

Lab 07: Debugging & Good Coding Practices

Math 3341: Introduction to Scientific Computing Lab

Spring 2018

In this lab you will learn how to debug code and develop ways to make code more readable by employing good coding practices.

Your goal is to fix the issues in `lab07script.m` and `lab07fcn.m`. These files solve the linear system $A\mathbf{x} = \mathbf{b}$ given by

$$\begin{array}{rrrrrr} 4x_1 & + & 3x^2 & + & & = & 24 \\ 3x_1 & + & 4x_2 & + & x_3 & = & 30 \\ & - & x_2 & + & 4x_3 & = & -24 \end{array}$$

using the Gauss-Seidel method with Successive Over Relaxation (SOR). This method gives a means to speed up the convergence of our iterative method. The only change from the Gauss-Seidel method is the use of a parameter ω . Depending on the choice of this ω , the Gauss Seidel method can be performed in significantly less iterations than the original method. The iterative step in this method is now

$$x_i^{(k)} = (1 - \omega)x_i^{(k-1)} + \frac{\omega}{a_{ii}} \left[b_i - \sum_{j=1}^{i-1} a_{ij}x_j^{(k)} - \sum_{j=i+1}^n a_{ij}x_j^{(k-1)} \right]$$

These code files are riddled with various errors. Your task is to look through the code and correct all of the issues you encounter. Methods for doing this efficiently will be explained in the lab.

Note that the necessary corrections may involve any of the following:

- changing variable names
- fixing indexing
- suppressing output
- adding proper indentation
- adding comments
- removing redundant code.

The output for your corrected files should look like that on the following page. You will submit your script file, function file, and output file via the LaTeX report posted on WyoCourses.

Lab 07 Output

lab07script.soln

SOR Gauss–Seidel Method

iter	x	y	z	res
0	0.00000	0.00000	0.00000	45.29901
1	7.50000	4.68750	−6.03516	22.83778
2	1.23047	5.54810	−4.25743	3.02202
3	1.99104	5.41313	−4.74404	0.57995
4	1.92743	5.33456	−4.64694	0.33727
5	2.01699	5.32857	−4.67309	0.06144
6	2.00022	5.33238	−4.66536	0.00800
7	2.00084	5.33346	−4.66696	0.00464
8	1.99968	5.33342	−4.66657	0.00117
9	2.00000	5.33334	−4.66669	0.00012
10	1.99999	5.33333	−4.66666	0.00006
11	2.00001	5.33333	−4.66667	0.00002
12	2.00000	5.33333	−4.66667	0.00000
13	2.00000	5.33333	−4.66667	0.00000
14	2.00000	5.33333	−4.66667	0.00000
15	2.00000	5.33333	−4.66667	0.00000
16	2.00000	5.33333	−4.66667	0.00000
17	2.00000	5.33333	−4.66667	0.00000

Solution of System:

x1 = 2.00000

x2 = 5.33333

x3 = −4.66667

found in 17 iterations

diary off