Technische Hochschule Rosenheim

Computer Science Fundamentals WS 2021/22

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Please solve the following exercises at home prior to the tutorial

Excercise 1

Given is the following image consisting of the colour values 1, 2, 3, 4, and 5. The individual pixels are stored row-wise.

1	1	1	2	1	1	1	1
1	1	2	2	2	1	1	1
1	1	2	3	2	1	1	1
1	1	1	3	1	1	1	1
1	1	4	4	4	1	1	5
1	1	4	4	4	1	5	5
1	1	4	4	5	5	5	5
5	5	5	1	1	1	5	5

a) Determine the occurrence probabilities for the different colour values in the shown image.
b) Give a minimum length binary code with constant word length and calculate the size (in bit) for the encoded image.
c) Create an optimal code of variable word length using Huffman. What is the size of the Huffman-encoded image in bits?
d) Define an efficient (block) code for run-length encoding.
   How many bits does it take to store the image if:
   - first the block code from b) is applied and then the run-length encoding from d)?
   - first the Huffman-code from c) is applied and then the run-length encoding from d)?

Excercise 2

Encode the word PAPAYA using arithmetic coding. Decode the resulting code word for self-checking. The symbols in the necessary table should be arranged in alphabetical order.

The following exercises will be done during the tutorial

Exercise 3

Encode the word PAPAYA using LZW compression. For self-checking, decode the result. Initialise the code-table using single characters in their appearance order in the word.