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Semester: 2

Group: 1

Section: 1

COMPUTER PROGRAMMING LABORATORY

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1. Task topic

Assignment 3

Compression. Write a program that compresses a file using the Huffman method.(In your C projects you need to use those elements of the language:printf and scanf function to communicate with the user (via console), structural elements like loops, if statements etc., a structure or a union,functions, pointers and dynamic memory allocation (malloc).

2. Project analysis

Huffman coding is one of the compression methods. It was developed by David Huffman in the early of 50s. The algorithm task is to encode a file into shorter encoded one, without loosing any data. The algorithm is based on a binary-tree frequency sorting method(frequency of occurrence of the data is in byte). The most frequent for example letter(or any other data item) will be represented and encoded with a lower number of bits. „The original representation has 8 bytes(64 bits) and the new representation have only 9 bits, that is **86% smaller** than the original." - that is why is very efficient and popular method to compress a file nowadays.

3. External specification

The program is intended to compress the file using Huffman's method. Right after the program is put in motion the user sees the console. The user has three options to choose by writing one of the letters: c-to compress a file, d-to decompress a file, t-to terminate a program. After selecting the operation user wants to be done(if it is not „t" to abandon the whole program), program asks the user to give to it the input file name and output file name. If there is a problem with opening the file user gave, program will inform about it by printing „Couldn't open the file".

4. Internal specification

The source code of the program starts with the created structure *node_of_a_huffman_tree*, which represents a node of a Huffman tree. The next one is function *int compare_node*, which task is to compare two nodes of a Huffman tree(thanks to this function we can refer to the number of occurrences of the, for instance particular letter in our document, that we want to compress).Then function *char read_bit* makes an appearance. This function reads one bit from file using char as a buffer. After that there is a function void coding_master, which assigns a code to each node in Huffman tree. Function *void write_bit* writes one bit to file using char as buffer. The next functions *void write_tree* and *node_of_a_huffman_tree* read_tree* are recurrent ones. *Void write_tree* is writing a tree to a file, while *node_of_a_huffman_tree* read_tree* is reading the tree from a file. Function *void destroy_tree* deallocates all memory(mode determinates if destroying the leaves is needed). In the int main we start by using seek function to set the file cursor to a specific

position-the beginning. Then there is built a menu for a user(to protect the program from bugs, we give the user option to write in the capital letters as well as small letters).

5. Source code

A source code with comments is enclosed.

6. Testing

Screenshoots are enclosed