

20SK – Signals and Codes

Lecture 9 – Prefix-free codes, optimal coding

Topics discussed:

- 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, Huffman coding
- Lempel-Ziv compression, LZ77 and LZ78

The relevant literature is [1, chapter 2], [2, chapter 2] and [3, section 1.2]. Huffman 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.