9990
1.0000
1.0000
0.9990
0.9971
0.9942
0.9903
0.9855
0.9797
0.9730
0.9654
0.9568
0.9473

```
      0.9368
      0.9255
      0.9132
      0.9001
      0.8861
      0.8713
      0.8556
      0.8391
      0.8217
      0.8036
      0.7847
      0.7650
      0.7446
      0.7235
      0.7017
      0.6792
      0.6560
      0.6322
      0.6078
      0.5828
      0.5573
      0.5312
      0.5045
      0.4774
      0.4499
      0.4219
      0.3935
      0.3647
      0.3356
      0.3061
      0.2763
      0.2463
      0.2160
      0.1856
      0.1549
      0.1241
      0.0932
      0.0622
      0.0311


lambda_max =

      3.9990


eigenvector_max =

      0.0311
     -0.0622
      0.0932
     -0.1241
      0.1549
     -0.1856
```

```
 0.2160
-0.2463
 0.2763
-0.3061
 0.3356
-0.3647
 0.3935
-0.4219
 0.4499
-0.4774
 0.5045
-0.5312
 0.5573
-0.5828
 0.6078
-0.6322
 0.6560
-0.6792
 0.7017
-0.7235
 0.7446
-0.7650
 0.7847
-0.8036
 0.8217
-0.8391
 0.8556
-0.8713
 0.8861
-0.9001
 0.9132
-0.9255
 0.9368
-0.9473
 0.9568
-0.9654
 0.9730
-0.9797
 0.9855
-0.9903
 0.9942
-0.9971
 0.9990
-1.0000
 1.0000
-0.9990
 0.9971
-0.9942
 0.9903
-0.9855
 0.9797
-0.9730
 0.9654
-0.9568
```

```
    0.9473
   -0.9368
    0.9255
   -0.9132
    0.9001
   -0.8861
    0.8713
   -0.8556
    0.8391
   -0.8217
    0.8036
   -0.7847
    0.7650
   -0.7446
    0.7235
   -0.7017
    0.6792
   -0.6560
    0.6322
   -0.6078
    0.5828
   -0.5573
    0.5312
   -0.5045
    0.4774
   -0.4499
    0.4219
   -0.3935
    0.3647
   -0.3356
    0.3061
   -0.2763
    0.2463
   -0.2160
    0.1856
   -0.1549
    0.1241
   -0.0932
    0.0622
   -0.0311
```

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