Implemention of Power Method

http://www.mma.cs.tsukuba.ac.jp/~ueta/

```
n = 10;
res = 10^(-13);
A = [[1, 2, 0];
    [2, 1, 1];
    [0, 1, 0];]
```

```
A =
     1     2     0
     2     1     1
     0     1     0
```

```
[V, D] =eig(A)
```

```
V =
  -0.561818306918717   0.497279484740920  -0.661115197274115
   0.671761200140652  -0.192165093185681  -0.715408601392609
  -0.482801284170389  -0.846041187541566  -0.226091196172428

D =
  -1.391382380630900                   0                   0
                   0   0.227134442170690                   0
                   0                   0   3.164247938460211
```

```
eigen_value = diag(D);
norm(A*V(:,3)-eigen_value(3)*V(:,3))
```

```
ans =
     1.110223024625157e-16
```

```
x = [1; 0; 0]
```

```
x =
     1
     0
     0
```

```
ite = 0;
lambda = 0;

while res < abs(norm(A*x-lambda*x))
    y = A*x;
    ite = ite +1
    lambda = dot(y,y)/dot(y,x);
    x = y;
    x = x/norm(x)
    res_norm = abs(norm(A*x-lambda*x))
```

```
end
```

```
ite =
     1

x =
   0.447213595499958
   0.894427190999916
                   0

res_norm =
   2.828427124746191

ite =
     2

x =
   0.745355992499930
   0.596284793999944
   0.298142396999972

res_norm =
   0.839836557781919

ite =
     3

x =
   0.619047619047619
   0.761904761904762
   0.190476190476190

res_norm =
   0.336694909580850

ite =
     4

x =
   0.678631916538111
   0.693712625794513
   0.241291348102439

res_norm =
   0.145372020886073

ite =
     5

x =
   0.653203529178169
   0.724722163759720
   0.219323812716757

res_norm =
   0.063696663150091

ite =
     6

x =
   0.664553913654196
```

```
   0.711268587856645
   0.229052596089428

res_norm =
   0.027989467442741

ite =
     7

x =
   0.659595232148850
   0.717220519578460
   0.224786245179969

res_norm =
   0.012305888970368

ite =
     8

x =
   0.661782032968875
   0.714610209810374
   0.226664485251564

res_norm =
   0.005411003831464

ite =
     9

x =
   0.660821681176958
   0.715759350633475
   0.225839008293975

res_norm =
   0.002379313563076

ite =
    10

x =
   0.661244205046227
   0.715254308225001
   0.226202068642970

res_norm =
   0.001046230212682

ite =
    11

x =
   0.661058458968333
   0.715476435206590
   0.226042439578243

res_norm =
     4.600480247719943e-04

ite =
    12
```

```
x =
   0.661140144095045
   0.715378771213942
   0.226112634681066

res_norm =
     2.022922050997249e-04

ite =
    13

x =
   0.661104227251078
   0.715421717865449
   0.226081769095180

res_norm =
     8.895188159591882e-05

ite =
    14

x =
   0.661120020930356
   0.715402833733832
   0.226095341417397

res_norm =
     3.911390100190790e-05

ite =
    15

x =
   0.661113076201668
   0.715411137529516
   0.226089373420982

res_norm =
     1.719915560833934e-05

ite =
    16

x =
   0.661116129948624
   0.715407486199840
   0.226091997671258

res_norm =
     7.562808774623888e-06

ite =
    17

x =
   0.661114787158116
   0.715409091764295
   0.226090843737349

res_norm =
     3.325516546865122e-06
```

```
ite =
    18

x =
   0.661115377610116
   0.715408385766363
   0.226091351145063

res_norm =
     1.462295376505499e-06

ite =
    19

x =
   0.661115117976787
   0.715408696207710
   0.226091128027889

res_norm =
     6.430001892397156e-07

ite =
    20

x =
   0.661115232142713
   0.715408559700530
   0.226091226136928

res_norm =
     2.827398962012639e-07

ite =
    21

x =
   0.661115181941702
   0.715408619725440
   0.226091182996445

res_norm =
     1.243263227404002e-07

ite =
    22

x =
   0.661115204016079
   0.715408593331301
   0.226091201966168

res_norm =
     5.466874215555953e-08

ite =
    23

x =
   0.661115194309539
   0.715408604937326
   0.226091193624806
```

```
res_norm =
     2.403892666833943e-08

ite =
    24

x =
   0.661115198577697
   0.715408599833927
   0.226091197292668

res_norm =
     1.057039062903913e-08

ite =
    25

x =
   0.661115196700904
   0.715408602077992
   0.226091195679837

res_norm =
     4.648009708879816e-09

ite =
    26

x =
   0.661115197526167
   0.715408601091233
   0.226091196389030

res_norm =
     2.043822004924935e-09

ite =
    27

x =
   0.661115197163282
   0.715408601525130
   0.226091196077184

res_norm =
     8.987090915766717e-10

ite =
    28

x =
   0.661115197322850
   0.715408601334337
   0.226091196214309

res_norm =
     3.951800659097935e-10

ite =
    29

x =
```

```
   0.661115197252685
   0.715408601418232
   0.226091196154012

res_norm =
     1.737686157741644e-10

ite =
    30

x =
   0.661115197283538
   0.715408601381342
   0.226091196180526

res_norm =
     7.640938731201015e-11

ite =
    31

x =
   0.661115197269971
   0.715408601397563
   0.226091196168867

res_norm =
     3.359824408717163e-11

ite =
    32

x =
   0.661115197275936
   0.715408601390431
   0.226091196173994

res_norm =
     1.477345589305466e-11

ite =
    33

x =
   0.661115197273313
   0.715408601393567
   0.226091196171740

res_norm =
     6.496472404051631e-12

ite =
    34

x =
   0.661115197274467
   0.715408601392188
   0.226091196172731

res_norm =
     2.856626756529691e-12

ite =
```

```
    35

x =
   0.661115197273960
   0.715408601392794
   0.226091196172295

res_norm =
     1.256089201658019e-12

ite =
    36

x =
   0.661115197274183
   0.715408601392528
   0.226091196172487

res_norm =
     5.525428303380685e-13

ite =
    37

x =
   0.661115197274085
   0.715408601392645
   0.226091196172402

res_norm =
     2.429817381693062e-13

ite =
    38

x =
   0.661115197274128
   0.715408601392593
   0.226091196172440

res_norm =
     1.065296452094961e-13

ite =
    39

x =
   0.661115197274109
   0.715408601392616
   0.226091196172423

res_norm =
     4.678256405835606e-14
```

```
disp('residual norm')
```

```
residual norm
```

```
norm(norm(A*x-lambda*x))
```

```
ans =
     4.678256405835606e-14
```