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http://jan.ucc.nau.edu/∼ns46/362/362.html
Office: AMB 175
Hours: MW 10:10-12:10, F 10:10-11:10

Write a C++ program that implements the inverse power method for finding the smallest eigenvalue in absolute value and a corresponding eigenvector. At each iteration print the number of iterations, the approximate value of the eigenvalue and the corresponding eigenvector. Run your code with the given input files.

**Turn in:**

- This problem sheet with your name.
- A summary sheet explaining what you did, how you approached the problem, what was accomplished, what was not accomplished, etc.
- A list of the eigenvalue-eigenvector pairs and the number of required iterations for each input file. If a matrix is too large then include only the first 5 coordinates of the eigenvector.

**Website:**

- Create a directory called `11invpower` on your web site and make all your input, output and source files available in this directory. Write the url for the website on this problem sheet.

**Input:**

A square matrix.

**Output:**

The number of iterations, the approximate eigenvalue and the corresponding eigenvector.

**Sample input:**

```
-2 0
0 4
```

**Sample output:**

```
0 1 2 5
1 0.2 -0.2 0.25
2 4 0.4 0.25
3 2.5 -0.5 0.15625
4 -2 -0.5 -0.078125
5 -2 -0.5 0.0390625
6 -2 -0.5 -0.0195312
7 -2 -0.5 0.00976562
8 -2 -0.5 -0.00488281
9 -2 -0.5 0.00244141
10 -2 -0.5 -0.0012207
11 -2 -0.5 0.000610352
12 -2 -0.5 -0.000305176
13 -2 -0.5 0.000152588
14 -2 -0.5 -7.62939e-05
15 -2 -0.5 3.8147e-05
16 -2 -0.5 -1.90735e-05
17 -2 -0.5 9.53674e-06
18 -2 -0.5 -4.76837e-06
19 -2 -0.5 2.38419e-06
20 -2 -0.5 -1.19209e-06
21 -2 -0.5 5.96046e-07
22 -2 -0.5 -2.98023e-07
```

**Hints:**

- Stop the iterations if the norm of the change in the eigenvector is less then a tolerance of $10^{-6}$.
- Try to use the makefile I created for this project. It creates the required files automatically.
- Use an initial guess of $x = (x_0, \ldots, x_{n-1})$ where $x_i = (i + 1)^2 + 1$. A random number would work best here but this makes it easier to verify your output against my output.
- You can either use your linear system solver or you can write separate code to find the inverse of a matrix and then use the power method code on the inverse. Explain your approach in the summary sheet.