

# Assignment 6: WRITEUP.pdf

Katrina VanArsdale

March 12, 2023

## 1 Description

This program provides an encode program and a decode program. The encode program performs LZ78 compression on a given file while the decode program performs LZ78 decompression.

## 2 Lessons learned and Thoughts

While working on this assignment I learned a lot about Tries and structures. I have a better understanding of how I should be allocating memory and how arrays work within structures. What we did for the Game of Life was pretty similar in terms of structures but with some differences that I had to better understand. I had a little trouble with the difference between the `trie_node_create` function and the `trie_create` function. At first, I basically had the same code for each and then called `node_create` in `trie_create` to make the `EMPTY_CODE` root but then I was having memory leaks. Then I realized that I shouldn't be allocating memory for another trie in `trie_create` and I could just call `trie_node_create` with `EMPTY_CODE`.

When I was trying to get `encode` to work I had a problem with it writing way too many lines. I realized I should've had a global variable for my buffer indexes so I implemented that and replaced the original static variables I had within functions. Then I had to use the global index in `flush_pairs` and `flush_words` because what was going on was that it was writing the whole block into the outfile. I also had a problem with the `read_bytes` buffer when using `stdin` because in this case `read()` isn't able to read it all at once so it gets called over and over again. But when it reads into the buffer it starts from 0 every time it's called so it was overriding the bytes already in the buffer. To fix this I added the total bytes read to the buffer when reading in a loop.

I had a problem with `write_pair` because when I tried to encode big files after encoding 4KB it would start encoding incorrectly. When looking at the hexdump of the outfile the outputs gradually contained more 'f's. At first, I thought it was a problem with doing '% 8' on the index of the buffer because code can be 16 bits so I changed the 8's to 16's but that caused more problems so I undid it. Then I realized that because the way `write_pair` works is with an `or` statement in the buffer so it was checking for 1s or 0s and I wasn't setting the buffer to 0 after filling it so there were leftover 1s which caused the new codes to be set to 1 when they should be 0. Once I figured that out all I had to do was use `memset` to set the whole buffer to 0 once it was filled.

Another issue I ran into was trying to get the statistics correct for `encode` and `decode`. Originally I just added to the total bits and syms wherever I saw either involved but I was getting incorrect stats. For `encode`, it was a pretty easy fix because the stats for the compressed file kept coming out as less than they should be. I realized I wasn't counting the bits from the header so I fixed that and it worked! But then with `decode` the uncompressed file size was sometimes more than it should be and other times it was more than it should be. Originally I was adding to total syms inside `read_pair` but then I took a closer look at what `decode` was calling and decided to add to total syms in `write_word` instead and that fixed it.

## 3 Conclusion

Overall, I have learned a lot about buffers and how to use them through trial and error and I have a better picture of how structures like Tries work. Understanding how the functions all worked together took a while but it was

especially important during the debugging phase to figure out where the problems were coming from. Throughout this class, I've gotten a lot more comfortable figuring out the problems in my code and looking through all my resources to get where I need to be. The assignment docs, google, lectures, and discord have all been incredibly helpful with my understanding of the code and pointing me in the right direction.