Applied Numerical Computing for Scientists and Engineers

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Lecture 14

This lecture focuses on parameter estimation with more advanced examples in MATLAB

1. Outline

- Parameter estimation example 1
- Parameter estimation example 2

2. Parameter Estimation Example 1

For data in Table 1, use MATLAB to estimate parameters b_1 and b_2 in a model involving one ODE

$$\frac{dx}{dt} = b_1 - b_2 x \tag{1}$$

with initial condition x(0) = 0;

Table 1: Data for parameter estimation Example 1

time, t	Position, x
0	0
0.5	0.5
1	1.2
5	2.5
30	2.7

Table 2: Data for parameter estimation Example 2

time, t	Position 1, x_1	Position 2, x_2
0.5	99	2
1	98	4
5	50	35
20	3	7

3. Parameter Estimation Example 2

For data in Table 2, use MATLAB to estimate parameters b_1 and b_2 in a model involving two ODEs

$$\frac{dx_1}{dt} = -b_1 x_1 x_2 \tag{2}$$

$$\frac{dx_2}{dt} = b_1 x_1 x_2 - b_2 x_2 \tag{3}$$

with initial conditions $x_1(0) = 100$ and $x_2(0) = 1$.