

# Project A: Multi particle system museum

-- RZC1021  
Rundi Zhou

## 1. Goals

This project includes 5 containers. Except the middle one, from the left to the right are tornado system in a cube, 10 balls connected by strings in a sphere, boid system in a cylinder and a fire system in a cube. For the middle cube, we can control it to show particle systems above in one cube with interaction to each other. A mouse-control little sphere is also drawn in the middle cube to interact with other systems.

## 2. User-guide

Switch Solvers: Select from list of solvers from the radio buttons and press ‘submit’ to apply.

Wall Constraints: Click the button of ‘hasWalls’.

Change Wall Elasticity: Slide the bar called ‘wall Elasticity’ column in the control bar.

Ball Constraint: Click the checkbox of ‘hasBall’ to decide to show the ball or not. The ball can be controlled by mouse drag to let it affect other particle’s movement.

Camera Navigation: Press w/a/s/d to turn or tilt the camera’s aiming direction up/left/ down/right without moving the camera. Press arrows to move the camera horizontally/vertically without changing the aiming direction of the camera. Press +/- to move the camera forward/backward in gaze direction.

Middle cube Ball System: Show or hide the fire/bouncy balls/spring-connected objects in the middle cube by clicking the ‘has fire’/‘has bouncy balls’/‘has spring line’/‘has spring tetra’ button. Click forces buttons to decide whether the current force is applied to the bouncy ball system. Specially, the central point of boid force is the mouse-control ball, you can change it by dragging.

Adjust Spring Properties: Adjust spring length, stiffness, damping coefficients and the ball mass by changing the values in the corresponding columns. Turn on or off gravity by clicking the button.

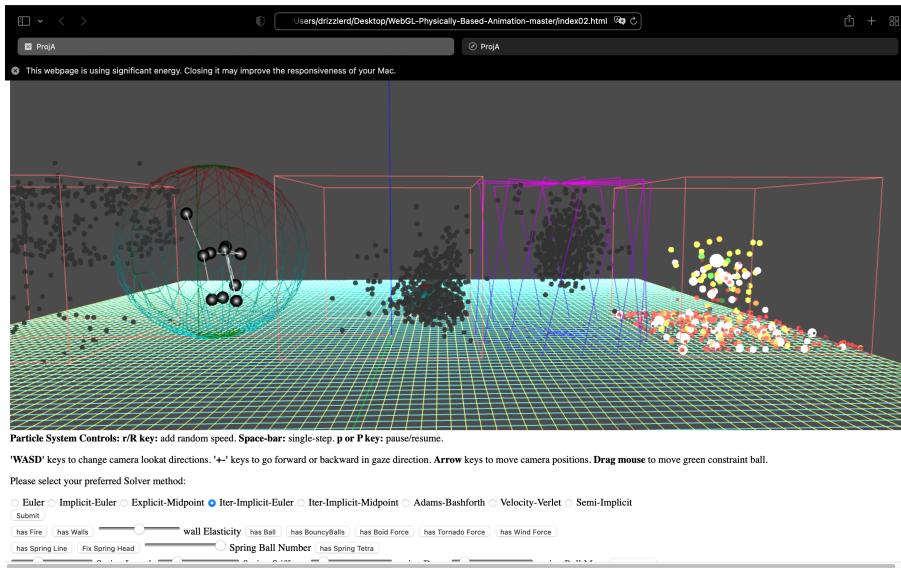
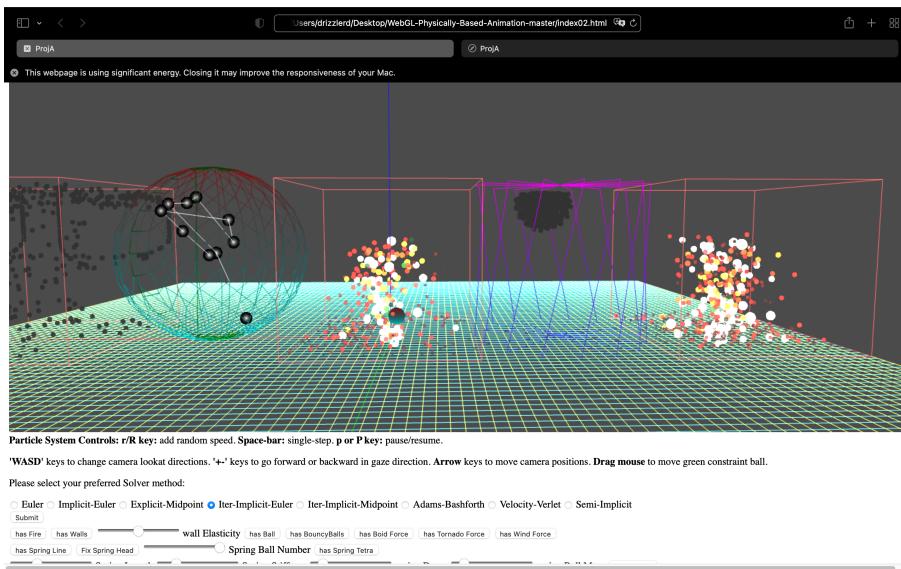
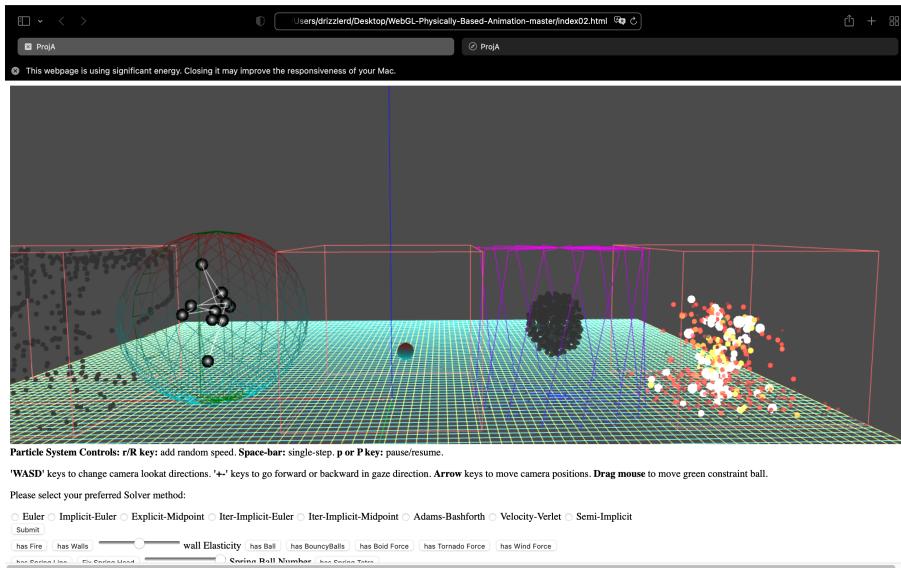
Fixed Point of Spring Line: The spring line has one head fixed in a certain position by default. You can unfix it by clicking the button ‘Fix spring head’.

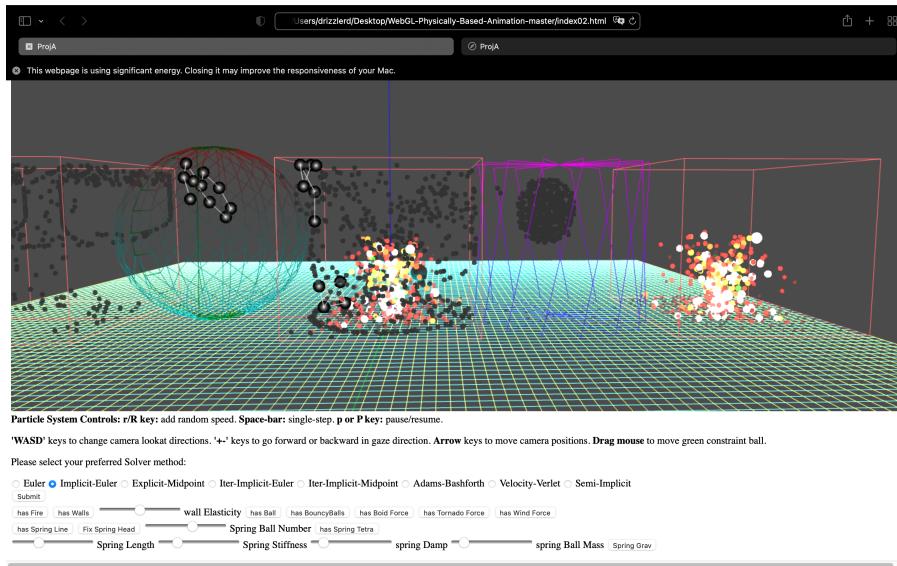
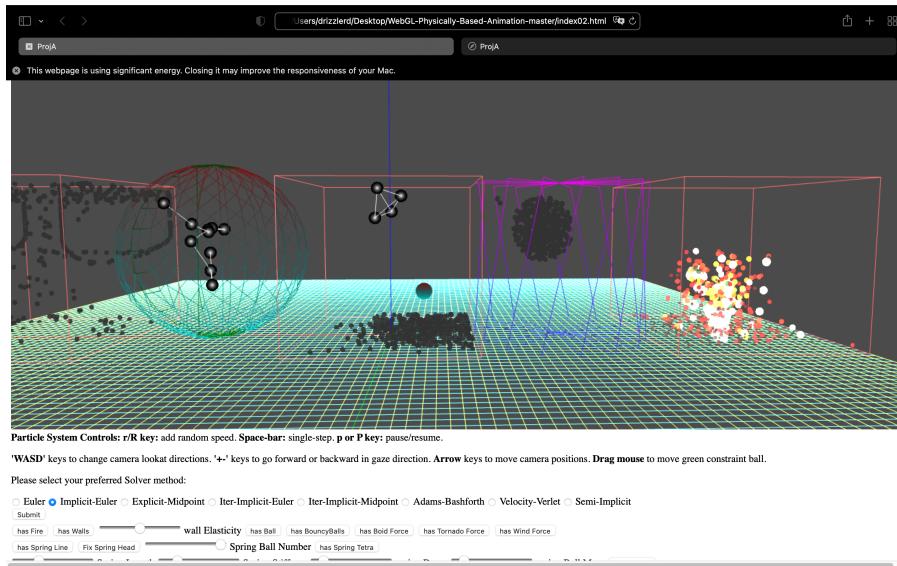
Adjust Number of Balls in Spring Snake: Slide ‘Spring ball number’ bar to change. Maximum is 10.

## 3. Code-guide

In the js folder, the Javascript files beginning with ‘C’ are JS classes, where CPartSys.js includes all the functions applied to the particle system. And StateSpaceBouncyBall3D.js contains my main entrance of the project. VBO-Lib.js is a file containing all VBO boxes.

## 4. Sample pictures





## 5. Optional functions chosen

Multiple solver types: a. Euler, b. Implicit-Euler, c. Explicit-Midpoint, d. Iter-Implicit-Euler, e. Iter-Implicit-Midpoint, f. Adams-Bashforth, g. Velocity-Verlet, h. Semi-Implicit.

Additional constraint-types: a. Sphere, b. Cylinder, c. User-control ball-shape constraint.

Additional force-maker: a. wind(by clicking ‘has wind force’ button when bouncy balls are chosen to shown in the middle cube, you can apply a wind-like force to the balls blowing them to the left)

Rendering options: a. Turn on/off the middle cube-shape constraint by clicking ‘has walls’  
b.Press buttons to show/hide systems in the middle cube.