Projectile Trajectory Visualization Client Documentation

Overview

This C program acts as a client to a TCP server that calculates the trajectory of a projectile. It sends the initial parameters (velocity, angle, gravitational constant) to the server, receives the trajectory coordinates, and visualizes the trajectory using SDL2.

Dependencies

The program requires the following libraries:

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include <arpa/inet.h>
#include <SDL2/SDL.h>
```

Constants

- `WINDOW_WIDTH`: Width of the SDL window (800 pixels).
- `WINDOW_HEIGHT`: Height of the SDL window (600 pixels).

Functions

`void drawBoldPoint(SDL_Renderer *ren, int x, int y, int size)`

Draws a bold point (a square) of a given size at the specified coordinates.

Parameters:

- `ren`: SDL renderer.
- `x`: X-coordinate of the point.
- `y`: Y-coordinate of the point.
- `size`: Size of the square.

`int InitializeSDL(double *bufferX_Coordinates, double *bufferY_Coordinates)`

Initializes SDL, creates a window and renderer, and draws the projectile trajectory.

Parameters:

- `bufferX_Coordinates`: Buffer containing X coordinates of the trajectory.
- `bufferY_Coordinates`: Buffer containing Y coordinates of the trajectory.

Returns:

- `0` on success, `1` on failure.

Steps:

1. Calculate scaling factors for X and Y coordinates.
2. Initialize SDL.
3. Create an SDL window and renderer.
4. Clear the screen and set the draw color to black.
5. Draw the trajectory points.
6. Delay for a few seconds before quitting SDL.

Main Function

`int main()`

Connects to the server, sends input parameters, receives trajectory data, and visualizes it using SDL.

Steps:

1. Set up the client socket and connect to the server.
2. Display a menu to the user for input.
3. Handle user input:
    - Send parameters to the server.
    - Receive trajectory data from the server.
    - Visualize the trajectory using `InitializeSDL`.
4. Close the socket and exit.

Usage

1. **Compile the program:**

   ```
   gcc -o projectile_client client.c -lSDL2
   ```

2. **Run the client:**

   ```
   ./projectile_client
   ```

3. **Client interaction:**
    - The user is prompted to input the initial velocity, angle, and gravitational constant.

    - The client sends these parameters to the server and receives the trajectory coordinates.
    - The trajectory is displayed in an SDL window.

Example Client Interaction

1. The client connects to the server at IP `127.0.0.1` and port `5566`.
2. The user selects "new projectile trajectory" and inputs the initial velocity, angle, and gravitational constant.
3. The client sends the parameters to the server.
4. The client receives the trajectory data and visualizes it using SDL.
5. The user can choose to exit the program.

Notes

- Ensure the server is running and reachable at the specified IP and port before starting the client.
- The program uses SDL2 to create a window and draw the projectile trajectory.
- Trajectory points are scaled to fit within the window dimensions.
- The program includes basic error handling for SDL initialization and server communication.

Example Output

- The program prints the scaling factors and trajectory points to the console.
- The SDL window displays the projectile trajectory as a series of bold points.