Numerical Analysis Day 5

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September 25th 2012

We will be looking at the system of equations with solution $(x, y) = (1, 2)$.

$$3x + y = 5 \qquad\qquad x + 2y = 5 \tag{1}$$

1 Jacobi Method

We solve the first equation for x and the second for y

$$x_1 = \frac{5 - y_0}{3} \qquad\qquad y_1 = \frac{5 - x_0}{2} \tag{2}$$

x_0	y_0	x_1	y_1
0	0		

2 Gauss-Seidel

We drop the subscripts: at each stage, we use the most recently computed value of x or y.

$$x = \frac{5 - y}{3} \qquad\qquad y = \frac{5 - x}{2} \tag{3}$$

x	y	
0	0	x=
	0	y=
		x=
		y=

3 Successive Over-Relaxation (SOR)

Use Gauss-Seidel, but modify the equations to overshoot.

Let $\omega = 1.1$

$$x = (1-\omega)x + \omega\frac{5-y}{3} \qquad\qquad y = (1-\omega) + \omega\frac{5-x}{2} \tag{4}$$

x	y	
0	0	x=
	0	y=
		x=
		y=

4 Exam Topics

Floating Point and rounding errors.

Finding roots: Bisection, Newton, and Secant Method.

Strengths and weaknesses of each method.

Systems of Equations: Gaussian Elimination, LU Form, Iterative Methods.

Interpolation: Lagrange and Newton's Divided Differences

Error measures and Chebyshev Polynomials.