

ECE 732 Homework 9

Suppose that we observe a stationary process of the form

$$y(n) = \sum_{i=1}^p \alpha_i e^{j(2\pi f_i n + \phi_i)} + u(n),$$

where $\{\alpha_i, f_i\}$ are unknown deterministic parameters, $\{\phi_i\}$ are iid random variables uniformly distributed on $[0, 2\pi]$, and $\{u(n)\}$ is a stationary Gaussian process generated by

$$u(n) = \sum_{k=0}^{\infty} h(k)w(n-k),$$

where $\{w(n)\}$ is a Gaussian white noise of power σ^2 .

Propose a scheme for spectral estimation in this scenario. Test your scheme by generating realizations $\{y(n)\}$ in Matlab (choose your favorite values for parameters $\{p, \alpha_i, f_i, h(n), \sigma^2\}$) and forming estimates of the underlying power spectral density.