Introduction to Scientific and Engineering Computation (C)

Assignment 1

Objective: To simulate a character navigating through a maze to locate the treasure room.

Assignment: Write a C program that will satisfy the following criteria to simulate the game.

- The initial letter of your name will represent the character in the game, and the character will always be located in the center of the room.
- The rooms are square-shaped and in each iteration, the dimensions of the next room will be obtained from the user. Since the rooms are square, the user will input the length of a single wall, which should be an odd number and must be greater than or equal to 5 unit. The program will not proceed to next step until a valid wall length is inputted.
- The walls of the rooms will be represented by the '#' character except for the treasure room, which will be represented by the '$' character.
- At the start of the program, the number of steps needed to reach the treasure room will be randomly determined. The quickest path to the treasure is in the 4th step, while the longest path takes 8 steps. The selection of the treasure room will be randomly done based on these criteria.

  The assignment comprises three progressive stages. These stages and the sample program outputs are presented below.

1. (50 points) During the initial stage, the user is prompted to input the wall length of the next room. Upon transitioning to the next room, only that room is displayed on the screen according to the entered wall length.

```
Please enter next room wall size (the wall size can not be less than 5 and should be an odd number): 3
Please enter next room wall size (the wall size can not be less than 5 and should be an odd number): 8
Please enter next room wall size (the wall size can not be less than 5 and should be an odd number): 11
###########
#         #
#         #
#         #
#         #
#    M    #
#         #
#         #
#         #
#         #
#         #
###########
```

Figure 1: Valid input control.

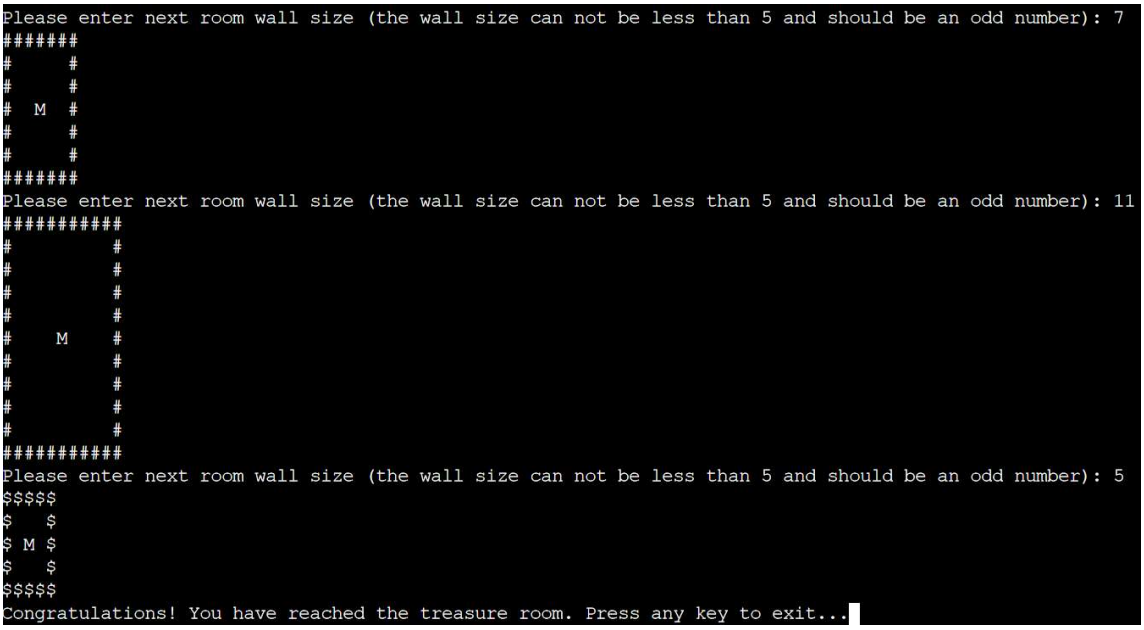

Figure 2: Example run of program.

2. (20 points) In the second stage, the user is prompted to input the wall length of the next room and whether the next room is above or below. Based on this input, the direction of the character's entry into the room will also be displayed on the screen. If the user selects **'up'** ('u'), an arrow **below** the room will be printed pointing towards the center of the wall. Conversely, if the user inputs **'down'** ('d'), an arrow **above** the room will be drawn, also pointing towards the center of the wall, as shown in Figure 3 below.

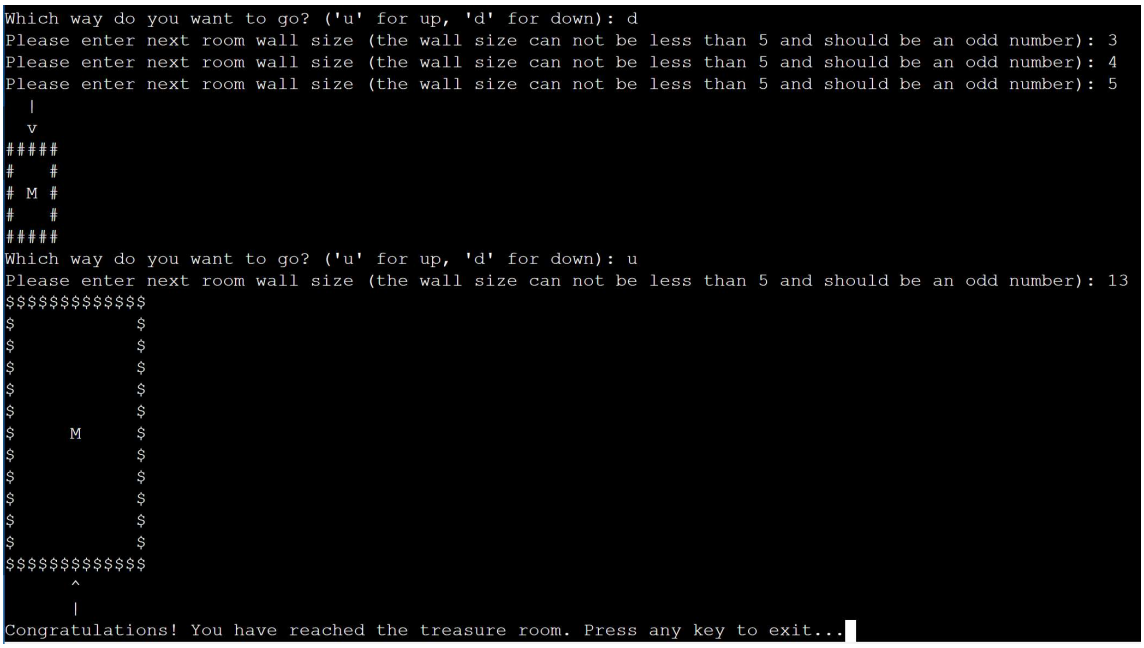

Figure 3: Example run of the program for Stage 2.

3. (30 points) In the final stage, along with the second stage tasks, the user will also be prompted to specify whether the next room is on the left or right side. Similarly, the direction of entry into the next room will be indicated accordingly. If the user selects **'left'** ('l'), an arrow pointing towards the center of the wall will be drawn to the **right** of the room. Conversely, if the user selects **'right'** ('r'), an arrow pointing towards the center of the wall will be drawn to the **left** of the room.

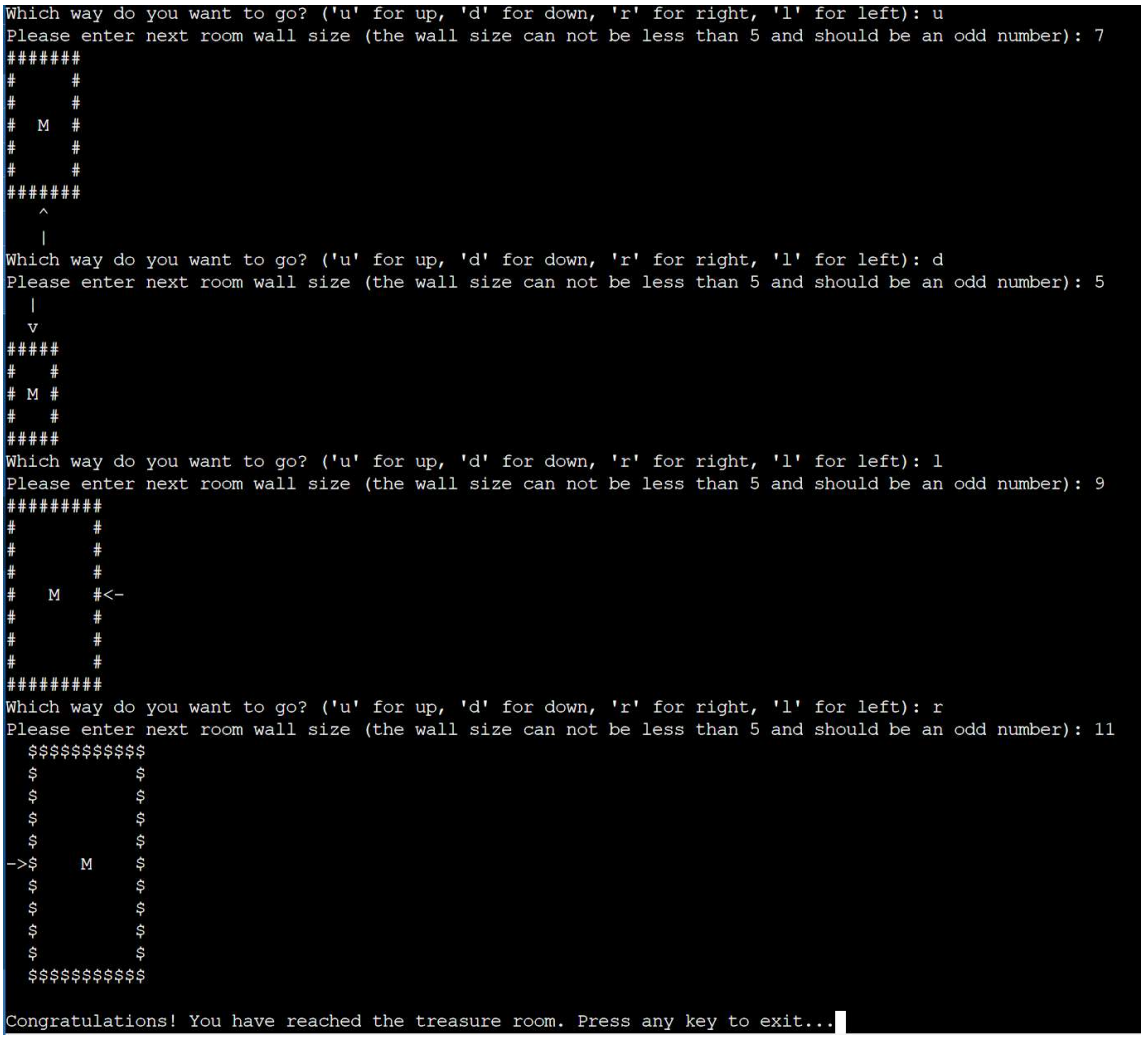

Figure 4: Example run of the program for Stage 3.

Rules:

- Since the assignment consists of progressive stages, it will be uploaded as a single code. Separate codes will not be uploaded for each stage. Your source code file has to have the name "assignment1.c".
- Your program will be compiled using the following command on a Linux system. If it cannot be compiled and linked using this command, it will not be graded (failed submission)

gcc -std=c99 -Wall -Werror assignment1.c -o assignment1

- Your program will be checked using an automatic checker. Therefore, make sure you print the messages exactly as given in the example runs.
- Do NOT use any construct that hasn't been covered in the course. Also use no C++ features such as *cout* and *cin*.
- Do NOT use any external functions except for *printf, scanf, rand and srand*.
- This is an individual assignment. Collaboration in any form is **NOT** allowed. No "working together", no sharing code in any form including showing code to your classmates to give them ideas.
- All the code you submit must be your own. Don't copy/paste any piece of code from any resource including anything you've found on the Internet.
- The assignments will be checked for plagiarism using both automated tools and manual inspection. Any assignment involving plagiarism and/or infringement of intellectual property will be not be graded and is subject to further disciplinary actions.