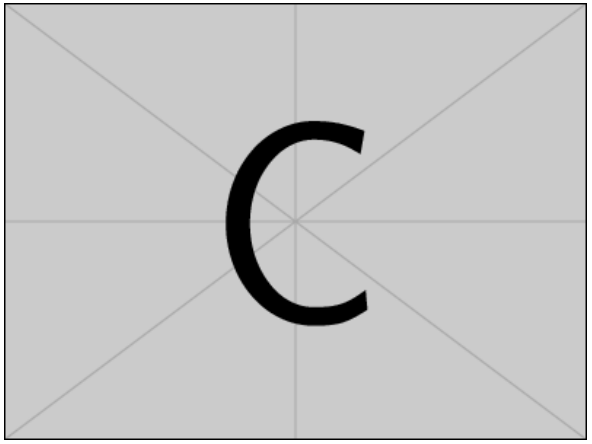
CEE384

Interpolation

Interpolation of discrete datasets



Arizona State University

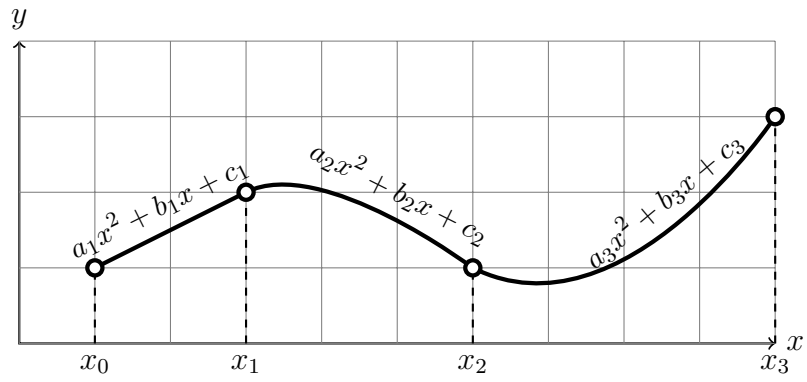
Brian Badahdah

Updated: October 11, 2018

Contents

1 Quadratic Splines

A *quadratic spline* is a set of piecewise quadratic functions which intersect all points in a dataset. There are three conditions that mathematically govern these functions. The first condition is that the functions must be *continuous*. The second condition is that the functions must be *smooth*, meaning that the derivatives are continous.



1.1 Continuous Functions

The spline equations should be continuous and go through all the points in the dataset. This means that the

$$f(x) = \begin{cases} a_1x^2 + b_1x + c_1 & x_0 < x < x_1 \\ a_2x^2 + b_2x + c_2 & x_1 < x < x_2 \\ a_3x^2 + b_3x + c_3 & x_2 < x < x_3 \end{cases} \tag{1}$$

1.2 Smooth Functions

Pseudocode

1. Define dataset or take dataset as input if programmed as a stand alone function
2. Initialize **A** as a matrix of zeros (3n,3n)
3. Loop through number of points and use continuous function information
   (a) Set values for first equation
4. Loop through number of points and use continuous derivatives information
   (a) Use interior points