Chapter 9

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The Matched Filter

- For a given choice of $s_1(t)$ and $s_2(t)$, we wish to determine an $H(f)$ that maximizes;
- The problem is to find to maximise μ=$g_o(T)$
- $\zeta = (s_{02}(T) - s_{01}(T))/\sigma_0$
- We can equally consider the maximization of ; $\zeta^2 = g_0^2(T)/\sigma_0^2$
- Since the input noise is stationary, $E(n_0^2(t)) = N_0^2(T) = N_0/2 * \int_{-\infty}^{+\infty} |H(f)|^2 df$
- For maximising this equation with respect to $H(f)$, we use the Schwarz's inequality is a generalization of the inequality.
- $|A * B| = |A * B * cos(\theta)| < |A| * |B|$, where A and B are
- After the following the assumptions , we will get the $h_0(t)$=$g(T - t)$-$s_1(T - t)$

Error Probability for the Matched-Filter Receiver

- $P_E = Q(\mu/2)$, where μ has the maximum value.
- We can use the Parseval's theorem , we can write μ^2 in terms of $g(t) = s_2(t) - s_1(t)$ as
- $\mu^2 = (2/N_o) * (\int_{-\infty}^{+\infty} (s_2(t) * s_1(t))^2 dt$
- We have assumed that s_1 and s_2 were assumed real and we know that s_1 and s_2 are the energies for E_1 and E_2 so than we define; $\rho_{12} = 1/(\sqrt{E_1, E_2}) * \int_{-\infty}^{+\infty} (s_2(t) * s_1(t))^2 dt$
- We know that $s_1(t)$ and $s_2(t)$ are correlation coefficients of $s_1(t)$ and $s_2(t)$ and it is normalized such that $-1 < \rho_1 2 < 1$