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Systems Programming
Assignment 1: File Compressor

Overview:

Our fileCompressor program will, based on command line arguments, either descend through a directory structure and compute a Huffman Code across all of the files it finds and write that codebook as a file, or it will build a Huffman Code book for a specified singular file. Our program also has an option to compress or decompress all or one file(s) in a directory structure given an already built codebook. The files our code operates on are files that contains words such as .txt files. Our code takes in different number of arguments depending on what the user would like to do. At most our program can take in 5 arguments and it at least requires 3 arguments. Using these arguments and flags our program can either build a Huffman codebook, decompress a file using Huffman codebook, or compress a file using Huffman codebook. Our decompress method takes in two file descriptors and a Huffman codebook as inputs and it writes out to a new file. The first file descriptor is used as the file to decompress and the second file descriptor defines which file that the method decompress should write out to. Our compress method works similarly to decompress because the inputs are the same. It uses two file descriptors, the first file descriptor points to a decompressed file and the second file descriptor is used to write out the compressed contents of the first file over to the output file. Finally, we have our build method. Our build method uses the AVL tree data structure which is then translated into a Huffman tree and encoded. This tree is then used in our build method to create the Huffman code book.

How to Use Program:
To use this code, user must understand the proper format of the arguments on the terminal and the compile step that comes first.

- First: Compile the source code.
    - Compiling the source code is easy for this program, all you have to do is make sure the terminal's current directory contains the file "fileCompressor.c". once this condition is met, simply use the make command on the terminal and the Makefile will automatically compile the source code.
- You can then run the program.
    - To run the program, you must follow the proper format.
        - ~./fileCompressor.c -b path/file
        - ~./fileCompressor.c -c path/file |codebook|
        - ~./fileCompressor.c -d path/file |codebook|
        - ~./fileCompressor.c -R -c path/file |codebook|
        - ~./fileCompressor.c -R -d path/file |codebook|
        - ~./fileCompressor.c -R -b path/file

Notes:

- the program will not run the "-c" or "-d" flags if the codebook argument is not present because the program can't compress or decompress without a codebook as reference.
- The program does not need the codebook argument for "-b" flag because the "-b" creates the codebook.
- The flag "-R" will recursively implement the following flag which can be one of "-b", "-c", or "-d" and implement that command/flag to all the files within the path/file location.