MANİSA CELAL BAYAR UNIVERSITY

CSE 3114 / CSE 3219

COMPUTER GRAPHICS

SPRING 2023

Midterm Assignment Report

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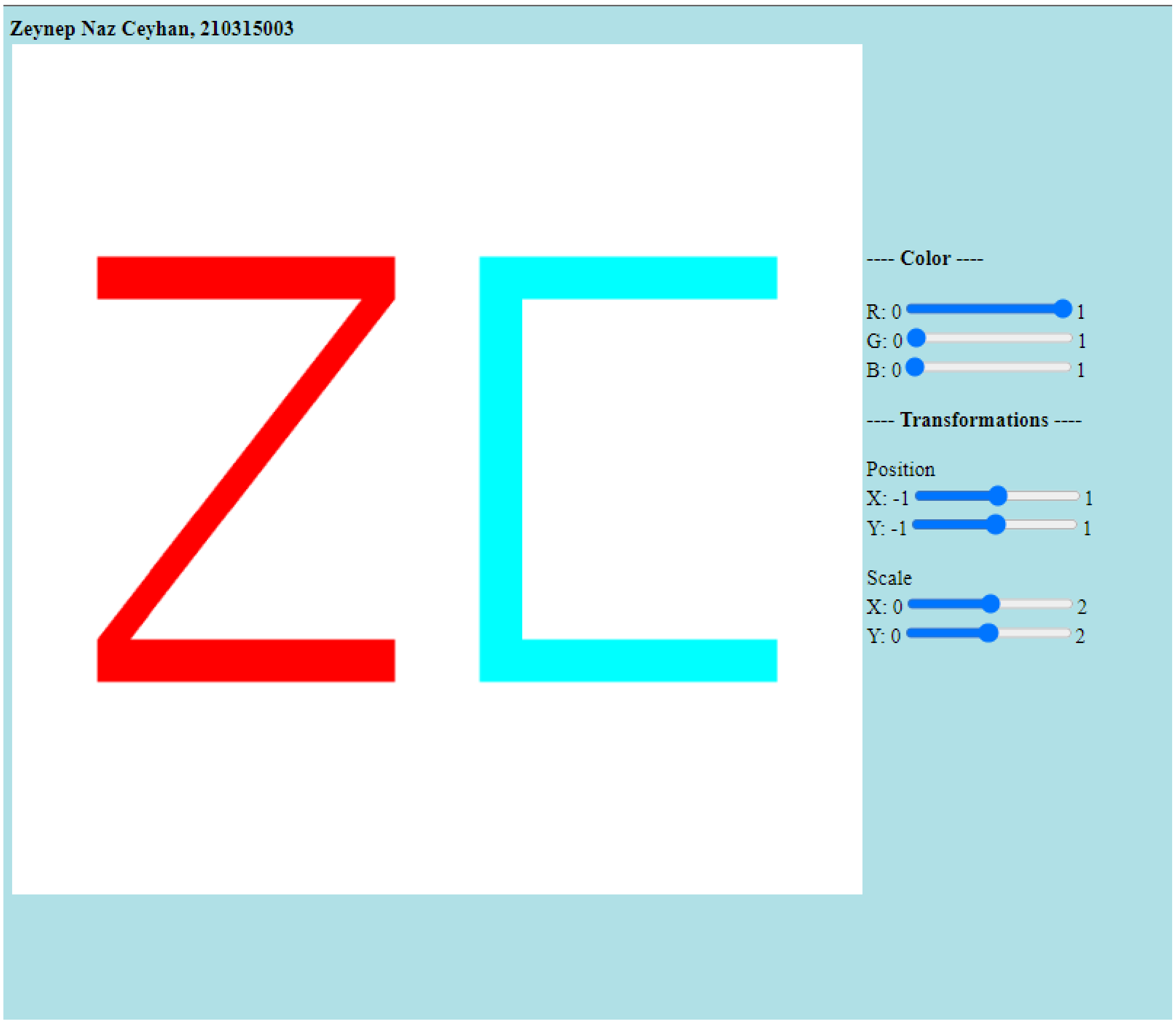
Program Output


Zeynep Naz Ceyhan, 210315003

Reflections

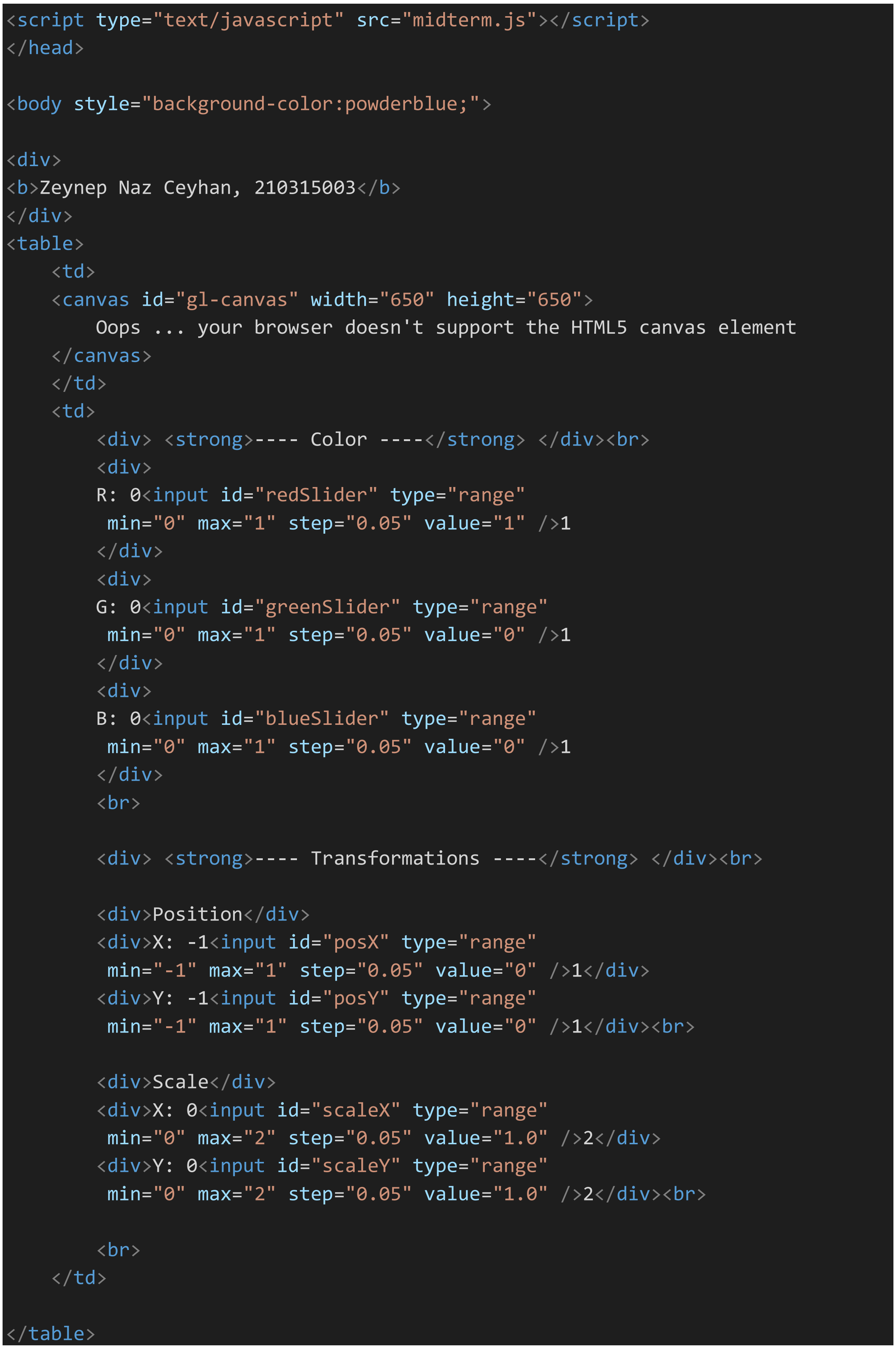
In this project, I first had difficulty with the letter Z, then I was able to do it by changing the coordinates. The fact that the colors are contrasting colors made it hard for me. I also encountered a lot of errors in the Scale section. But with trial and error, I finally got it.

Source Code

HTML Codes:

```
<!DOCTYPE html>
<html>
<head>
```

```
<meta http-equiv="Content-Type" content="text/html;charset=utf-8" >
<title>Midterm Exam</title>

<script id="vertex-shader" type="x-shader/x-vertex">
attribute vec4 vPosition;

// TODO: get required variables


uniform float x;
uniform float y;

uniform float scaleX;
uniform float scaleY;


void main()
{
    // TODO: calculate gl_Position appropriately


    gl_Position.x = vPosition.x * scaleX + x;
    gl_Position.y = vPosition.y * scaleY + y;
    gl_Position.z = 0.0;
    gl_Position.w = 1.0;


}
</script>

<script id="fragment-shader" type="x-shader/x-fragment">

precision mediump float;

// TODO: get required variables

uniform vec4 color;

void main()
{
    // TODO: assign color

    gl_FragColor = color;
}
</script>

<script type="text/javascript" src="../Common/webgl-utils.js"></script>
<script type="text/javascript" src="../Common/initShaders.js"></script>
<script type="text/javascript" src="../Common/MV.js"></script>
```



```html
<script type="text/javascript" src="midterm.js"></script>
</head>

<body style="background-color:powderblue;">

<div>
<b>Zeynep Naz Ceyhan, 210315003</b>
</div>
<table>
    <td>
    <canvas id="gl-canvas" width="650" height="650">
        Oops ... your browser doesn't support the HTML5 canvas element
    </canvas>
    </td>
    <td>
        <div> <strong>---- Color ----</strong> </div><br>
        <div>
        R: 0<input id="redSlider" type="range"
         min="0" max="1" step="0.05" value="1" />1
        </div>
        <div>
        G: 0<input id="greenSlider" type="range"
         min="0" max="1" step="0.05" value="0" />1
        </div>
        <div>
        B: 0<input id="blueSlider" type="range"
         min="0" max="1" step="0.05" value="0" />1
        </div>
        <br>

        <div> <strong>---- Transformations ----</strong> </div><br>

        <div>Position</div>
        <div>X: -1<input id="posX" type="range"
         min="-1" max="1" step="0.05" value="0" />1</div>
        <div>Y: -1<input id="posY" type="range"
         min="-1" max="1" step="0.05" value="0" />1</div><br>

        <div>Scale</div>
        <div>X: 0<input id="scaleX" type="range"
         min="0" max="2" step="0.05" value="1.0" />2</div>
        <div>Y: 0<input id="scaleY" type="range"
         min="0" max="2" step="0.05" value="1.0" />2</div><br>

        <br>
    </td>

</table>
```

```
<div>
</body>
</html>
```

JAVASCRIPT Codes:

```
var canvas;
var gl;
var vPosition;
var program;

var color;

var red = 1.0;
var green = 0.0;
var blue = 0.0;

var x = 0.0;
var y = 0.0;

var scaleX = 1.0;
var scaleY = 1.0;


// TODO: define any global variables you need

window.onload = function init() {
    canvas = document.getElementById("gl-canvas");

    gl = WebGLUtils.setupWebGL(canvas);
    if (!gl) { alert("WebGL isn't available"); }

    //  Configure WebGL
    gl.viewport(0, 0, canvas.width, canvas.height);
    gl.clearColor(1.0, 1.0, 1.0, 1.0);

    //  Load shaders and initialize attribute buffers
    program = initShaders(gl, "vertex-shader", "fragment-shader");
    gl.useProgram(program);

    // Create geometry data

    // TODO: create vertex coordinates for your initial letters instead of
these vertices
```

```
// for Z;
letter1vertices = [vec2(-0.8, 0.4),
vec2(-0.8, 0.5),
vec2(-0.1, 0.4),
vec2(-0.1, 0.5)];



letter7vertices = [vec2(-0.1, 0.5),
vec2(-0.8, -0.4),
vec2(-0.1, 0.4),
vec2(-0.8, -0.5)];

letter8vertices = [vec2(-0.8, -0.4),
vec2(-0.8, -0.5),
vec2(-0.1, -0.4),
vec2(-0.1, -0.5)];

// for C;
letter2vertices = [vec2(0.1, -0.4),
vec2(0.2, -0.4),
vec2(0.1, 0.4),
vec2(0.2, 0.4)];

letter3vertices = [vec2(0.1, -0.4),
vec2(0.1, -0.5),
vec2(0.8, -0.4),
vec2(0.8, -0.5)];



letter5vertices = [vec2(0.1, 0.4),
vec2(0.1, 0.5),
vec2(0.8, 0.4),
vec2(0.8, 0.5)];





// Load the data into the GPU
buffer1 = gl.createBuffer();
gl.bindBuffer(gl.ARRAY_BUFFER, buffer1);
gl.bufferData(gl.ARRAY_BUFFER, flatten(letter1vertices), gl.STATIC_DRAW);

buffer2 = gl.createBuffer();
gl.bindBuffer(gl.ARRAY_BUFFER, buffer2);
gl.bufferData(gl.ARRAY_BUFFER, flatten(letter2vertices), gl.STATIC_DRAW);
```

```
buffer3 = gl.createBuffer();
gl.bindBuffer(gl.ARRAY_BUFFER, buffer3);
gl.bufferData(gl.ARRAY_BUFFER, flatten(letter3vertices), gl.STATIC_DRAW);


buffer5 = gl.createBuffer();
gl.bindBuffer(gl.ARRAY_BUFFER, buffer5);
gl.bufferData(gl.ARRAY_BUFFER, flatten(letter5vertices), gl.STATIC_DRAW);


buffer7 = gl.createBuffer();
gl.bindBuffer(gl.ARRAY_BUFFER, buffer7);
gl.bufferData(gl.ARRAY_BUFFER, flatten(letter7vertices), gl.STATIC_DRAW);

buffer8 = gl.createBuffer();
gl.bindBuffer(gl.ARRAY_BUFFER, buffer8);
gl.bufferData(gl.ARRAY_BUFFER, flatten(letter8vertices), gl.STATIC_DRAW);



xLoc = gl.getUniformLocation(program, "x");
yLoc = gl.getUniformLocation(program, "y");

scaleXLoc = gl.getUniformLocation(program, "scaleX");
scaleYLoc = gl.getUniformLocation(program, "scaleY");

colorLoc = gl.getUniformLocation(program, "color");


document.getElementById("posX").oninput = function (event) {
    //TODO: fill here to adjust translation according to slider value
    x = event.target.value;
};
document.getElementById("posY").oninput = function (event) {
    //TODO: fill here to adjust translation according to slider value
    y = event.target.value;
};
document.getElementById("scaleX").oninput = function (event) {
    //TODO: fill here to adjust scale according to slider value
    scaleX = event.target.value;
};
document.getElementById("scaleY").oninput = function (event) {
    //TODO: fill here to adjust scale according to slider value
    scaleY = event.target.value;
};
document.getElementById("redSlider").oninput = function (event) {
    //TODO: fill here to adjust color according to slider value
```

```
        red = event.target.value;
    };
    document.getElementById("greenSlider").oninput = function (event) {
        //TODO: fill here to adjust color according to slider value

        green = event.target.value;
    };
    document.getElementById("blueSlider").oninput = function (event) {
        //TODO: fill here to adjust color according to slider value

        blue = event.target.value;
    };

    render();
};


function render() {
    gl.clear(gl.COLOR_BUFFER_BIT);

    // TODO: Send necessary uniform variables to shader and
    // perform draw calls for drawing letters

    // bind vertex buffer and associate position data with shader variables
    gl.bindBuffer(gl.ARRAY_BUFFER, buffer1);
    gl.vertexAttribPointer(vPosition, 2, gl.FLOAT, false, 0, 0);
    gl.enableVertexAttribArray(vPosition);
    // draw triangle
    color = vec4(red, green, blue, 1.0);
    gl.uniform4fv(colorLoc, color);
    gl.drawArrays(gl.TRIANGLE_STRIP, 0, letter1vertices.length);

    // bind vertex buffer and associate position data with shader variables
    gl.bindBuffer(gl.ARRAY_BUFFER, buffer2);
    gl.vertexAttribPointer(vPosition, 2, gl.FLOAT, false, 0, 0);
    gl.enableVertexAttribArray(vPosition);
    // draw rectangle
    color = vec4(1 - red, 1 - green, 1 - blue, 1.0);
    gl.uniform4fv(colorLoc, color);
    gl.drawArrays(gl.TRIANGLE_STRIP, 0, letter2vertices.length);

    // bind vertex buffer and associate position data with shader variables
    gl.bindBuffer(gl.ARRAY_BUFFER, buffer3);
    gl.vertexAttribPointer(vPosition, 2, gl.FLOAT, false, 0, 0);
    gl.enableVertexAttribArray(vPosition);
    // draw rectangle
    color = vec4(1 - red, 1 - green, 1 - blue, 1.0);
    gl.uniform4fv(colorLoc, color);
    gl.drawArrays(gl.TRIANGLE_STRIP, 0, letter3vertices.length);
    // bind vertex buffer and associate position data with shader variables
    gl.bindBuffer(gl.ARRAY_BUFFER, buffer5);
    gl.vertexAttribPointer(vPosition, 2, gl.FLOAT, false, 0, 0);
    gl.enableVertexAttribArray(vPosition);
    // draw rectangle
    color = vec4(1 - red, 1 - green, 1 - blue, 1.0);
    gl.uniform4fv(colorLoc, color);
    gl.drawArrays(gl.TRIANGLE_STRIP, 0, letter5vertices.length);



    // bind vertex buffer and associate position data with shader variables
    gl.bindBuffer(gl.ARRAY_BUFFER, buffer7);
    gl.vertexAttribPointer(vPosition, 2, gl.FLOAT, false, 0, 0);
    gl.enableVertexAttribArray(vPosition);
    // draw rectangle
    color = vec4(red, green, blue, 1.0);
    gl.uniform4fv(colorLoc, color);
    gl.drawArrays(gl.TRIANGLE_STRIP, 0, letter7vertices.length);

    // bind vertex buffer and associate position data with shader variables
    gl.bindBuffer(gl.ARRAY_BUFFER, buffer8);
    gl.vertexAttribPointer(vPosition, 2, gl.FLOAT, false, 0, 0);
    gl.enableVertexAttribArray(vPosition);
    // draw rectangle
    color = vec4(red, green, blue, 1.0);
    gl.uniform4fv(colorLoc, color);
    gl.drawArrays(gl.TRIANGLE_STRIP, 0, letter8vertices.length);



    gl.uniform1f(xLoc, x);
    gl.uniform1f(yLoc, y);

    gl.uniform1f(scaleXLoc, scaleX);
    gl.uniform1f(scaleYLoc, scaleY);

    window.requestAnimFrame(render);
}
```