CSS 455 Winter 2012 C. Jackels

Activity Answer No. 8 February 11, 2012

In this setup you have three data points (x_1,y_1), (x_2,y_2), and (x_3,y_3), which are known. They may have been measured or taken from a table, for example. Your goal is to interpolate them with the cubic polynomial

$$p(x_i) = y_i = a + bx_i + cx_i^2$$

$$p(x_1) = y_1 = a + bx_1 + cx_1^2$$

$$p(x_2) = y_2 = a + bx_2 + cx_2^2$$

$$p(x_3) = y_3 = a + bx_3 + cx_3^2$$

Assume we will use the methods of linear systems of equations to solve these equations. That is we will cast this in the form: **Az=b.**

a) How many equations are there (rows of **A**)? And, how many unknowns (cols of **A**)?
three rows and three columns.

b) What are the unknowns? Are the equations linear in these unknowns? Write the **z** vector in terms of these unknowns.

the three unknowns: a,b,c. the equations are linear. $\mathbf{z} = \begin{pmatrix} a \\ b \\ c \end{pmatrix}$

c) What is the right hand side or **b** vector? Write **b** in terms of the constant terms in the three equations.

$$\mathbf{b} = \begin{pmatrix} y_1 \\ y_2 \\ y_3 \end{pmatrix}$$

d) Create the **A** matrix. Remember, each row must contain those factors that multiply the unknowns in the **z** vector. The elements of **A** can be complex, but must be known for each equation prior to solving the system. *Write the matrix row by row in terms of the parameters of the problem:*

$$\mathbf{A} = \begin{pmatrix} 1 & x_1 & x_1^2 \\ 1 & x_2 & x_2^2 \\ 1 & x_3 & x_3^2 \end{pmatrix}$$

See reverse side