CSE378: Computer Graphics

Assignment 3 – Bricks Breaker

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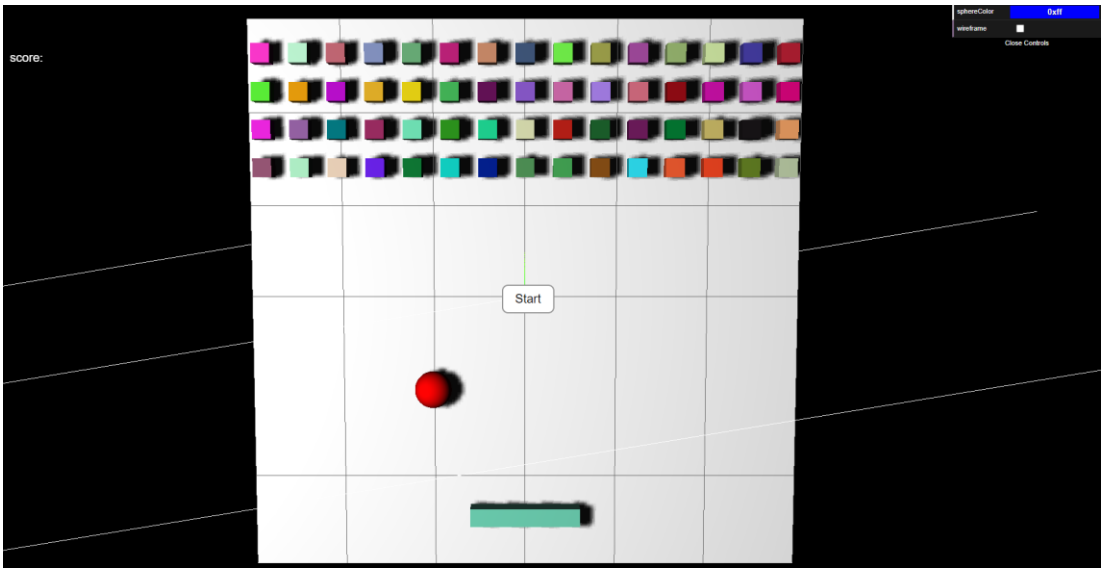
GitHub Link:

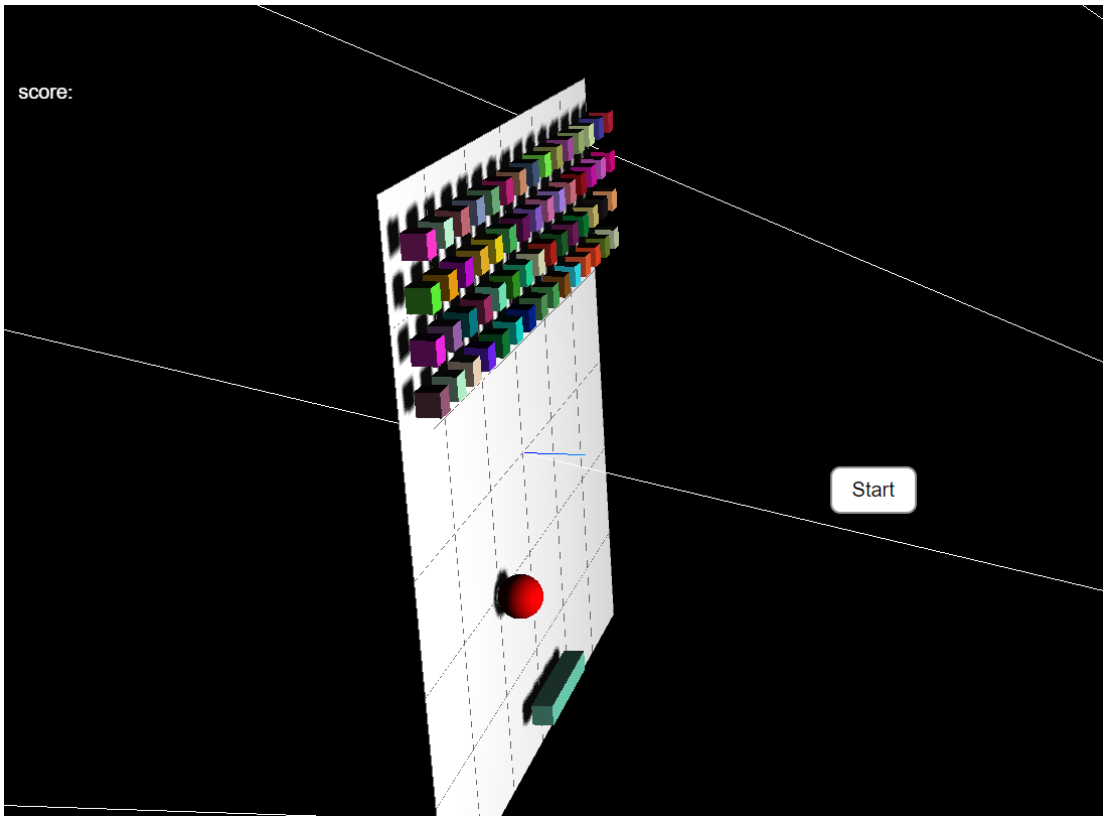
[github/AhmedElshobaky/Brick-Breakers-Threejs]

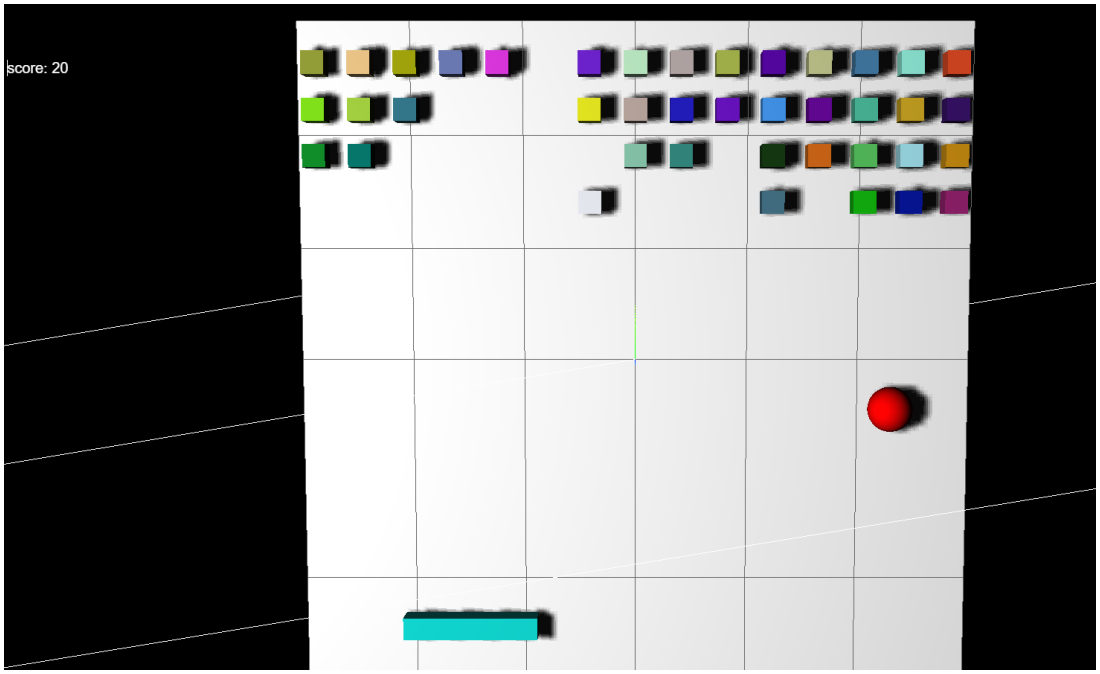
Demo:

[Video]

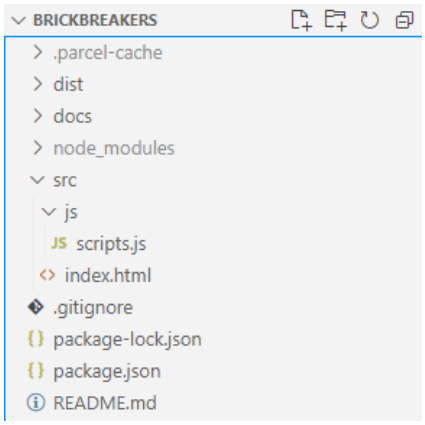
Snippets:







Files hierarchy



Breaking down the code

Bricks Breaker project code consists of:

- A 3D scene using the three.js library and renders it using a WebGL renderer. The scene includes boxes, a sphere that represents a the ball and the padel and bricks.
- An animation function that gets added to the rendering using

```
renderer.setAnimationLoop( animate );
```

- The animation function updates the positioning of the sphere and the positioning of the padel.

```
function animate() {
    // if all bricks broked, congrate the user and end the game
    if (counter == 60){
      congratulationMsg();
    }
    updatePadelPosition();
    if(isPlaying){
        updateSpherePosition();
    }
    renderer.render( scene, camera );
}
```

- Update padel positioning function checks on global step which have values of 0.02 and -0.02 (step amount) only if the button is held on, otherwise both are zeros

```
// onkeydown event listener
var step  = 0;
function onKeyDown(event) {
  // move left
  if (event.keyCode == 37) {
    console.log("left");
    step = -0.2;
  }
  if (event.keyCode == 39) {
    console.log("right");
    step = 0.2;
  }
}

// onkeyreleast event listener
function onKeyUp(event) {
  if (event.keyCode == 37) {
    step = 0;
  }
```

```
  if (event.keyCode == 39) {
    step = 0;
  }
}
```

```
var currentPosition = padel.position.x;
function updatePadelPosition() {
  currentPosition += step;

  // bound the padel to the borders
  if ( currentPosition  < -12) {
    currentPosition = -12;
  }else if(currentPosition > 12) {
    currentPosition = 12;
  }
  padel.position.x = currentPosition;
}
```

- Bricks are made of boxes that are created inside nested for loop.

```
// create fruit basket geometry
var bricks = [];
var bricksRow = [];
const spacing = 2;
// create 2d array of bricks
for(let i = 0; i < 15; i++){
  for (let j = 0; j < 4; j++){
    const brickGeometry = new THREE.BoxGeometry( 1, 1, 1 );
    const brickMaterial = new THREE.MeshStandardMaterial( { color:
getRandomColor(), wireframe: false } );
    const brick = new THREE.Mesh( brickGeometry, brickMaterial );
    brick.position.set(14- (i*spacing) ,7 +  (j*(spacing)), 1 );
    console.log(brick.position);
    bricksRow.push(brick);
    scene.add( brick );
    brick.castShadow = true;
  }
  bricks.push(bricksRow);
}
```

- An Orbit control is added to the scene to allow the user to rotate and zoom the camera.

```
const orbit = new OrbitControls( camera, renderer.domElement );
```

- A lighting is added to the scene, including an ambient light and a spot light, the spot light is set to cast shadows.

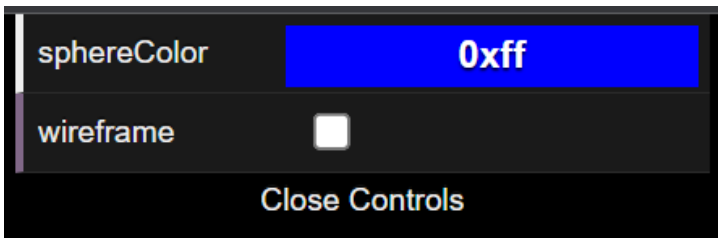
```
const ambiantLight = new THREE.AmbientLight( 0x333333, 1);
```

```
scene.add( ambiantLight );

const spotLight = new THREE.SpotLight( 0xffffff, 1);
scene.add( spotLight );
spotLight.position.set( -30, 0, 60 );
spotLight.castShadow = true;
spotLight.angle = 0.50;
```

- dat.gui is added to give the user the ability control the sphere color, speed, wirefram using gui

```
const gui = new dat.GUI();
const options = {
    sphereColor: 0x0000ff,
    wireframe: false,
    HorizontalSpeed: 0.15,
    VerticalSpeed: 0.15,
};
gui.addColor( options, 'sphereColor' ).onChange(function(e){
    sphere.material.color.set(e);
})
gui.add( options, 'wireframe' ).onChange(function(e){
    sphere.material.wireframe = e;
})
```



- Finally, updating the sphere function, it updates the sphere with its new coordinates and checks if collision occurred the padel or any brick. If the y coordinate of the ball went lower than the padel then game is over.

```
var counter = 0;
var sphereHorizontalDirection = 1;
var sphereVerticalDirection = -1;
function updateSpherePosition() {
    sphere.position.x = sphere.position.x + options.HorizontalSpeed *
sphereHorizontalDirection;
    sphere.position.y = sphere.position.y + options.VerticalSpeed *
sphereVerticalDirection;
    //if sphere hit the edge of the field or players then change direction
    if (sphere.position.x < -14 || sphere.position.x >14) {
      sphereHorizontalDirection *= -1;
```

```
    }
    if (sphere.position.y > 14) {
      sphereVerticalDirection *= -1;
    }
    if (sphere.position.y < -14) {
      gameOver();
    }

    // if sphere hits a padel it changes direction
    if (sphere.position.y < -11 && sphere.position.x > padel.position.x - 3
&& sphere.position.x < padel.position.x + 3) {
      sphereVerticalDirection *= -1;
      sphereHorizontalDirection = Math.random() * 2 - 1;
    }

    // if sphere hits a brick it changes direction and brick is removed
    for (let i = 0; i < bricks.length; i++){
      for (let j = 0; j < bricks[i].length; j++){
        if (sphere.position.y > bricks[i][j].position.y - 1 &&
sphere.position.y < bricks[i][j].position.y + 1 && sphere.position.x >
bricks[i][j].position.x - 1 && sphere.position.x < bricks[i][j].position.x
+ 1){
          sphereVerticalDirection *= -1;
          sphereHorizontalDirection = Math.random() * 2 - 1;
          scene.remove(bricks[i][j]);
          bricks[i].splice(j, 1);
          counter++;
          updateScoreHTML();
        }
      }
    }
  }
```

References

Three.js. three.js docs. (n.d.). Retrieved January 6, 2023, from https://threejs.org/docs/