Lab4 Report

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1   实验结果

1.1   A1

```
A1:
 1.000000  2.000000  3.000000  4.000000
 2.000000  5.000000  6.000000  7.000000
 3.000000  6.000000  8.000000  9.000000
 4.000000  7.000000  9.000000  10.000000
Begin Jacobi:
Iteration 0
nondiagonalsum: 390.000000
After iteration 0:
 1.000000  2.000000  -0.432302  3.268823
 2.000000  5.000000  -0.197682  5.347735
 -0.432302  -0.197682  -0.055385  0.000000
 3.268823  5.347735  0.000000  18.055385
Iteration 1
nondiagonalsum: 87.018869
After iteration 1:
 1.000000  0.783471  -0.432302  2.814590
 0.783471  3.089148  -0.186155  0.000000
 -0.432302  -0.186155  -0.055385  0.062638
 2.814590  0.000000  0.062638  19.966237
Iteration 2
nondiagonalsum: 17.522408
After iteration 2:
 0.591129  0.775332  -0.436816  0.000000
 0.775332  3.089148  -0.186155  -0.111461
 -0.436816  -0.186155  -0.055385  0.124784
 0.000000  -0.111461  0.124784  20.375108
Iteration 3
nondiagonalsum: 1.709194
After iteration 3:
 0.370049  0.000000  -0.369026  0.030564
 0.000000  3.310229  -0.077828  -0.115570
 -0.369026  -0.077828  -0.055385  0.124784
 0.030564  -0.115570  0.124784  20.375108
Iteration 4
nondiagonalsum: 0.344198
After iteration 4:
 0.583276  0.038937  0.000000  -0.035965
 0.038937  3.310229  -0.086868  -0.115570
 0.000000  -0.086868  -0.268613  0.126038
 -0.035965  -0.115570  0.126038  20.375108
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Iteration 5
nondiagonalsum: 0.079195
After iteration 5:
 0.583276   0.038937   0.000220   -0.035966
 0.038937   3.310229   -0.086160   -0.115042
 0.000220   -0.086160   -0.269382   0.000000
 -0.035966   -0.115042   0.000000   20.375877
Iteration 6
nondiagonalsum: 0.046936
After iteration 6:
 0.583276   0.038694   0.000220   -0.035704
 0.038694   3.309453   -0.086158   0.000000
 0.000220   -0.086158   -0.269382   -0.000581
 -0.035704   0.000000   -0.000581   20.376653
Iteration 7
nondiagonalsum: 0.020391
After iteration 7:
 0.583276   0.038677   -0.000711   -0.035704
 0.038677   3.311526   0.000000   0.000014
 -0.000711   0.000000   -0.271456   -0.000581
 -0.035704   0.000014   -0.000581   20.376653
Iteration 8
nondiagonalsum: 0.005543
After iteration 8:
 0.582728   0.000000   -0.000711   -0.035701
 0.000000   3.312074   0.000010   0.000520
 -0.000711   0.000010   -0.271456   -0.000581
 -0.035701   0.000520   -0.000581   20.376653
Iteration 9
nondiagonalsum: 0.002551
After iteration 9:
 0.582664   0.000001   -0.000712   0.000000
 0.000001   3.312074   0.000010   0.000520
 -0.000712   0.000010   -0.271456   -0.000582
 0.000000   0.000520   -0.000582   20.376717
Iteration 10
nondiagonalsum: 0.000002
After iteration 10:
 0.582664   0.000001   0.000000   0.000000
 0.000001   3.312074   0.000010   0.000520
 0.000000   0.000010   -0.271456   -0.000582
 0.000000   0.000520   -0.000582   20.376717
```

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Iteration 11
nondiagonalsum: 0.000001
After iteration 11:
 0.582664  0.000001  0.000000  0.000000
 0.000001  3.312074  0.000010  0.000520
 0.000000  0.000010  -0.271456  0.000000
 0.000000  0.000520  0.000000  20.376717
Iteration 12
nondiagonalsum: 0.000001
After iteration 12:
 0.582664  0.000001  0.000000  0.000000
 0.000001  3.312074  0.000010  0.000000
 0.000000  0.000010  -0.271456  -0.000000
 0.000000  0.000000  -0.000000  20.376717
Iteration 13
nondiagonalsum: 0.000000
After iteration 13:
 0.582664  0.000001  0.000000  0.000000
 0.000001  3.312074  0.000000  -0.000000
 0.000000  0.000000  -0.271456  -0.000000
 0.000000  -0.000000  -0.000000  20.376717
Iteration 14
nondiagonalsum: 0.000000
After iteration 14:
 0.582664  0.000000  0.000000  0.000000
 0.000000  3.312074  -0.000000  -0.000000
 0.000000  -0.000000  -0.271456  -0.000000
 0.000000  -0.000000  -0.000000  20.376717
End Jacobi
This is nondiagsum 0.000000
390.000000
87.018869
17.522408
1.709194
0.344198
0.079195
0.046936
0.020391
0.005543
0.002551
0.000002
0.000001
0.000001
0.000000
0.000000
This is eig value:
0.582664
3.312074
-0.271456
20.376717
check det(lamda I - A1):
```

```
check det(lamda I - A1):
0.000000
```

1.2   A2

```
A2:
 0.499200  0.604100  0.129400  0.369900
 0.276500  0.249600  0.246400  0.929000
 0.425200  0.146200  0.065900  0.114900
 0.907100  0.323700  0.883000  0.760600
Begin Jacobi:
Iteration 0
nondiagonalsum: 3.441386
After iteration 0:
 0.499200  -0.329917  0.129400  0.921444
 -0.329917  -0.458394  -0.339249  0.000000
 0.425200  -0.339249  0.065900  0.907932
 0.921444  0.000000  0.907932  1.468594
Iteration 1
nondiagonalsum: 3.992209
After iteration 1:
 -0.057251  -0.282415  -0.358580  0.000000
 -0.282415  -0.458394  -0.339249  0.145993
 -0.358580  -0.339249  0.065900  0.962574
 0.000000  0.145993  0.962574  2.025046
Iteration 2
nondiagonalsum: 2.542579
After iteration 2:
 -0.057251  -0.282415  -0.331882  0.125663
 -0.282415  -0.458394  -0.369268  0.274941
 -0.331882  -0.369268  -0.327885  0.000000
 0.125663  0.274941  0.000000  2.418830
Iteration 3
nondiagonalsum: 0.835294
After iteration 3:
 -0.057251  -0.429659  -0.530394  0.125663
 -0.429659  -0.768129  0.000000  0.210650
 -0.530394  0.000000  -0.018150  0.135373
 0.125663  0.210650  0.135373  2.418830
Iteration 4
nondiagonalsum: 1.088830
After iteration 4:
 -0.568455  -0.309360  0.000000  0.184422
 -0.309360  -0.768129  -0.214684  0.210650
 0.000000  -0.214684  0.493054  0.225452
 0.184422  0.210650  0.225452  2.418830
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Iteration 5
nondiagonalsum: 0.542013
After iteration 5:
 -0.343221  0.000000  0.126360  0.025106
  0.000000 -0.993362 -0.247932  0.155519
  0.126360 -0.247932  0.493054  0.225452
  0.025106  0.155519  0.225452  2.418830
Iteration 6
nondiagonalsum: 0.306165
After iteration 6:
 -0.343221  0.020255  0.127973  0.025106
  0.020255 -1.033626  0.000000  0.189648
  0.127973  0.000000  0.533317  0.252937
  0.025106  0.189648  0.252937  2.418830
Iteration 7
nondiagonalsum: 0.234723
After iteration 7:
 -0.343221  0.020255  0.123595  0.008739
  0.020255 -1.033626 -0.024784  0.191260
  0.123595 -0.024784  0.499976  0.000000
  0.008739  0.191260  0.000000  2.452172
Iteration 8
nondiagonalsum: 0.105914
After iteration 8:
 -0.343221  0.019748  0.123595  0.007647
  0.019748 -1.044089 -0.024747  0.000000
  0.123595 -0.024747  0.499976  0.001352
  0.007647  0.000000  0.001352  2.462634
Iteration 9
nondiagonalsum: 0.032677
After iteration 9:
 -0.360964  0.023064  0.000000  0.007378
  0.023064 -1.044089 -0.027774  0.000000
  0.000000 -0.027774  0.517719  0.000290
  0.007378  0.000000  0.000290  2.462634
Iteration 10
nondiagonalsum: 0.002716
After iteration 10:
 -0.360964  0.023060  0.000410  0.007378
  0.023060 -1.044583  0.000000  0.000005
  0.000410  0.000000  0.518213  0.000290
  0.007378  0.000005  0.000290  2.462634
Iteration 11
nondiagonalsum: 0.001173
After iteration 11:
 -0.360187  0.000000  0.000410  0.007374
  0.000000 -1.045360  0.000014  0.000253
  0.000410  0.000014  0.518213  0.000290
  0.007374  0.000253  0.000290  2.462634
```

```
Iteration 12
nondiagonalsum: 0.000109
After iteration 12:
 -0.360207  -0.000001  0.000409  0.000000
 -0.000001  -1.045360  0.000014  0.000253
 0.000409  0.000014  0.518213  0.000289
 0.000000  0.000253  0.000289  2.462654
Iteration 13
nondiagonalsum: 0.000001
After iteration 13:
 -0.360207  -0.000001  0.000000  -0.000000
 -0.000001  -1.045360  0.000014  0.000253
 0.000000  0.000014  0.518213  0.000289
 -0.000000  0.000253  0.000289  2.462654
Iteration 14
nondiagonalsum: 0.000000
After iteration 14:
 -0.360207  -0.000001  0.000000  -0.000000
 -0.000001  -1.045360  0.000014  0.000253
 0.000000  0.000014  0.518213  0.000000
 -0.000000  0.000253  0.000000  2.462654
Iteration 15
nondiagonalsum: 0.000000
After iteration 15:
 -0.360207  -0.000001  0.000000  -0.000000
 -0.000001  -1.045360  0.000014  0.000000
 0.000000  0.000014  0.518213  -0.000000
 -0.000000  0.000000  -0.000000  2.462654
Iteration 16
nondiagonalsum: 0.000000
After iteration 16:
 -0.360207  -0.000001  0.000000  -0.000000
 -0.000001  -1.045360  0.000000  0.000000
 0.000000  0.000000  0.518213  -0.000000
 -0.000000  0.000000  -0.000000  2.462654
End Jacobi
This is nondiagsum 0.000000
3.441386
3.992209
2.542579
0.835294
1.088830
0.542013
0.306165
0.234723
0.105914
0.032677
0.002716
0.001173
0.000109
0.000001
```

```
0.000000
0.000000
0.000000
This is eig value:
-0.360207
-1.045360
0.518213
2.462654
check det(lamda I - A2):
0.000000
```

2　结果分析

1. 矩阵初始值：图中 `Ai`

   迭代后的矩阵：图中 `After iteration iter`

   每次迭代后的非对角元素和：图中 `This is nondiagsum`

   计算得到的特征值：图中 `This is eig value`

2. 平方和：图中 `This is nondiagsum` 确实呈下降趋势

   特征值：图中 `check det(lamda I - A)` 在要求精度范围内为0，可认为即为A的特征值