

6 Signal Processing

6.1 Introduction

6.2 Generating Signals

6.3 Linear Time Invariant Systems

is not invertible. Since this system yields equal responses for different input signals, such as $y=4$ for input signal $x=-2$ and $x=+2$, the input signal x cannot be reconstructed from the output signal y .

6.4 Convolution, Deconvolution, and Filtering

6.5 Comparing Functions for Filtering Data Series

This command simply shifts the output signal by $(m-1)/2$ toward the lower end of the t -axis and then fills the data to the end with zeros.

6.6 Recursive and Nonrecursive Filters

6.7 Impulse Response

Furthermore, the values of the output signal y_6 equal the filter weights of b_6 . In our example, these values are 0.2 for all elements of b_6 and y_6 .

The stem plot of the input signal x_7 and the output signal y_7 shows an interesting impulse response:

6.8 Frequency Response

Furthermore, since the magnitude response is the absolute value of the complex frequency response h , its real part takes on negative values and lies between ~ 0.09082 and ~ 0.1816 , between ~ 0.2725 and ~ 0.3633 , and between ~ 0.4546 and the Nyquist frequency.

6.9 Filter Design

The function `freqz` returns the complex frequency response h of the digital filter b_{12} .

Such a filter requires a higher order, that is, it needs a larger number of filter weights a_{13} and b_{13} .

6.10 Adaptive Filtering

where `kron` returns the Kronecker tensor product of y_{n1} and y_{n1}' (which is a matrix formed by taking all possible products between the elements of y_{n1} and y_{n1}') and `eig` returns the eigenvalue of k .

```
[h,w] = freqz(w,1,1024);
```

Recommended Reading

Kalman R, Bucy R (1961) New Results in Linear Filtering and Prediction Theory. ASME
Trans. Ser. D J. Basic Eng. 83:95–107

Figure Captions