Time Series Analysis
Fall 2019
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MA(1)-process

\[ Y(t) = e(t) - 0.8e(t - 1); \text{ (a) realisation, (b) covf. func., (c) scatter-plot and (d) spectral density.} \]

MA(2)-process

\[ Y(t) = e(t) + e(t - 1) + 0.6e(t - 2). \]

AR(1)-process

\[ Y(t) = 0.8Y(t - 1) + e(t); \text{ (a) realisation, (b) covf. func., (c) scatter-plot and (d) spectral density.} \]
AR(1)-process $Y(t) = -0.8Y(t-1) + e(t)$; (a) realisation, (b) covf. func., (c) scatter-plot and (d) spectral density.

AR(2)-process $Y(t) = 1.13Y(t-1) - 0.64Y(t-2) + e(t)$; (a) realisation, (b) covf. func., (c) scatter-plot and (d) spectral density.

MA(4)-process

95% confidence interval
Finite length effects

\[ P(\omega) = 1/2 \pi P(\omega) * W_B(\omega) \]

\[ f_f = (0:P-1)/P - 0.5; \]
\[ X = \text{fftshift}( \text{abs}( \text{fft}(x,P)^2 )); \]
\[ \text{plot}(f_f, X) \]

Finite length effects

Mainlobe
Sidelobes

Medical ultrasound

B-mode image
Blood velocity estimate

Estimating the velocity of blood is a spectral estimation problem
Medical ultrasound

Use every emission

Need about 40% of emissions to form the B-mode image

This week

We will cover
• Stochastic processes. Identification.
• Reading instructions: Ch. 3, 4.1-4.2
• Problems: 3.5-3.10, 3.12-3.15