

Design Document of Assignment 4
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The purpose of the assignment is to implement a Universe ADT in `universe.c`, and a main function to complete the implementation of the Game of Life in `life.c`

`universe.c`

`universe.h` already declared a structure and contains multiple data types. It is better than using an array because a structure may contain many different data types, allowing more possibilities, gather up many related variable in a single group.

`uv"underscore"delete` deletes a universe, which will use dynamic memory allocations, it frees all memory allocated to that universe because not doing so will result in a memory leak – C does not collect garbage. Used `free()` function and for loop to free all memory allocated to the universe.

`uv"underscore"rows` returns how many rows are in the universe specified. Will be using accessor functions since `typedef` is used to create opaque data types. it is really simple, passing the number of rows to a variable and return it.

`uv"underscore"cols` returns how many columns are in the universe specified. Just like `uv"underscore"rows`.

`uv"underscore"live"underscore"cell` takes 3 arguments, Universe and row and column. It marks the specific cell alive based on the 3 arguments provided. True is live, False is dead. By turning that element's value to TRUE, it is that simple.

`uv"underscore"dead"underscore"cell` marks the specific cell dead, just like `uvlivecell`.

`uv"underscore"get"underscore"cell` returns the status of the cell. If out of bound then return false. Pseudocode in Python: "if r "bigger than" len(rows) or c "bigger than" len(cols): return False else: return `grid[r][c]`".

`uv"underscore"populate` takes in an argument that is a file path. returns false if universe is successfully populated, and returns error message if not. Pseudocode in Python:

`i=0, value=0, X=0, Y=0`

for char in file:

while char != EOF:

```

if i%modulus==0: X=value
else: Y=value
if i%modulus==2:
if X >= rows or Y >= cols :
return false
else : grid[X][Y] = TRUE;

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uv underscore census loops the 8 elements around that element and get their status. Used a switch case here. It returns how many elements are alive.

uv underscore print I used a for loop inside a for loop here to print out the elements according to i and j, which are coordinates. If user specified -o outfile, then it does not print the final results after the animation has finished. fprintf is used here to print characters to the file.

life.c Basically like the previous assignment, it is a menu embedded with functions that call other basic functions in universe.c, to accomplish the assignment's aim. like Lrefresh creates the command-line animation using mvprintw, and like in the previous assignment, getopt is used here to make the command line parameter input happen. The main function consists of the commandline parameter input part and other essential parts to accomplish the animation, final output, conditions to be considered, and calling functions in universe.c to create the universe and filling it up with elements.

Works Cited: assignment instruction file provided by professor.