EE631: Detection and Estimation

Midterm Exam

Date: 10/15/2012 Time: 5:00-6:30 pm

Problem 1: (40)

Given the following hypothesis testing problem:

$$H_0\colon\ R = N - S$$

$$H_1\colon\ R = N + S$$

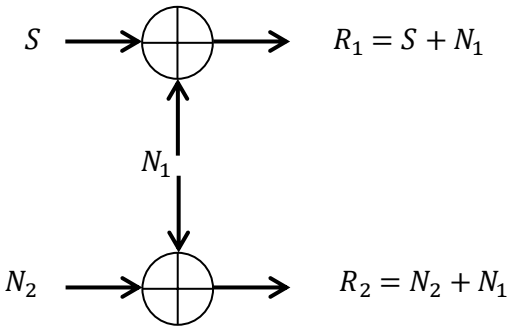
Assume equal a priori probabilities, unitary cost, $S > 0$ and $N \sim P_N(N) = \frac{1}{\pi(1+N^2)}$. Find the Likelihood Ratio Test and sufficient statistics on R.

Problem 2: (60)

Consider the following hypothesis testing problem:

$$H_k\colon\ S = a_k + \omega\ , \quad \text{for } k = 0,1$$

Where $\omega \sim N(0, \sigma_\omega^2)$, and $a_k's$ are constants. The following measurements are made



Where $N_1 \sim N(0, \sigma_1^2)$; $N_2 \sim N(0, \sigma_2^2)$ and ω, N_1, N_2 are independent random variables.

Construct the Likelihood Ratio Test for this problem.