CSE 13S: Assignment 4 Write-Up

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1 Introduction

Completing this particular assignment proved to be quite a challenging task for me, despite being referred to as one of the "easy assignments". Despite the daunting descriptions from the TAs and professors about the likelihood of running into segmentation faults, I was surprised that I didn't encounter as many of these errors as I anticipated. Although, I must admit that I was bracing myself for what could have potentially been a nightmarish experience.

Thankfully, I found the task to be mostly bearable as each function in universe.c was relatively straightforward to develop. However, the main function in life.c presented a greater challenge. This was due to the fact that the success of this particular assignment hinged heavily on the proper functioning of Conway's Game of Life, which was reliant on the main function.

This is a deviation from previous assignments where the main function was mainly responsible for piecing everything together. In those assignments, the individual files were much more self-contained and could be developed independently of the main function.

2 ncurses

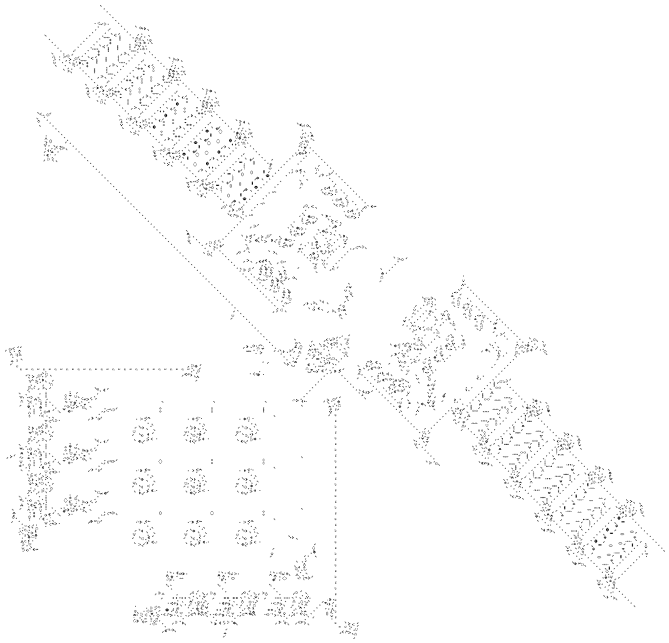
To be completely honest, I still don't understand much about ncurses. Going to discussion section and office hours really saved me for the assignment and without them, I would have no idea how to implement ncurses. Although it was one of the smallest parts of the assignment, I probably spent the most amount of time relative to how much physical code was written. For the parts I didn't understand, looking at the ncurses section in the pdf helped a lot. I don't really know what they're doing, just that putting several functions in a specific order allowed the program to print onto the terminal and cleared it, allowing regular terminal functions to resume.

3 The Game of Life

John Conway was a prominent British mathematician who was active in the theory of finite groups, knot theory, number theory, combinatorial game theory, and coding theory. He also made many contributions to recreational mathematics where he made his most notable one lay: The Game of Life. Conway first conceived this idea in 1970 to observe how something so complex such as life can evolve from a simple initial state. The concept builds upon ideas first put forth by the famous Hungarian Physicist and Mathematician John von Neumann. Conway's game involves a two-dimensional grid in which each square cell interacts with its neighbors according to a simple set of rules:

1. Any live cell with two or three live neighbors survives.
2. Any dead cell with exactly three live neighbors becomes a live cell.
3. All other cells die, either due to loneliness or overcrowding.

Over successive generations, these simple rules – in conjunction with the initial state – can give rise to surprisingly complex states. Since The Game of Life is a zero-player game, one needs only to interact with the game to set its initial state; once the game begins, it requires no further input and the player can simply observe how it evolves through generations. Interestingly enough, Conway's Game of Life is also Turing Complete since a Universal Turing Machine can be built from a pattern that acts like a finite-state machine connected to two counters.



Example of a Turing Machine implemented in The Game of Life

Our goal was to implement Conway's Game of Life with a minimum of two files – universe.c and life.c. The former containing various functions which is called from a main function implemented in life.c; however, like the previous assignment, life.c can include various functions not directly mentioned in the asgn4.pdf which we deem necessary to the function of our program. Additionally, we'll be constructing our first abstract data type (ADT) in this assignment with an abstract called universe which is described in the universe.h file. The various functions in universe.c are described in further detail in the Universe section directly below.

4 Reflection

As always, I learned a little more about various programming things during this assignment. I'm getting a better grasp of makefiles and how to implement them. This was the first time since Assignment 1 where I had an issue with my Makefile. This was due to the ncurse library we had to include and minor stuff I forgot to replace since I carry over the previous Makefile instead of making a new one from scratch (why break something that works?). After the troubleshooting, I better understand how the Makefile links various libraries and files together and how it helps compile files now.

Furthermore, I have cursory knowledge of how abstract data structures work and how to implement them. I'm still unsure about many things and decided not to mess with them too much since everything seemed to be breaking during this assignment. Although thankfully, not too many segmentation faults. Overall, a great learning experience and I hope that in the future, I can come back to this assignment and see the ways I can improve upon it as a measure of how much I've improved since then, when this was so challenging.

5 Sources

- The C Programming Language
- Several functions in universe.c were provided by TA John Yu and subsequently used in their original form or altered to various extents.
- Many Stack Overflow posts were used to help debug and/or to gain inspiration.
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