EE-553 Stochastic Signals

Class Schedule: Tuesdays and Thursdays 12:30-13:45
Classroom: E423 Office: 403F

Office Hours: Mondays & Wednesdays: 13:10-14:45; Tuesdays 17:00-18:00

Text: Probability and Random Processes for Electrical Engineers by Leon-Garcia

Addison-Wesley 1994, 2nd Edition

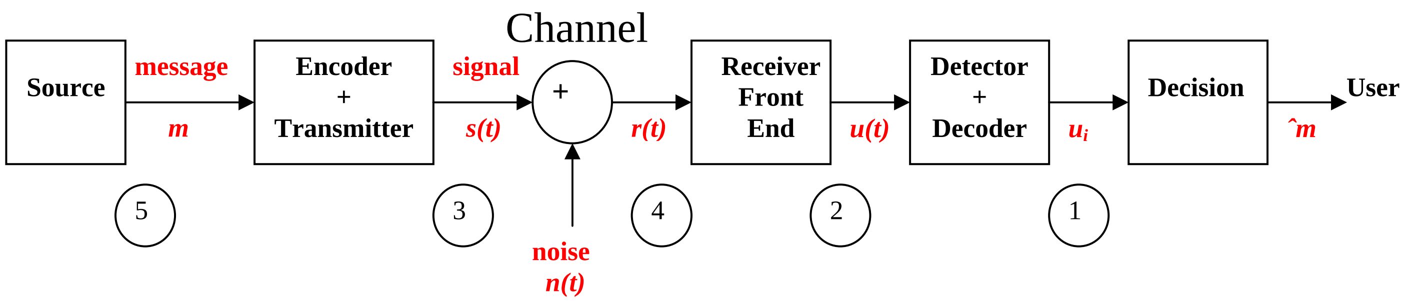
Reference: Probability and Stochastic Processes by Papoulis, McGraw-Hill 2nd Edition

Outline: Closely follow text – Chapters 1-7 with some outside examples
Time permitting, limited coverage Chapters 8-9

Performance Evaluation: (Temporary until Grader situation is finalized.)

1. 2 Midterms (Dates and Percentages will be decided in class by consensus.)
2. Final (40% if no TA; 35% if there is a TA to grade the assignments)
3. Homeworks. (If there is a TA for the course, percentage will be decided in class by consensus.)

INTRODUCTION AND APPROACH TO RELIABLE COMMUNICATION SYSTEMS



1 Probabilistic methods in making decisions about the transmitted/received message (Is $m = \hat{m}$?) (EE553).

5 m : {m_i ; i = 1,2,3,…} messages are generally finite but they could be very large. Soure Coding (EE652).

$\hat{m} : \{\hat{m}_j ;\ j = 1,2,3,\cdots\}$: reconstructed message.

In reliable communication systems $m = \hat{m}$ usually (very often)!!!

2 Detection Theory and Decoders (EE653).

3 Signal Theory (EE650, EE558). Electrical signals transmitted thru a medium of transmission (channel) usually corrputed by an additive noise n(t) to form a received signal

4 $r(t) = s(t) + n(t)$ (*)

Most common model for channel (*) is additive White gaussian Noise (AWGN) model. (EE650, EE558)

Signals: $s(t) = \{s_i(t);\ i = 1,2,3,\cdots\}$ for every message symbol m_i we generate a signal $s_i(t)$ and it is encoded for reliable communication thru a given channel.

$n(t) =$
- White or bandlimited Gaussian Noise
- Impulse noise, shot noise

$r(t) = \{r_j(t);\ j = 1,2,3,\cdots\}$ noisy received signals. They may even be lost or added in the channel.

$u(t) = \{u_j(t);\ j = 1,2,3,\cdots\}$ detected and decoded signal, and finally

$\hat{m} = \{\hat{m}_j(t);\ j = 1,2,3,\cdots\}$ reconstructed message.

Task: Transmit '*m*' as a message symbol to represent a random behavior of the source (more unknown Source is more to communicate!!!) and receive $\hat{m}$. Hopefully without error and $m_i = \hat{m}_j$.

Ex: Binary Symmetric Channel:

Input Output ε : Error in the channel