Gibbs phenomenon

Michael La Barbera

June 2025

1) The power spectrum of the sampled waveform has potentially infinitely many frequencies since the waveform is a combination of many cosine waveforms. The shape of the graph that models the given sample output must be a complicated waveform of cosine, similar to the sample data but with a tight sinusoidal action at the top of the range of the graph.

2) To interpolate the data well, if the DC is 1/2, this will minimize error between the sample data and the FFT.

3) We observe via the FFT that there are only cosine waveforms. Generally speaking, since this step function is symmetric about a vertical axis, it would make sense to use an even function to represent the sample data, as they are also symmetric functions about a vertical axis (setting the midpoint of the sampled data to be $t = 0$).