**Assignment#2:**

**Cy436**

In this assignment, I split test cases into 3 parts. First I detect input file is read correctly. Secondly, I check module by module, including addition test, product test, row permute, colomn permute, D matrix generate and so on. Finally, I try a small scale of system to solve for that. The results are all calculated manually before and then used to compare with the program result. In the second part, I just use that 5x5 matrix used in class and b is [1,0,0,0,0]. In the third parts, the equation I used is:

|  |  |  |
| --- | --- | --- |
| 1 |  |  |
|  | 2 | 0.1 |
| 0.1 |  | 5 |

And b =3, -3.9, 5.3 with corresponding X=3, -2, 1

As the result, the system finally converges and the result at 51th loop is 3, -1.894, 1.12 which I think is good enough.

On the other hand, when I am looking for the real result for our questions, I find it not converge.

***Output report: (detailed) a short summary report could be viewed as highlighted part.***

col: 17758, row: 17758, nonzero: 126150

MatrixA: rank=17758; nonzero=126150

MatrixD: rank=17758; nonzero=17758

MatrixL+U: rank=17758; nonzero=108392

addition test col 0 match

addition test col 1 match

addition test col 2 match

addition test col 3 match

addition test col 4 match

1.0 2.0 0.0 0.0 3.0

4.0 5.0 6.0 0.0 0.0

0.0 7.0 8.0 0.0 9.0

0.0 0.0 0.0 10.0 0.0

11.0 0.0 0.0 0.0 12.0

Diagonal matrix:

sparse matrix value is: 1.00; 5.00; 8.00; 10.00; 12.00; 0.00; 0.00; 0.00; 0.00; 0.00; 0.00; 0.00;

sparse matrix row pointer is: 0; 1; 2; 3; 4; 5;

sparse matrix indices is: 0; 1; 2; 3; 4; 0; 0; 0; 0; 0; 0; 0;

1.0 0.0 0.0 0.0 0.0

0.0 5.0 0.0 0.0 0.0

0.0 0.0 8.0 0.0 0.0

0.0 0.0 0.0 10.0 0.0

0.0 0.0 0.0 0.0 12.0

L+U matrix:

sparse matrix value is: 2.00; 3.00; 4.00; 6.00; 7.00; 9.00; 11.00; 0.00; 0.00; 0.00; 0.00; 0.00;

sparse matrix row pointer is: 0; 2; 4; 6; 6; 7;

sparse matrix indices is: 1; 4; 0; 2; 1; 4; 0; 0; 0; 0; 0; 0;

0.0 2.0 0.0 0.0 3.0

4.0 0.0 6.0 0.0 0.0

0.0 7.0 0.0 0.0 9.0

0.0 0.0 0.0 0.0 0.0

11.0 0.0 0.0 0.0 0.0

product test:

size match

b=

20.00

32.00

83.00

40.00

71.00

Product test value match

20.000000; 32.000000; 83.000000; 40.000000; 71.000000;

row permute test:

sparse matrix value is: 7.00; 8.00; 9.00; 4.00; 5.00; 6.00; 1.00; 2.00; 3.00; 10.00; 11.00; 12.00;

sparse matrix row pointer is: 0; 3; 6; 9; 10; 12;

sparse matrix indices is: 1; 2; 4; 0; 1; 2; 0; 1; 4; 3; 0; 4;

0.0 7.0 8.0 0.0 9.0

4.0 5.0 6.0 0.0 0.0

1.0 2.0 0.0 0.0 3.0

0.0 0.0 0.0 10.0 0.0

11.0 0.0 0.0 0.0 12.0

col permute test:

sparse matrix value is: 2.00; 1.00; 3.00; 6.00; 5.00; 4.00; 8.00; 7.00; 9.00; 10.00; 11.00; 12.00;

sparse matrix row pointer is: 0; 3; 6; 9; 10; 12;

sparse matrix indices is: 1; 2; 4; 0; 1; 2; 0; 1; 4; 3; 2; 4;

0.0 2.0 1.0 0.0 3.0

6.0 5.0 4.0 0.0 0.0

8.0 7.0 0.0 0.0 9.0

0.0 0.0 0.0 10.0 0.0

0.0 0.0 11.0 0.0 12.0

maximize diagonal test:

1.0 2.0 0.0 0.0 3.0

4.0 5.0 6.0 0.0 0.0

0.0 7.0 8.0 0.0 9.0

0.0 0.0 0.0 10.0 0.0

11.0 0.0 0.0 0.0 12.0

result:

12.0 0.0 0.0 0.0 11.0

0.0 10.0 0.0 0.0 0.0

9.0 0.0 8.0 7.0 0.0

0.0 0.0 6.0 5.0 4.0

3.0 0.0 0.0 2.0 1.0

corresponding Xcomp:

5.000000; 4.000000; 3.000000; 2.000000; 1.000000;

corresponding b:

0.000000; 0.000000; 0.000000; 0.000000; 1.000000;

test1 sparse transformation: pass

test2 Diagonal check : pass

test3 L+U check : pass

test4 product test : pass

test5 row permute test : pass

test6 col permute test : pass

test7 MaximizeDiagonal test: pass

epsilon=0.001936 at 0 step

epsilon=0.007792 at 1 step

epsilon=0.007843 at 2 step

epsilon=0.007843 at 3 step

epsilon=0.007843 at 4 step

…

epsilon=0.007843 at 46 step

epsilon=0.007843 at 47 step

epsilon=0.007843 at 48 step

epsilon=0.007843 at 49 step

epsilon=0.007843 at 50 step

Xresult:

3.000000; -1.894000; 1.120000;

b at 1 st:

epsilon=0.497620 at 0 step

epsilon=2.963757 at 1 step

epsilon=8.331680 at 2 step

epsilon=16.536586 at 3 step

epsilon=27.539496 at 4 step

epsilon=41.252104 at 5 step

…

epsilon=2359.230936 at 46 step

epsilon=2446.322528 at 47 step

epsilon=2534.580925 at 48 step

epsilon=2623.597856 at 49 step

epsilon=2713.731005 at 50 step

b at 1st result diverge

b at 2nd result diverge

b at 5th result diverge

b at 6th result diverge

b at 8th result diverge

b=1 in all result diverge