

WRITEUP

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1 Program description

This program simulates The Game of Life which is a non-player game. In other words, users/players only need to specify the input and determine if the grid is flat or a torus and then just wait for the result.

2 what I learned

1. **opacity:** I learned how to use typedef to hide the implementation details from the user, which means the user can access only the functions or methods provided by the implementation and cannot access the data members directly. This will help protect private member data.
2. **macro:** Since it is very frequent to check if the index is inside the bound, and this is a simple function, I just wrote a define to substitute repeated codes.

```
define INBOUND(x,y,row,col)(x>=0&& x<row&& y>=0&& y<col)
```

3. **file operation:** I learned how to read and write files in C. In addition, I also know stdin and stdout are also predefined file pointers. And fgets is better than fscanf because fscanf is subject to buffer overflows. Besides, I spent an afternoon to figure out the importance of " " here if I want to use !feof(infile) to check if the file is at the end.

```
sscanf(buffer, "%* SCNu16 " "%* SCNu16 " " ", &x, &y)
```

3 ncurses

Here is the code I use ncurses library:

```
void display(Universe *u){  
    uint32_t rows = uv_rows(u);  
    uint32_t cols = uv_cols(u);
```

```

    curs_set(FALSE);
    for (uint32_t i = 0; i < rows; ++i)
    {
        for (uint32_t j = 0; j < cols; ++j)
        {
            if (uv_get_cell(u, i, j))
            {
                mvprintw(i, j, "o");
            }
        }
    }
    refresh();
    usleep(DELAY);
    clear();
}

```

Outside the loop of each generation, I will use `initscr()` initiate the terminal and use `endwin()` to close the window. In the display function, I refresh till the loop ends, so we can see the whole grid. `curs_set(FALSE)` makes the cursor invisible. I will clear the terminal at the end.

4 compiling and linking

Compiling converts the source code into object files which are machine code, they are executable yet though. Linking combines the compiled machine code files and libraries such as `ncurses` into an executable.

An simple example from this assignment is that, we don't need to include `lncurses` when we are compiling `*.c` to `*.o`, but we need `lncurses` when we generate the executable.

5 understanding of Conway's Game of Life

Conway's Game of Life is a cellular automaton simulation that takes places in a 2 dimensional grid. The next generation depends on the current state and all the cells change simultaneously. Each cell will die or survive depending on their neighbors. It's very surprising that simple rules can result in complex patterns. Depending on the initial state, some die out fast but some last very long.