CS-101 Project: Sci-Fi Planet Generator

Project Report: Planet Explorer and Alien Encounter MS Dos Style Interactive Experience

Authors: Yazdan Ali Khan (2024665), Raja Yawar Abbas (2024533), Hammad Shahid (2024389)

Link to repository: [Yhoqw/Planet_gererator-CS-project]

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1. Introduction

The "Science Fiction Planet Generator" project is an interactive console-based application designed to engage users in exploring fictitious planets and their unique attributes. The program generates dynamic details about planets, their atmospheres, histories, and the alien races inhabiting them. Players also engage in mini-games to overcome challenges posed by alien inhabitants. This project demonstrates the use of random generation, seeding, Arrays, file I/O, and game logic in C++.

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2. Objectives

1. Provide an engaging experience for users through the exploration of procedurally generated planets.
2. Demonstrate the application of key programming concepts such as:
    - Randomization and seeding
    - File handling (Saves and Loads planet information from a txt file)
    - Functions
    - Loops
    - IF/ELSE and Switch statements
    - User interaction
3. Develop mini-games to enhance the interactivity of the program.
4. Showcase teamwork and coding best practices.

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3. Features

Core Features

1. **Planet Generation**

- Randomly generates a planet name using pre-defined syllables and meshing together strings stored in an array
- Assigns a random atmosphere and size from predefined lists.
- Creates a unique history and events for each planet. While randomly choosing how many history events each planet will house
- Generates Alien species for each planet and cycles number of races

2. **Alien Races**
    - Randomly generates alien races with unique appearances, technological levels, and forms of government.
3. **Mini-Games**
    - **Guessing Game:** Users must guess a randomly selected number within a limited number of attempts.
    - **Tic Tac Toe:** Users compete against an AI in a classic game of Tic Tac Toe.
4. **File Handling**
    - Allows users to save and load planet details to store previously visited planet.
5. **User Interface**
    - Interactive menu system
    - Title with cout statements

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4. Implementation

Technologies Used

- **Language:** C++
- **Libraries:**
    - <iostream> for input and output.
    - <string> for handling textual data.
    - <ctime> for random number generation.
    - <fstream> for file handling.

Code Structure

The project adheres to a modular design to promote code clarity and reusability. Key components include:

1. **Constants and Data Arrays**
    - Predefined lists for atmospheres, sizes, histories, races, and alien details.
    - 2 dimensional arrays for tic tac toe game.

Functions

- Each function handles a specific task, such as generating planet attributes, saving/loading files, or running mini-games.

2. **Main Program Logic**
    - A Do-While loop-based menu system guides the user through exploring new planets, loading saved planets, and exiting the program.

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5. Challenges Encountered

1. **Randomization**
    - Ensuring that random generation did not repeat patterns too frequently.
    - Solution: Seeded the random number generator using the current time (srand(time(0))).
2. **Game Logic**
    - Developing AI logic for Tic Tac Toe that avoids obvious flaws.
    - Solution: Implemented a basic but effective AI that prioritizes available moves.
3. **File Handling**
    - Handling edge cases such as missing or corrupted files. (cerr)
    - Solution: Added error handling to ensure graceful failure with informative messages.
4. **Clearing text**
    - “system("cls");” clears the screen (only works on windows)

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6. Results

The program successfully achieves its goals:

1. Generates unique and engaging planet profiles with detailed attributes.
2. Provides an interactive user experience through challenging and fun mini-games.
3. Implements a robust file-saving and loading mechanism to preserve user generation.
4. Making an early Dos RPG imitation

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6. **Future Possibilities**
   If we were ever to revisit the project or theoretically ponder what can or could have been added to the project.

1. **Fuel System:**
    - Add a fuel management system to simulate resource constraints during exploration and enhance gameplay loop.
2. **Graphical User Interface (GUI):**
    - Upgrade from a console-based interface to a GUI for improved aesthetics and usability.
3. **Enhanced Mini-Games:**
    - Introduce additional games or improve AI complexity in existing games.
4. **Expanded Planet Details:**
    - Include additional attributes such as gravity, temperature, and ecosystems.
5. **Porting the project on a dedicated Game engine**:
    - Rebuilding the project on an engine like unity or Godot to flesh out the project and make a playable build
6. **Actual utilization of the structures made in the program**

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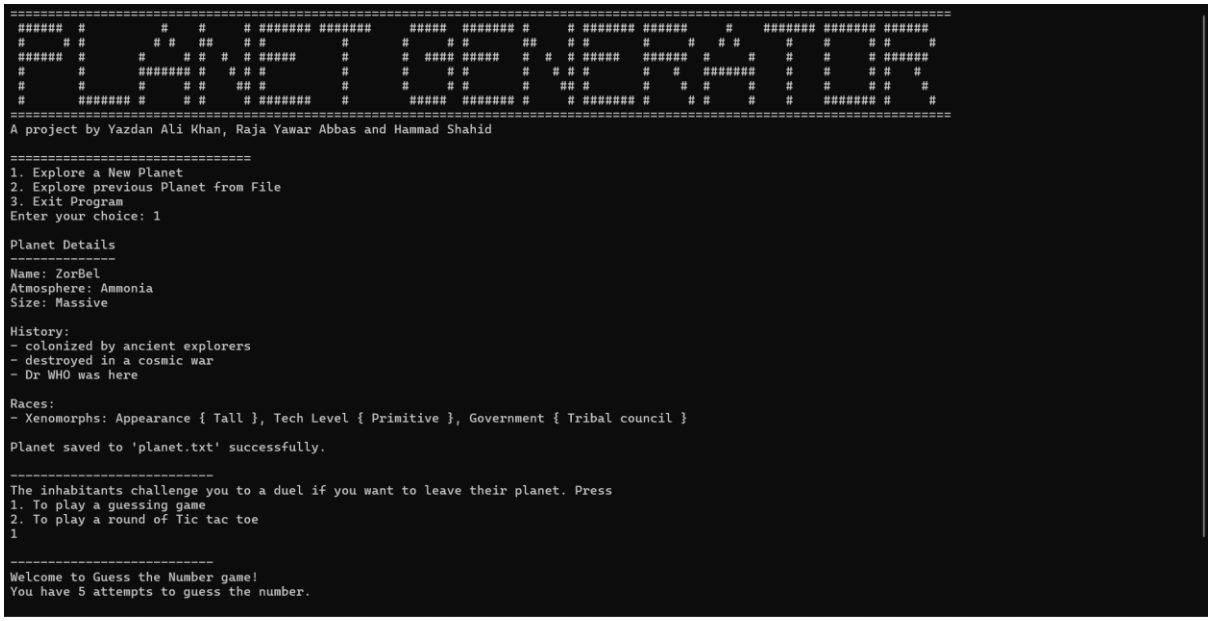
8. Conclusion

The "Science Fiction Planet Generator" project successfully combines creativity, programming skills, and user interactivity. It serves as a practical demonstration of C++ programming concepts. This project was an excellent opportunity for the team to apply theoretical knowledge in a hands-on environment, resulting in an engaging and functional application.

9. References

- C++ Standard Library Documentation
- Online tutorials
- Header files for <ctime>, <fstream>
- Various resources on file handling and random number generation in C++

10. Output



11. Code:

```
#include <iostream>
#include <string>
#include <ctime>
#include <fstream>

//TO DO:
//fuel system
//structures

using namespace std;

// Constants
const int MAX_NAME_PARTS = 5;
const int MAX_HISTORY_EVENTS = 6;
const int MAX_RACES = 6;

// Struct Definitions
struct Planet
{
    string name;
    string atmosphere;
```

```
    string size;
};

struct Race
{
    string name;
    string appearance;
    string techLevel;
    string government;
};




// String arrays
string name_parts[] = {"Zor", "Arg", "Tron", "Bel", "Nix", "Eld",
"Omn", "Qua", "Tal", "Xyn", "Arra", "Kis"};
string atmospheres[] = {"Oxygen-rich", "Methane", "Carbon Dioxide",
"Nitrogen", "Ammonia", "Helium"};
string size_descriptions[] = {"Tiny", "Small", "Medium", "Large",
"Massive"};



//string for planet history prompts (too many sci-fi references!!)
string histories[] =
{
    "colonized by ancient explorers",
    "destroyed in a cosmic war",
    "thrived as a hub for trade",
    "home to a great empire",
```

```
    "witness to a catastrophic event",
    "abandoned due to resource depletion",
    "birthplace of a new religion",
    "known for its unique flora and fauna",
    "a target of space pirates",
    "a secret research outpost",
    "ravaged by nuclear war",
    "survived the death star",
    "probably one of starfields 1,692 planets",
    "They claim that this is where they found out the answer to
Life, the Universe and Everything",
    "Great source of Spice",
    "Home Planet to the Lisan al-Gaib?",
    "Dr WHO was here",
    "In proximity to a Halo ring",
    "It has multiple moons",

};

//string for alien race names (I admit laser shark is kind of silly)
string races[] =
{
    "Mandalorians", "Shanghili", "Xenomorphs", "Vulcans", "Geth",
"Jedi", "Turians", "Daleks", "Martians", "Laser Sharks"
};

string appearances[] = {"Tall", "Short", "slender", "Reptilian",
"Humanoid", "Insect-like"};
string techLevels[] = {"Primitive", "Industrial", "Spacefaring",
"Advanced AI", "Interdimensional"};
```

```
string governments[] = {"Monarchy", "Republic", "Tribal council",
"Technocracy", "Anarchy", "Theocracy"};



// Function prototypes

string generatePlanetName();

string generateAtmosphere();

string generateSize();

void generateHistory(string history[], int &eventCount);

void generateRaces(string raceList[], string raceDetails[], int
&raceCount);

void displayPlanet(const string &name, const string &atmosphere,
const string &size, const string history[], int eventCount, const
string raceList[], const string raceDetails[], int raceCount);

void save_planet_file(const string &name, const string &atmosphere,
const string &size, const string history[], int eventCount, const
string raceList[], const string raceDetails[], int raceCount);

void load_planet_file();


int main()

{

    //for seeding

      srand(static_cast<unsigned int>(time(0)));


      int Input;


      //Menu

      cout <<
"================================================================
============================================================" << endl;
```

```
     cout << " ######  #          #    #     # ####### #######
#####  ####### #     # ####### ######     #    ####### #######
######  " << endl;

          cout << " #     # #         # #   ##    # #          #
#     # #       ##    # #       #     #   # #      #    #     # #
# " << endl;

     cout << " ######  #       #     # #  #  # #####      #       #
#### #####   #  #  # #####   ######  #     #    #    #     # ######
" << endl;

     cout << " #       #       ####### #   # # #          #       #
# #       #   # # #       #   #   #######    #    #     # #   #   "
<< endl;

     cout << " #       #       #     # #    ## #          #       #
# #       #    ## #       #    #  #     #    #    #     # #    #  "
<< endl;

     cout << " #       ####### #     # #     # #######    #
#####  ####### #     # ####### #     # #     #    #    ####### #
# " << endl;

     cout <<
"================================================================
============================================================" << endl;


     cout << "A project by Yazdan Ali Khan, Raja Yawar Abbas and
Hammad Shahid" << endl;



     do
     {
        cout << "\n" "================================" << endl;

        cout << "1. Explore a New Planet" << endl;
        cout << "2. Explore previous Planet from File" << endl;
        cout << "3. Exit Program" << endl;
        cout << "Enter your choice: ";
```

```
        cin >> Input;

        switch (Input)
           {

                //case for planet Gereration
            case 1:
                {
                string planetName = generatePlanetName();

                string planetAtmosphere = generateAtmosphere();
                string planetSize = generateSize();

                // Generate history
                string planetHistory[MAX_HISTORY_EVENTS];
                int historyEventCount = 0;
                generateHistory(planetHistory, historyEventCount);

                     //Generate Races
                string planetRaces[MAX_RACES];
                string raceDetails[MAX_RACES];

                int raceCount = 0;
                generateRaces(planetRaces, raceDetails, raceCount);

                // Display and save the planet (using functions)
                displayPlanet(planetName, planetAtmosphere,
planetSize, planetHistory, historyEventCount, planetRaces,
raceDetails, raceCount);
```

```
                save_planet_file(planetName, planetAtmosphere,
planetSize, planetHistory, historyEventCount, planetRaces,
raceDetails, raceCount);


                //Challenge logic

                int Duel_input;


                cout << "\n" "---------------------------" << endl;

                cout << "The inhabitants challenge you to a duel if
you want to leave their planet. Press" "\n" "1. To play a guessing
game " "\n" "2. To play a round of Tic tac toe" << endl;

                cin >> Duel_input;


                switch (Duel_input)

                {


                //Case for guessing game

                case 1:

                {


                      //Guessing game logic

                      int secret_number = rand() % 20 + 1;

                      int max_attempts = 5;


                      cout << "\n" "---------------------------" <<
endl;

                            cout << "Welcome to Guess the Number
game!" << endl;

                            cout << "You have " << max_attempts << "
attempts to guess the number." << endl;
```

```
                        // Loop for the guessing game
                        for (int attempt = 1; attempt <=
max_attempts; attempt++)
                              {

                              cout << "Attempt " << attempt << "
of " << max_attempts << endl;

                              // Ask for the user's guess
                              int guess;

                        cout << "Enter your guess (1-20): ";
                        cin >> guess;

                        // Check if the guess is correct or not
                        if (guess > secret_number)
                                    {
                                          //Feedback depending on
how close the guess is for higher
                                          if (guess >
(secret_number + 5) )
                                          {
                              cout << "Too high! Try again." <<
endl;
                              }

                              else if (guess > secret_number)
                              {
                                    cout << "Slightly too high.
Try again." << endl;
                                          }
```

```
                                    }

                                          else if (guess <
secret_number)
                                          {
                                                //Feedback depending on
how close the guess is for lower
                                                if (guess <
(secret_number - 5) )
                                                {
                                    cout << "Too low! Try again." <<
endl;
                                    }

                                    else if (guess < secret_number)
                                    {
                                          cout << "Slightly too low. Try
again." << endl;
                                                }

                              }

                                          else
                                          {
                                                //to clear previous text
and restart the loop
                                                system("cls");
                                    cout << "Congratulations! You guessed
the right number!" << endl;
                                    break;
```

```
                        }

                        // after attempts are finished give the
answer
                        if (attempt == max_attempts)
                                {
                                        system("cls");
                                cout << "Sorry, you've used all
your attempts. The correct number was " << secret_number << "." <<
endl;
                                }
                        }

                        break;
                }

                        //case for tic tac toe game
                        case 2:
                        {
                                char board[3][3] = {{'1', '2',
'3'}, {'4', '5', '6'}, {'7', '8', '9'}};
                        char player = 'X', computer = 'O';

                        cout << "Welcome to Tic Tac Toe!\n";

                        while (true)
                                {
                                // Display the board
                                cout << "\n";
                                for (int i = 0; i < 3; i++)
```

```
                {

                for (int j = 0; j < 3; j++)
                    {
                cout << board[i][j] << " ";
                }

               cout << "\n";

            }

            // Player's turn
            int move;
            cout << "Enter your move (1-9): ";
            cin >> move;

            int row = (move - 1) / 3, col =
(move - 1) % 3;

            if (move < 1 || move > 9 ||
board[row][col] == 'X' || board[row][col] == 'O')
                {

                cout << "Invalid move! Try
again.\n";
                continue;

            }

           board[row][col] = player;
```

```
                                    // Check for player win
                                    bool playerWin = false;
                                    for (int i = 0; i < 3; i++)
                                          {
                                                //Horizontal and
vertical
                                          if ((board[i][0] == player &&
board[i][1] == player && board[i][2] == player) || (board[0][i] ==
player && board[1][i] == player && board[2][i] == player))
                                                {


                                          playerWin = true;
                                          break;


                                          }


                                    }


                                    //diagonal
                                          if ((board[0][0] == player &&
board[1][1] == player && board[2][2] == player) || (board[0][2] ==
player && board[1][1] == player && board[2][0] == player))
                                          {


                                        playerWin = true;


                                    }


                                    if (playerWin)
```

```
                {

                cout << "\n";
                for (int i = 0; i < 3; i++)
                      {

                for (int j = 0; j < 3; j++)
                            {
                      cout << board[i][j] << "
";
                }

                cout << "\n";
                }


                      //clear previous text
and display win statement

                      system("cls");

                cout << "Congratulations! You
win!\n";
                break;
          }

          // Check if board is full (draw)
          bool draw = true;
          for (int i = 0; i < 3; i++)
                {

                for (int j = 0; j < 3; j++)
```

```
                {

                if (board[i][j] != 'X' &&
board[i][j] != 'O')
                {
                draw = false;
                }

                }

        }
        if (draw)
                {

                cout << "\n";
                for (int i = 0; i < 3; i++)
                {

                for (int j = 0; j < 3; j++)
                {
                cout << board[i][j] << "
";

                }

                cout << "\n";
                }

                system("cls");
        cout << "It's a draw!\n";
```

```
                                    cout << endl;

                                    break;
                                    }

                                    // Computer's turn
                                    bool moveMade = false;
                                    for (int i = 1; i <= 9 &&
!moveMade; i++)
                                          {

                                          row = (i - 1) / 3, col = (i -
1) % 3;
                                          if (board[row][col] != 'X' &&
board[row][col] != 'O')
                                                {
                                          board[row][col] = computer;
                                          moveMade = true;
                                          }

                                    }

                                    // Check for computer win
                                    bool computerWin = false;
                                    for (int i = 0; i < 3; i++)
                                          {

                                          if ((board[i][0] == computer
&& board[i][1] == computer && board[i][2] == computer) ||
(board[0][i] == computer && board[1][i] == computer && board[2][i]
== computer))
```

```
                    {
                    computerWin = true;
                    break;
                    }

                }

                    if ((board[0][0] == computer
&& board[1][1] == computer && board[2][2] == computer) ||
(board[0][2] == computer && board[1][1] == computer && board[2][0]
== computer))
                    {
                        computerWin = true;
                }

                if (computerWin)
                    {
                    cout << "\n";
                    for (int i = 0; i < 3; i++)
                        {

                    for (int j = 0; j < 3; j++)
                            {
                        cout << board[i][j] << "
";
                    }
                    cout << "\n";

                    }
```

```
                                        system("cls");
                                    cout << "Computer wins! Better
luck next time.\n";

                                        break;
                                    }
                                }
                                break;
                                }

                            }
                        //break for outer switch statement
                    break;
                }

                //case for loading saved planet
                case 2:
                {
                    load_planet_file();
                    break;
                }

                //case for exiting program
                case 3:
                {
                    cout << "Exiting program. Goodbye!" << endl;
                    break;
                }
```

```
            default:
            {
                //can use cerr here instead :) I checked
                cout << "Invalid choice. Please try again." << endl;
            }

        }
    } while (Input != 3);

    return 0;
}

// Function to generate a random planet name
string generatePlanetName()
{
    int parts = rand() % 3 + 2; // Between 2 and 4 parts
    string name = "";

    // Combining together multiple names to make one name
essentially
    for (int i = 0; i < parts; ++i)
     {

        name += name_parts[rand() % MAX_NAME_PARTS];

    }

    return name;
}
```

```
// Function to generate a random atmosphere
string generateAtmosphere()
{

    return atmospheres[rand() % (sizeof(atmospheres) /
sizeof(atmospheres[0]))];

}

// Function to generate a random size
string generateSize()
{

    return size_descriptions[rand() % (sizeof(size_descriptions) /
sizeof(size_descriptions[0]))];

}

// Function to generate a random history
void generateHistory(string history[], int &eventCount)
{
    eventCount = rand() % MAX_HISTORY_EVENTS + 1; // Between 1 and
MAX_HISTORY_EVENTS

    for (int i = 0; i < eventCount; ++i)
     {

        history[i] = histories[rand() % (sizeof(histories) /
sizeof(histories[0]))];
```

```
    }

}

// Function to generate random races
void generateRaces(string raceList[], string raceDetails[], int
&raceCount)
{
    raceCount = rand() % MAX_RACES + 1; // Between 1 and MAX_RACES
    for (int i = 0; i < raceCount; ++i)
     {

        raceList[i] = races[rand() % (sizeof(races) /
sizeof(races[0]))];

        //randmly generates (apearance, tech and government of alien
races
        raceDetails[i] = "Appearance { " + appearances[rand() %
(sizeof(appearances) / sizeof(appearances[0]))] + " }, " +
                         "Tech Level { " + techLevels[rand() %
(sizeof(techLevels) / sizeof(techLevels[0]))] + " }, " +
                         "Government { " + governments[rand() %
(sizeof(governments) / sizeof(governments[0]))] + " }";

     }
}

// Function to display the planet details
```

```
void displayPlanet(const string &name, const string &atmosphere,
const string &size, const string history[], int eventCount, const
string raceList[], const string raceDetails[], int raceCount)
{
    cout << "\n" "Planet Details" << endl;
    cout << "--------------" << endl;
    cout << "Name: " << name << endl;
    cout << "Atmosphere: " << atmosphere << endl;
    cout << "Size: " << size << endl;

    cout << "\nHistory:" << endl;
    for (int i = 0; i < eventCount; ++i)
     {

        cout << "- " << history[i] << endl;

    }

    cout << "\nRaces:" << endl;
    for (int i = 0; i < raceCount; ++i)
     {

        cout << "- " << raceList[i] << ": " << raceDetails[i] <<
endl;

    }
}

// Function to save the planet details to a file
```

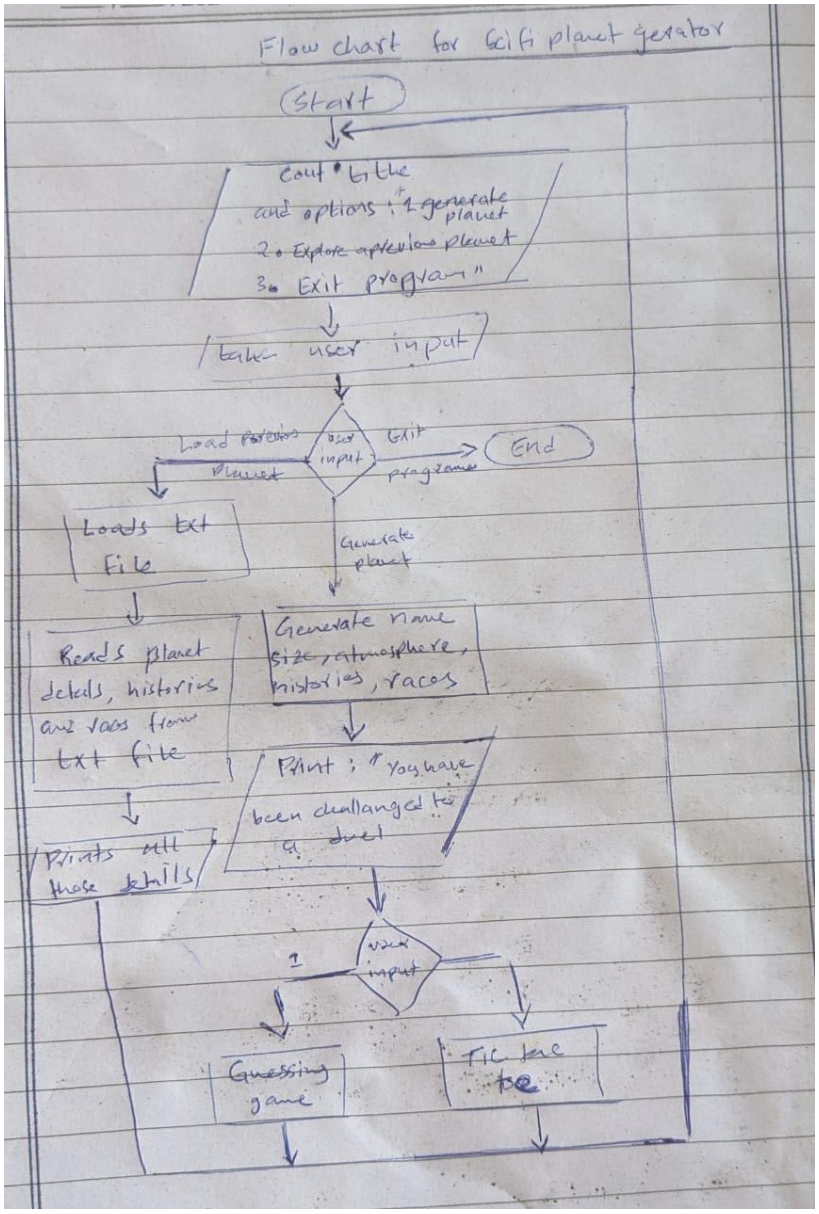
```
void save_planet_file(const string &name, const string &atmosphere,
const string &size, const string history[], int eventCount, const
string raceList[], const string raceDetails[], int raceCount)
{
    ofstream outFile("planet.txt");
    if (outFile.is_open())
     {
        outFile << name << endl;
        outFile << atmosphere << endl;
        outFile << size << endl;
        outFile << eventCount << endl;

        //for saving histories
        for (int i = 0; i < eventCount; ++i)
           {

            outFile << history[i] << endl;

        }

        //for saving races
        outFile << raceCount << endl;
        for (int i = 0; i < raceCount; ++i)
           {

            outFile << raceList[i] << endl;
                 outFile << raceDetails[i] << endl;

        }
```

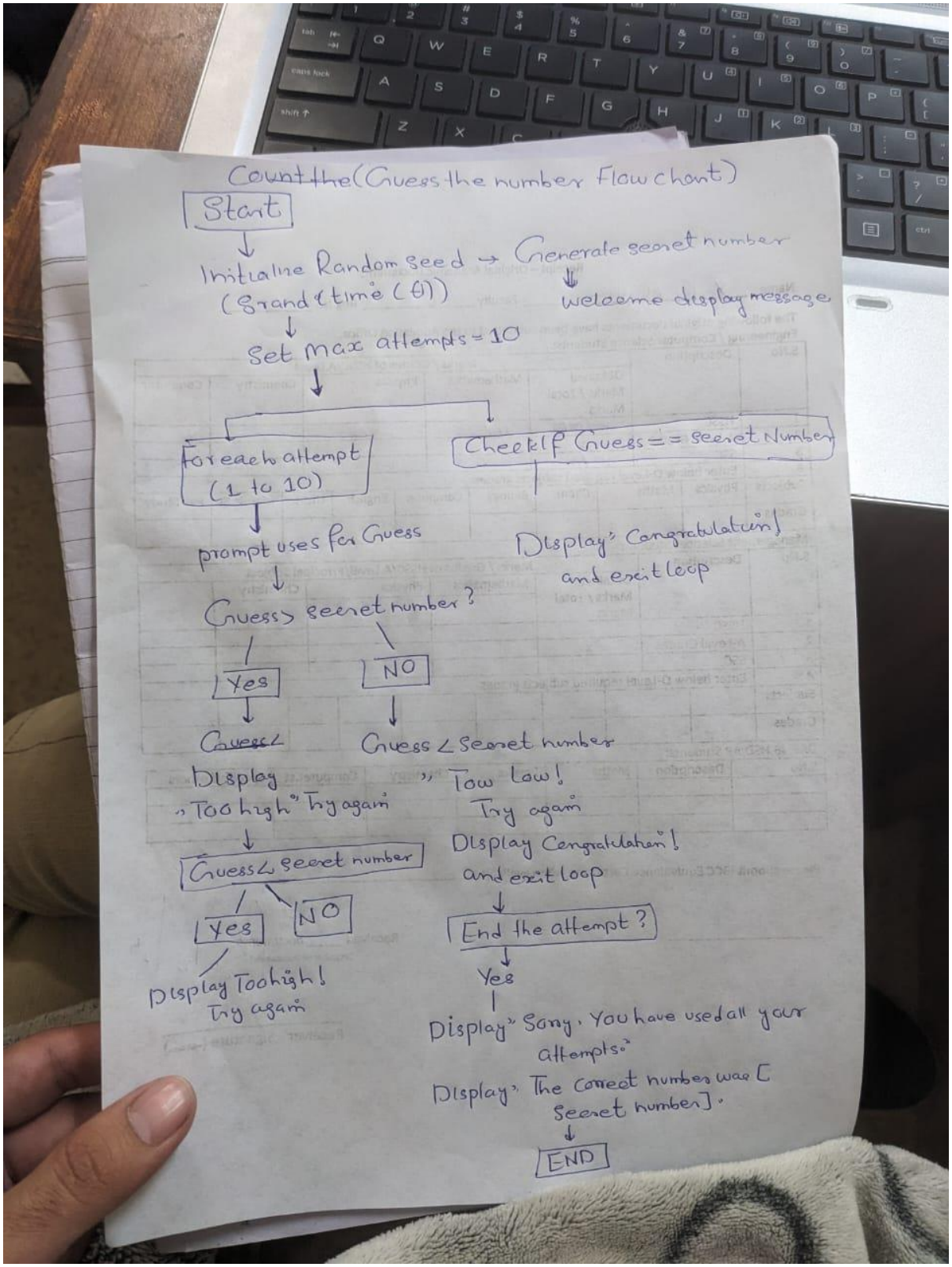
```
        //for closing the file after we are done with it
        outFile.close();
        cout << "\nPlanet saved to 'planet.txt' successfully." <<
endl;

    }

      else
      {
        cerr << "\nError: Unable to open file for writing." << endl;
    }

}

// Function to load and display planet details from a file
void load_planet_file()
{
    ifstream inFile("planet.txt");

      if (inFile.is_open())
      {
        string name, atmosphere, size;
        int eventCount, raceCount;

        getline(inFile, name);
        getline(inFile, atmosphere);
        getline(inFile, size);
```

```
inFile >> eventCount;
inFile.ignore(); // Ignore newline

   //for loading histories
string history[MAX_HISTORY_EVENTS];
for (int i = 0; i < eventCount; ++i)
   {

    getline(inFile, history[i]);

}

inFile >> raceCount;
inFile.ignore(); // Ignore newline

   //for loading races
string raceList[MAX_RACES];
string raceDetails[MAX_RACES];

for (int i = 0; i < raceCount; ++i)
   {

    getline(inFile, raceList[i]);
    getline(inFile, raceDetails[i]);

}


   //for closing the file after we are done with it
```

```
        inFile.close();


        // Display the loaded planet details
        displayPlanet(name, atmosphere, size, history, eventCount,
raceList, raceDetails, raceCount);
    }


     else
     {
        cerr << "\nError: Unable to open file for reading." << endl;
    }


}
```

Algorithms:


Flow chart for Scifi planet generator
Start
Cout "the
and options: 1. generate
planet
2. Explore previous planet
3. Exit program"
Enter user input
user input
Load previous planet
Exit program
End
Loads txt File
Generate planet
Reads planet details, histories and races from txt file
Generate name size, atmosphere, histories, races
Prints all those details
Print: "You have been challenged to a duel
user input
1
Guessing game
Tic tac toe


Count the (Guess the number Flow chart)
Start
Initialize Random seed (Srand(time(0))
Generate secret number
Welcome display message
Set max attempts = 10
For each attempt (1 to 10)
Check if Guess == secret Number
prompt uses for Guess
Display "Congratulation" and exit loop
Guess > secret number ?
Yes
NO
Guess <
Guess < secret number
Display "Too high" Try again
"Too low! Try again
Guess < secret number
Display Congratulation! and exit loop
Yes
NO
End the attempt ?
Display Too high! Try again
Yes
Display "Sorry, You have used all your attempts"
Display "The correct number was [Secret number]."
END