CARLETON UNIVERSITY
Department of Systems and Computer Engineering

94.566 **Introduction to Mobile Communications** **Winter 2000**

Professor Halim Yanıkömeroğlu

Given: Friday, March 24, 2000 **Assignment 5** Due: Tuesday, April 4, 2000

Question 1: Error Performance in the Presence of ISI

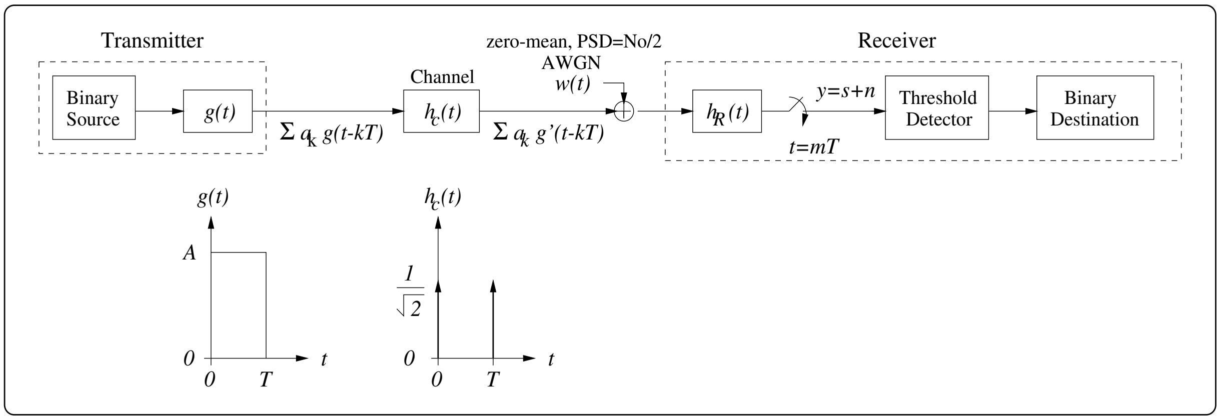

Figure 1: An equivalent baseband binary communication system through a wireless channel that introduces intersymbol interference

An equivalent baseband binary NRZ scheme is shown in Fig. 1. The information bits are equally-likely. The rectangular pulses used at the transmitter, $g(t)$, and the channel impulse response, $h_c(t)$, are also shown in Fig. 1.

(a) Find and sketch the probability of error if the receiver is unaware of the intersymbol interference (ISI) introduced by the channel and therefore it consists of a filter matched to the transmitted pulse; that is, $h_R(t) = g(T-t)$. Compare this error performance with that of an ideal channel with $h_c(t) = \delta(t)$.

(b) Find and sketch the probability of error if the receiver filter is matched to the received pulse g'(t). Compare this error performance with that of an ideal channel with $h_c(t) = \delta(t)$.

Question 2: Linear Equalization

Consider the equivalent baseband binary communication scheme depicted in Fig. 1 once again. Assume that a 3-tap zero-forcing equalizer is inserted after the sampler.

(a) Compute the coefficients of the equalizer for the case where $h_R(t)$ is matched to $g(t)$. Calculate the probability of error after equalization.

(b) This time, compute the coefficients of the equalizer for the case where $h_R(t)$ is matched to $g'(t)$. Once again, calculate the probability of error after equalization, and compare the result with that obtained in part (a).

Questions 3 & 4: Antenna Diversity

Questions 6.7 and 6.10 from the textbook (Rappaport).

Note: Question 6.11 from the textbook is also an interesting one. However, it seems that there are some mistypes in its wording. I may assign this question as well (as a bonus question) after correcting the mistypes next week.