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Theoretisches Aufgabenblatt 6

Abgabetermin: 01.12.-03.12.2012

1. Hammming-Distance
   a) Suppose, there are two codes consisting only of two code words each:
      i. $1111111111_{[2]}$ und $1111100000_{[2]}$
      ii. $4711_{[16]}$ und $4812_{[16]}$

      Infer the Hamming-Distance of both the code words of each code. What can be stated regarding error correction as well as error detection? If you suppose a Hamming-Code how many data and parity bits are used in each code?
   b) What Hamming-Distance does all code words of a (63,57)-Hamming-Code have? How many valid code words does this code have?
2. Hamming-Code
   a) Encode the value $0101\ 0101_{[2]}$ as (7,4)-Hamming-Code word!
   b) Suppose the following code word of a 1 bit error correcting (7,4,even) Hamming-Code. The bold marked bits are the parity bits:

      011**1**0**10**

      Is this code word valid. If not what correct the error!.
3. Encode „TECHNISCHE INFORMATIK“ with a Huffman-Code. Compare the needed bits with a plain ASCII encoding!
4. Transform the number $728_{[10]}$ given in the decimal system into the binary, octal and hexadecimal system.
5. Transform the number $1010111_{[2]}$ from the binary to the decimal system. Use a polynom of the form:

   $$d_{dec} = a_0 \cdot 2^0 + a_1 \cdot 2^1 + a_2 \cdot 2^2 + a_3 \cdot 2^3 + a_4 \cdot 2^4 + \cdots$$

   and the Horner-Scheme

   $$d_{dec} = a_0 + 2 \cdot (a_1 + 2 \cdot (a_2 + 2 \cdot (a_3 + \cdots))).$$

   How many operations(mulitplications, additions) are necessary for each individual conversion?