

Introduction to Error Control Coding and Channel Coding Theorem

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October 7, 2010



Outline

- 1 Introduction
- 2 Problem Statement
- 3 Framework of Communication System
- 4 Shannon Limit
- 5 Historical Milestones
- 6 Outline of the Course



Introduction

- Digital communication part of live.
- Shannon's landmark paper (1948).
- An era of error control coding.
- Close-to-bound error correcting codes.
- Turbo codes, low-density parity-check codes.



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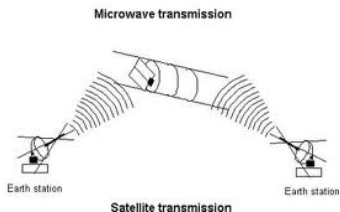
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Problem statement

- What is channel?
- What is substitution error?
- What is the aim?



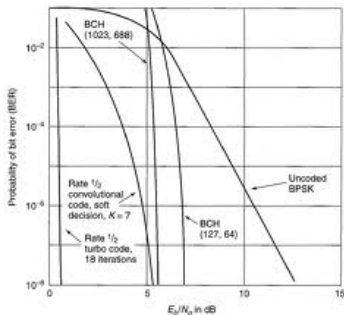
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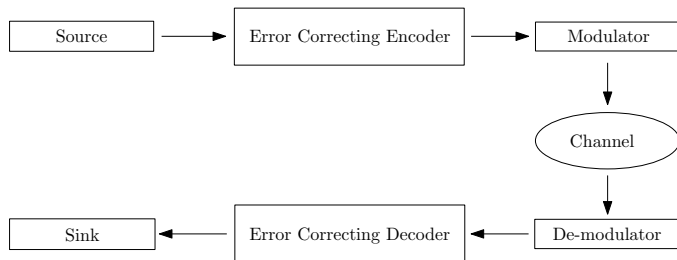


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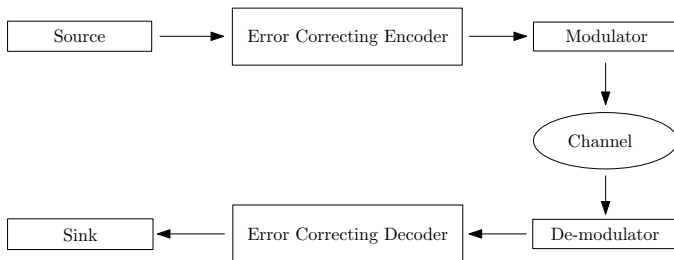
A Simple Communication Model



- Source coding and modulation coding.
- Image, computer data, voice etc.
- ARQ/FEC



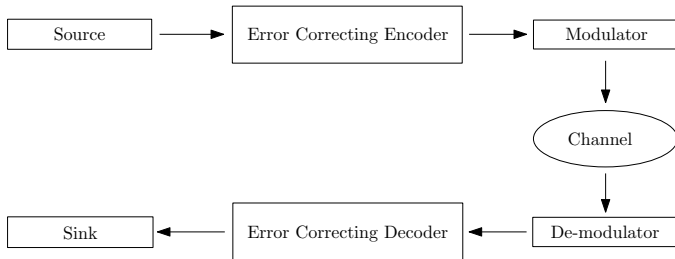
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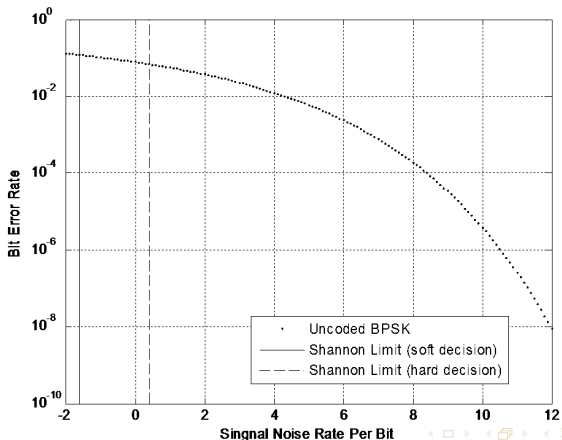


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Shannon Limit

$$C = B \log_2 \left(1 + \frac{S}{N} \right) \text{bits/sec,}$$



Milestones

- Channel Coding Theorem (1948).
- Hamming Codes (1950).
- Convolutional Codes (1955).
- Cyclic Codes (1957)
- BCH, Reed-Solomon Codes and Decoding Algorithm (1960)
- LDPC Codes (1962)
- 2400 bps modem commercially available
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