Assigment IV

In this assignment, we wrote a rocket launch simulation code. The code consists of a few different parts.
First, the code starts by calling the simMenu() function. The main task of this function is to print a welcome statement and display four options for the user to choose from. After the user selects one of the options by entering a number, the switch case statement checks whether the number is between one and four. If the input is valid, the simulation begins.

The first option is launchParameters(). In this function, we first ask the user to enter initial velocity, gravity, and launch height. The program checks if these values are in the correct format. If they are valid, it creates a new file named rocket_data.txt using FILE *rocket_file. The function also checks whether the file is successfully created. If there is no issue, the program writes the values entered by the user into the file and then closes it.

The second option is simulating the rocket. This function starts by opening the rocket_data.txt file and reading the initial velocity, gravity, and launch height using fscanf(). Then, based on these values, the program prints the equation: ***h(t)= -1/2g*t^2 + vt + h***

After that, it calls the drawTrajectory() function.

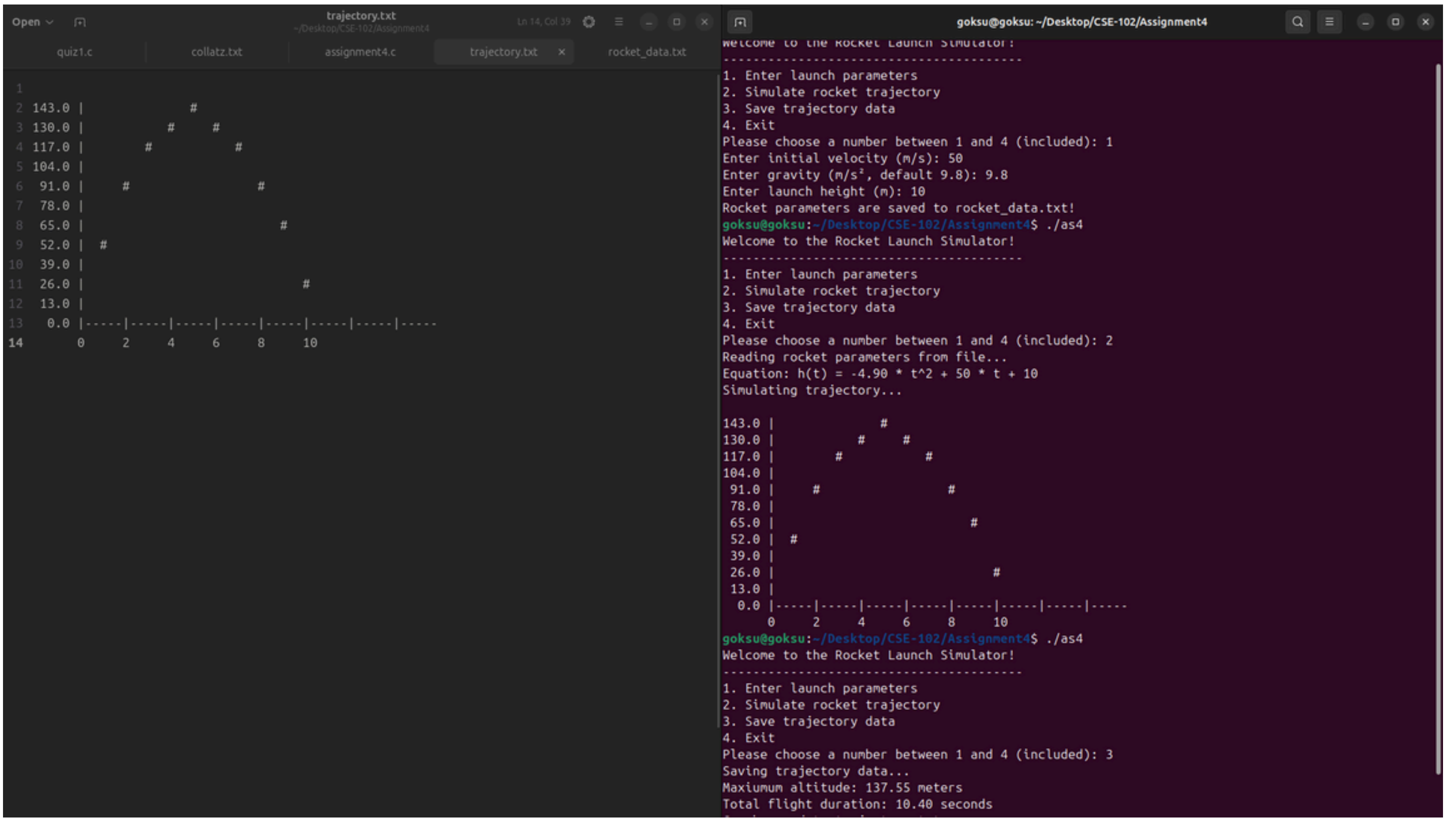
This function first calls other functions to calculate total flight time and maximum altitude. Then, it starts drawing the rocket's path. The height divisions variable determines how many indentations will be used for the y-axis, based on the maximum altitude. Sometimes, if the gap is too large between two indentations on the y-axis, two values might have the same height. This does not fully fix the issue but helps reduce it.

Then, the function uses nested for loops. The outer loop generates the y-axis values. The inner loop checks if the rocket reaches that height at a given time. If it does, it prints # to create the trajectory path. The last part of the graph prints the x-axis. There are two different loops. One prints the |---- structure. The other prints the time values, ensuring they are properly aligned with the trajectory markers above.

The third option is saveTrajectory(). This function is similar to drawTrajectory(). The main difference is that instead of printing the graph to the console, it saves it to a file (trajectory.txt) using fprintf().

The last option is Exit. When the user chooses this option, the program stops.

Output screenshots at the next page.



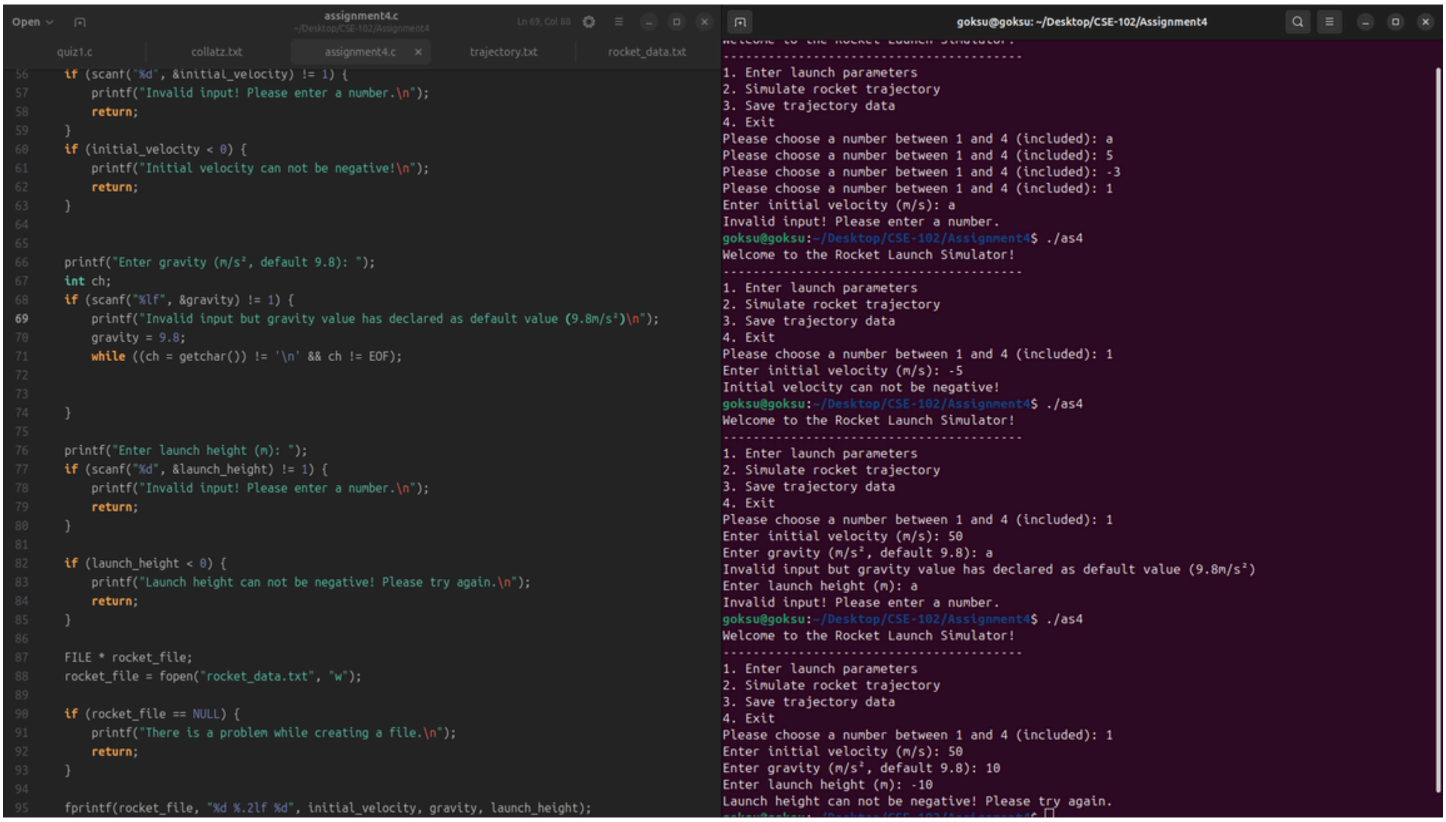
```

143.0 |              #
130.0 |           #     #
117.0 |        #           #
104.0 |
 91.0 |     #                 #
 78.0 |
 65.0 |                          #
 52.0 |  #
 39.0 |
 26.0 |                             #
 13.0 |
  0.0 |-----|-----|-----|-----|-----|-----|-----|-----
      0     2     4     6     8     10
```

```
Welcome to the Rocket Launch Simulator!
----------------------------------------
1. Enter launch parameters
2. Simulate rocket trajectory
3. Save trajectory data
4. Exit
Please choose a number between 1 and 4 (included): 1
Enter initial velocity (m/s): 50
Enter gravity (m/s², default 9.8): 9.8
Enter launch height (m): 10
Rocket parameters are saved to rocket_data.txt!
goksu@goksu:~/Desktop/CSE-102/Assignment4$ ./as4
Welcome to the Rocket Launch Simulator!
----------------------------------------
1. Enter launch parameters
2. Simulate rocket trajectory
3. Save trajectory data
4. Exit
Please choose a number between 1 and 4 (included): 2
Reading rocket parameters from file...
Equation: h(t) = -4.90 * t^2 + 50 * t + 10
Simulating trajectory...

143.0 |              #
130.0 |           #     #
117.0 |        #           #
104.0 |
 91.0 |     #                 #
 78.0 |
 65.0 |                          #
 52.0 |  #
 39.0 |
 26.0 |                             #
 13.0 |
  0.0 |-----|-----|-----|-----|-----|-----|-----|-----
      0     2     4     6     8     10
goksu@goksu:~/Desktop/CSE-102/Assignment4$ ./as4
Welcome to the Rocket Launch Simulator!
----------------------------------------
1. Enter launch parameters
2. Simulate rocket trajectory
3. Save trajectory data
4. Exit
Please choose a number between 1 and 4 (included): 3
Saving trajectory data...
Maxiumum altitude: 137.55 meters
Total flight duration: 10.40 seconds
```

Error outputs of code.



```c
    if (scanf("%d", &initial_velocity) != 1) {
        printf("Invalid input! Please enter a number.\n");
        return;
    }
    if (initial_velocity < 0) {
        printf("Initial velocity can not be negative!\n");
        return;
    }


    printf("Enter gravity (m/s², default 9.8): ");
    int ch;
    if (scanf("%lf", &gravity) != 1) {
        printf("Invalid input but gravity value has declared as default value (9.8m/s²)\n");
        gravity = 9.8;
        while ((ch = getchar()) != '\n' && ch != EOF);


    }

    printf("Enter launch height (m): ");
    if (scanf("%d", &launch_height) != 1) {
        printf("Invalid input! Please enter a number.\n");
        return;
    }

    if (launch_height < 0) {
        printf("Launch height can not be negative! Please try again.\n");
        return;
    }

    FILE * rocket_file;
    rocket_file = fopen("rocket_data.txt", "w");

    if (rocket_file == NULL) {
        printf("There is a problem while creating a file.\n");
        return;
    }

    fprintf(rocket_file, "%d %.2lf %d", initial_velocity, gravity, launch_height);
```

```
Welcome to the Rocket Launch Simulator!
----------------------------------------
1. Enter launch parameters
2. Simulate rocket trajectory
3. Save trajectory data
4. Exit
Please choose a number between 1 and 4 (included): a
Please choose a number between 1 and 4 (included): 5
Please choose a number between 1 and 4 (included): -3
Please choose a number between 1 and 4 (included): 1
Enter initial velocity (m/s): a
Invalid input! Please enter a number.
goksu@goksu:~/Desktop/CSE-102/Assignment4$ ./as4
Welcome to the Rocket Launch Simulator!
----------------------------------------
1. Enter launch parameters
2. Simulate rocket trajectory
3. Save trajectory data
4. Exit
Please choose a number between 1 and 4 (included): 1
Enter initial velocity (m/s): -5
Initial velocity can not be negative!
goksu@goksu:~/Desktop/CSE-102/Assignment4$ ./as4
Welcome to the Rocket Launch Simulator!
----------------------------------------
1. Enter launch parameters
2. Simulate rocket trajectory
3. Save trajectory data
4. Exit
Please choose a number between 1 and 4 (included): 1
Enter initial velocity (m/s): 50
Enter gravity (m/s², default 9.8): a
Invalid input but gravity value has declared as default value (9.8m/s²)
Enter launch height (m): a
Invalid input! Please enter a number.
goksu@goksu:~/Desktop/CSE-102/Assignment4$ ./as4
Welcome to the Rocket Launch Simulator!
----------------------------------------
1. Enter launch parameters
2. Simulate rocket trajectory
3. Save trajectory data
4. Exit
Please choose a number between 1 and 4 (included): 1
Enter initial velocity (m/s): 50
Enter gravity (m/s², default 9.8): 10
Enter launch height (m): -10
Launch height can not be negative! Please try again.
```