

NUMERICAL ANALYSIS

MATLAB Practicals (Autumn 2020)

B.E. III Semester

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EXPERIMENT- 5

1. Solve this system of equations by Gauss-Seidel starting with the initial vector [0,0,0] and tolerance 10^{-3} :

$$\begin{aligned}4.63x_1 - 1.21x_2 + 3.22x_3 &= 2.22 \\ -3.07x_1 + 5.48x_2 + 2.11x_3 &= -3.17 \\ 1.26x_1 + 3.11x_2 + 4.57x_3 &= 5.11.\end{aligned}$$

Sol 1:

```
SOR.m x Siedel.m x +
1 - A=[4.63,-1.21,3.22;-3.07,5.48,2.11;1.26,3.11,4.57];
2 - B=[2.22;-3.17;5.11];
3 - n=max(size(A));
4 - x0=[0;0;0];
5 - x=x0;
6 - k=1;
7 - e=input("Enter the Tolerance");
8 - err=[0.1;0.1;0.1];
9 - while norm(err,inf)>=e
10 -     for i = 1:1:n
11 -         temp1=0; temp2=0;
12 -         for m = 1:i-1
13 -             temp1 = temp1 + A(i,m)*x(m,:);
14 -         end
15 -         for a = i+1:n
16 -             temp2 = temp2 + A(i,a)*x0(a,:);
17 -         end
18 -         x(i,:)= (B(i,:)-temp1-temp2)/A(i,i);
19 -         err=abs(x(i)-x0(i));
20 -         x0=x;
21 -         k=k+1;
22 -     end
23 - end
24 - fprintf("The Solution is\n");
25 - disp(x);
26 - fprintf("Iteration is : %d",k);
```

```
>> Siedel
```

```
Enter the Tolerance
```

```
0.001
```

```
The Solution is
```

```
-8.9807
```

```
-9.4762
```

```
10.0430
```

```
Iteration is : 196
```

2. Use the SOR method with $\omega = 1.2$ to solve the linear system with an initial vector $[0,0,0,0]$ a tolerance 10^{-3} in the $\| \cdot \|_{\infty}$ norm.

$$4x_1 + x_2 - x_3 + x_4 = -2$$

$$x_1 + 4x_2 - x_3 - x_4 = -1$$

$$-x_1 - x_2 + 5x_3 + x_4 = 0$$

$$x_1 - x_2 + x_3 + 3x_4 = 1$$

Sol 2:

```
SOR.m x Siedel.m x +
1 - A=[4,1,-1,1;1,4,-1,-1;-1,-1,5,1;1,-1,1,3];
2 - B=[-2;-1;0;1];
3 - n=max(size(A));
4 - x0=[0;0;0;0];
5 - x=x0;
6 - k=1;
7 - e=input("Enter the Tolerance");
8 - w=input("Enter the Quantam");
9 - err=[0.1;0.1;0.1;0.1];
10 - while norm(err,inf)>=e
11 -     for i = 1:1:n
12 -         temp1 =0; temp2=0;
13 -         for m = 1:i-1
14 -             temp1 = temp1 + A(i,m)*x(m,:);
15 -         end
16 -         for a = i+1:n
17 -             temp2 = temp2 + A(i,a)*x0(a,:);
18 -         end
19 -         x(i,:)= (1-w)*x0(i,:)+(w*(B(i,:)-temp1-temp2))/A(i,i);
20 -         err=abs(x(i)-x0(i));
21 -         x0=x;
22 -         k=k+1;
23 -     end
24 - end
25 - fprintf("The Solution is\n");
26 - disp(x);
27 - fprintf("Iteration is : %d",k);

>> SOR
Enter the Tolerance
0.001
Enter the Quantam
1.2
The Solution is
-0.7540
0.0404
-0.2808
0.6918

Iteration is : 21
```