Gegenbauer Post Processing

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Fourier Series: A Brief Recap

A function can be approximated using a series of trigonometric or exponential sums.

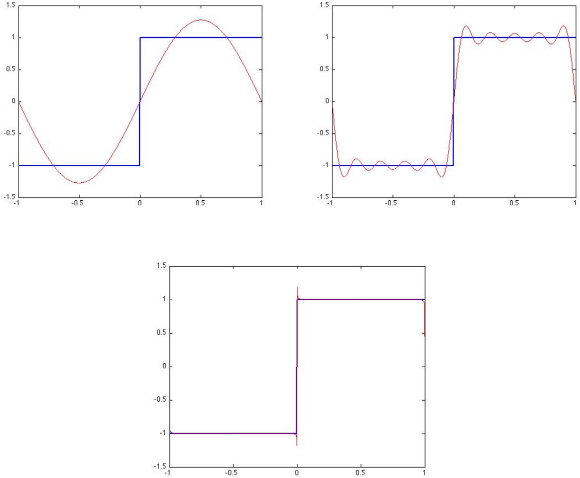
$$F(x) = 4/\pi \sum_{j=odd}^{\infty} 1/j sin(j\pi x) \tag{1}$$

$$F(x) = \sum_{-N}^{N} f(x) e^{i(k\pi x)} \tag{2}$$

As more terms are used, the approximation gets better.

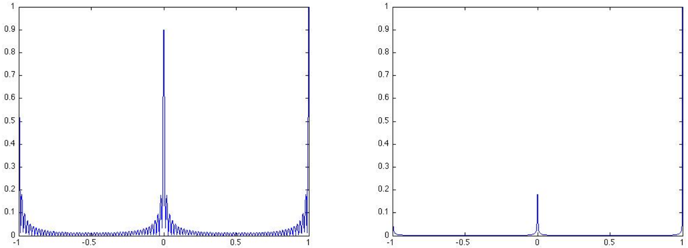
Fourier Series: A Brief Recap

Approximation of the Step Function



Fourier Series: A Brief Recap

Error



Fourier Series: A Brief Recap

At the bounds of the function there remains a discontinuity no matter how many terms are used.
This discontinuity is known as the Gibbs Phenomenon.

Post Processing

Resolving the Gibbs Phenomenon using Post Processing
What's the point?

- Better Approximations
- Extracting More Data
- Optimizing Amount of Coefficients Used

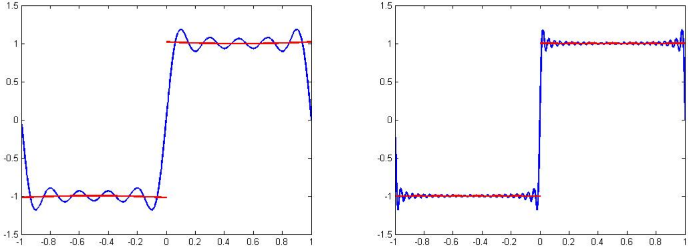
Gegenbauer Code

How the Code Works

- Part 1: Number of terms and points used
- Part 2: The Fourier approximation of the function
- Part 3: Computing the Gegenbauer Polynomials and creating the approximation

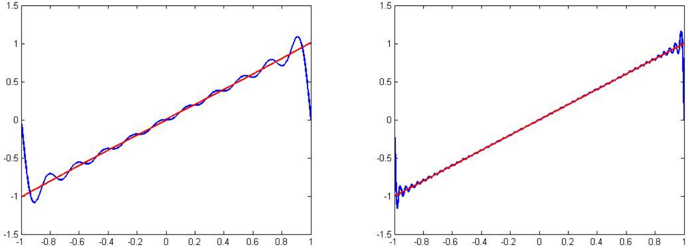
Gegenbauer Results

Approximation of the Step Function



Gegenbauer Results

Approximation of the Sawtooth Function



Conclusions

Where to go from here.

- Radial Basis Functions