20SK – Signals and Codes

Lecture 9 – Prefix-free codes, optimal coding (2013/11/26)

Topics discussed:

- Linear Gaussian channel model
- Error correction, channel capacity, channel capacity for a band-limited AWGN channel
- Important classes of signal sources (continuous, discrete-time and quantized, digital)
- Formal definition of a code
- Fixed-length codes for discrete sources
- Variable-length codes for discrete sources
- Unique decodability
- The Kraft inequality for prefix-free codes
- Optimal prefix-free codes, Huffmann coding

The relevant literature is [1, chapter 2], [2, chapter 2] and [3, section 1.2]. Huffmann coding, arithmetic coding and Lempel-Ziv algorithms are also described in Wikipedia.

Resources

[1] Gallager, R.: Course materials for 6.450 *Principles of Digital Communications I*, Fall 2006. MIT OpenCourseWare (http://ocw.mit.edu/), Massachusetts Institute of Technology.

[2] Adámek, J: *Foundations of Coding: Theory and Applications of Error-Correcting Codes with an Introduction to Cryptography and Information Theory*. Wiley Interscience, 1991, 352 pp.

[3] Seibt, P.: Algorithmic Information Theory – Mathematics of Digital Information Processing. Springer, 2006, 447 pp.