Kathmandu University

Department of Computer Science and Engineering

Dhulikhel, Kavre

A Report on '**Lab Work 1'** [COMP 342]

Submitted by:

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III-year, II semester

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Qlab1

1. ***Get Familiar with the coordinate system and draw a flag of Nepal using the chosen graphics library.***

Solution:

https://flagwebgl.netlify.app

I have used JavaScript as the programming language and WebGL as the graphics library. **JavaScript** is a popular programming language that is used for web development and has the capability of creating interactive graphics and animations on the web. **WebGL** is a graphics library that enables high-performance 3D graphics library that enables high-performance 3D graphics rendering in web browser using JavaScript. These technologies provide a powerful platform for creating engaging and interactive graphics, which is essential for my lab work.

The code snippets for setting graphics environment in my chosen graphics library and programming language and display system resolution are as follow:

Code snippets for setting graphics environment:

.html

```
  <canvas class="display_area" id="canvas"></canvas>
```

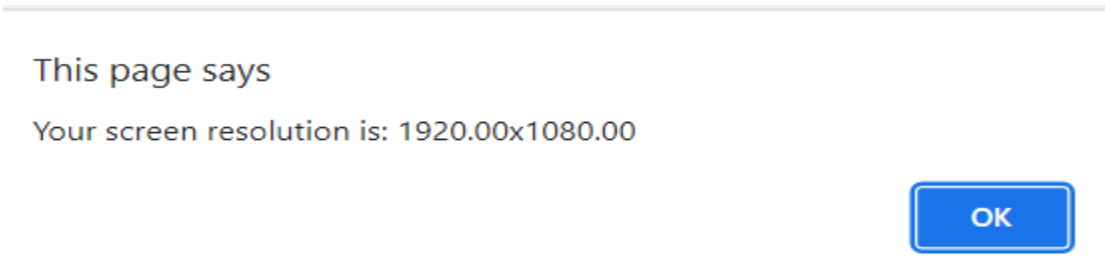
.js

```
var canvas = document.querySelector("canvas");
var gl = canvas.getContext("webgl");

if (!gl) {
  throw new Error("WebGL not supported");
}
//  supported
```

Code snippets to get display system resolution:

```
function getResolution() {
  alert("Your screen resolution is: " +
      (window.screen.width * window.devicePixelRatio).toFixed(2) +
      "x" +(window.screen.height * window.devicePixelRatio).toFixed(2)
  );
}
getResolution();
```



Source Code:

https://github.com/ChandankMahato/Graphics_Lab_6th_Sem

flag.html

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
    <meta name="language" content="English" />
    <meta name="author" content="Chandan Kumar Mahato" />
    <title>Nepal Flag WebGL</title>
</head>
<body>
    <canvas class="display_area" id="canvas"></canvas>
    <script src="./javaScript/sunData.js"></script>
    <script src="./javaScript/moonData.js"></script>
    <script src="./javaScript/data.js"></script>
    <script src="./javaScript/flag.js"></script>
</body>
</html>
```

<Script/>

sunData.js

```
var sunVertexData = [];
function createSunVertexList(radius, xo, yo) {
  for (i = 0; i < 360; i += 15) {
    sunVertexData.push(...[xo, yo, 0]);
    x = radius * Math.cos((Math.PI / 180) * i) + xo;
    y = radius * Math.sin((Math.PI / 180) * i) + yo;
    sunVertexData.push(...[x, y, 0]);
    x = radius * Math.cos((Math.PI / 180) * (i + 15)) + xo;
    y = radius * Math.sin((Math.PI / 180) * (i + 15)) + yo;
    sunVertexData.push(...[x, y, 0]);
  }
}
createSunVertexList(0.75, 1.25, 1.25);
var sunSpikeData = [];
function createSunSpikeList(radius, xo, yo) {
  midWidth = radius / 8;
  for (i = -15; i < 375; i += 30) {
    x = radius * Math.cos((Math.PI / 180) * i) + xo;
    y = radius * Math.sin((Math.PI / 180) * i) + yo;
    sunSpikeData.push(...[x, y, 0]);
    x = radius * Math.cos((Math.PI / 180) * (i + 30)) + xo;
    y = radius * Math.sin((Math.PI / 180) * (i + 30)) + yo;
    sunSpikeData.push(...[x, y, 0]);
    if (i <= 90) {
      x = radius * Math.cos((Math.PI / 180) * (i + 15)) + xo + midWidth;
      y = radius * Math.sin((Math.PI / 180) * (i + 15)) + yo + midWidth;
      sunSpikeData.push(...[x, y, 0]);
    } else if (i <= 180) {
      x = radius * Math.cos((Math.PI / 180) * (i + 15)) + xo - midWidth;
      y = radius * Math.sin((Math.PI / 180) * (i + 15)) + yo + midWidth;
      sunSpikeData.push(...[x, y, 0]);
    } else if (i <= 270) {
      x = radius * Math.cos((Math.PI / 180) * (i + 15)) + xo - midWidth;
      y = radius * Math.sin((Math.PI / 180) * (i + 15)) + yo - midWidth;
      sunSpikeData.push(...[x, y, 0]);
    } else if (i <= 360) {
      x = radius * Math.cos((Math.PI / 180) * (i + 15)) + xo + midWidth;
      y = radius * Math.sin((Math.PI / 180) * (i + 15)) + yo - midWidth;
      sunSpikeData.push(...[x, y, 0]);
    }}}
createSunSpikeList(0.75, 1.25, 1.25);
```

moonData.js

```
//moon
var moonVertexData = [];
function createMoonVertexList(radius, xo, yo) {
  for (i = 0; i > -180; i -= 15) {
    moonVertexData.push(...[xo, yo, 0]);
    x = radius * Math.cos((Math.PI / 180) * i) + xo;
    y = radius * Math.sin((Math.PI / 180) * i) + yo;
    moonVertexData.push(...[x, y, 0]);
    x = radius * Math.cos((Math.PI / 180) * (i - 15)) + xo;
    y = radius * Math.sin((Math.PI / 180) * (i - 15)) + yo;
    moonVertexData.push(...[x, y, 0]);
  }
}
createMoonVertexList(0.75, 1.25, 4.25);
var moonSpikeData = [];
function createMoonSpikeList(radius, xo, yo) {
  gap = radius / 4;
  midWidth = gap / 2;
  leftX = xo - radius;
  leftY = yo;
  rightX = xo + gap - radius;
  rightY = yo;
  topX = leftX + midWidth;
  topY = yo + gap;
  for (i = 0; i < 8; i++) {
    moonSpikeData.push(
      ...[leftX, leftY, 0],
      ...[rightX, rightY, 0],
      ...[topX, topY, 0]
    );
    leftX = rightX;
    rightX = rightX + gap;
    topX = topX + gap;
  }
}
createMoonSpikeList(0.75, 1.25, 4.25);
```

data.js

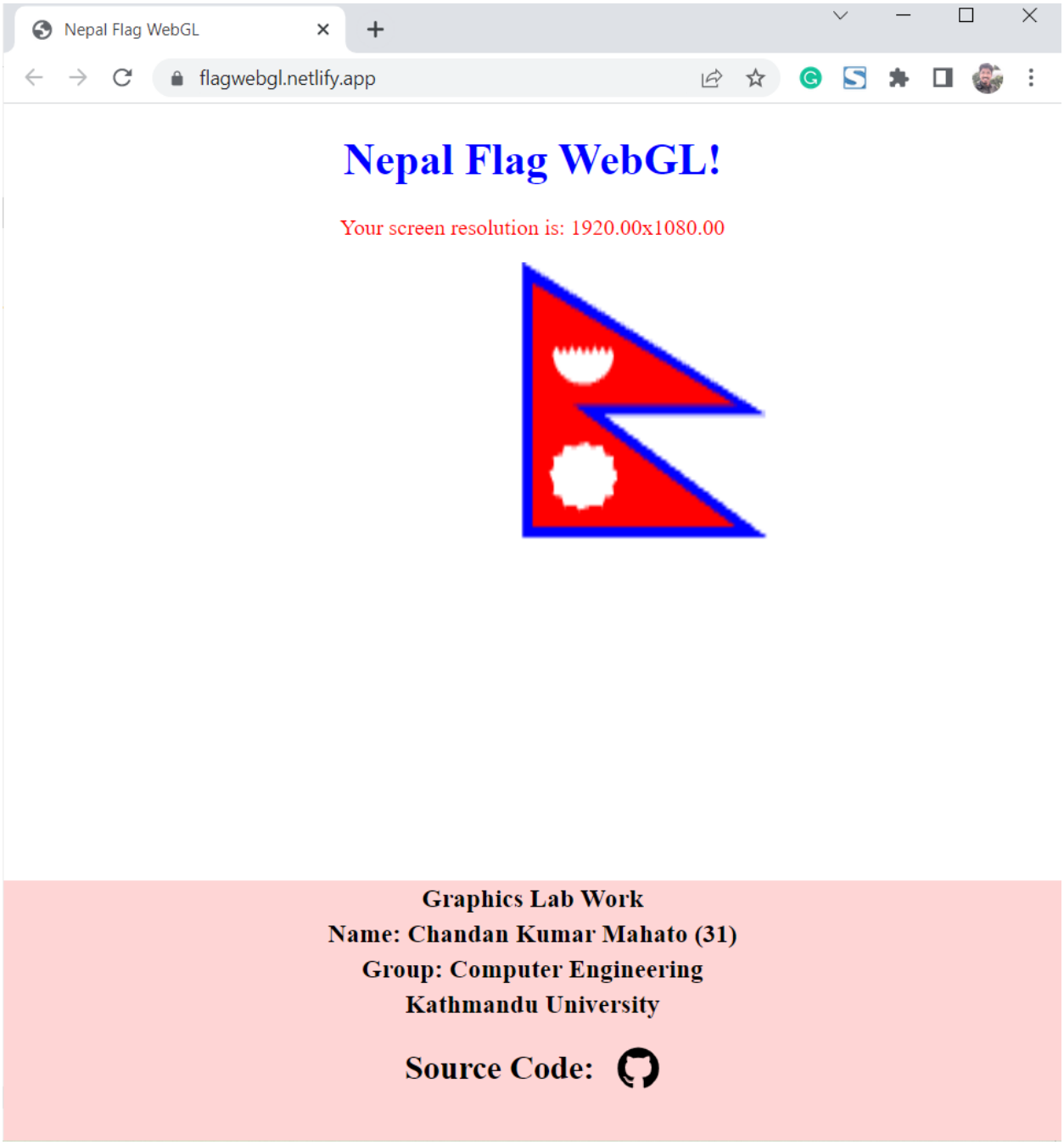
```
//RED PART
t1 = [...[0, 0, 0], ...[0, 3.75, 0], ...[5, 0, 0]];
t2 = [...[0, 3, 0], ...[0, 6, 0], ...[5, 3, 0]];
//Blue PART
t3 = [...[5.75, 2.75, 0], ...[-0.25, 6.5, 0], ...[-0.25, 2.75, 0]];
t4 = [...[-0.25, -0.25, 0], ...[5.75, -0.25, 0], ...[-0.25, 4.25, 0]];
//processing data
const vertexData = [];
const dataArray = [
  ...t1,
  ...t2,
  ...t3,
  ...t4,
  ...sunVertexData,
  ...moonVertexData,
  ...moonSpikeData,
  ...sunSpikeData,
];
for (i = 0; i < dataArray.length; i++) {
  y = dataArray[i] / 6.5;
  vertexData.push(y);
}
```

flag.js

```
document.getElementById("resolution").innerHTML =
  "Your screen resolution is: " +
  (window.screen.width * window.devicePixelRatio).toFixed(2) +
  "x" +
  (window.screen.height * window.devicePixelRatio).toFixed(2);

var canvas = document.querySelector("canvas");
var gl = canvas.getContext("webgl");
if (!gl) {
  throw new Error("WebGL not supported");
}
const buffer = gl.createBuffer();
gl.bindBuffer(gl.ARRAY_BUFFER, buffer);
gl.bufferData(gl.ARRAY_BUFFER, new Float32Array(vertexData), gl.STATIC_DRAW);
const vertexShader = gl.createShader(gl.VERTEX_SHADER);
gl.shaderSource(
  vertexShader,
  `attribute vec3 position;void main() {gl_Position = vec4(position, 1);}`
);
gl.compileShader(vertexShader);
function Triangles(color, start, end) {
  const fragmentShader = gl.createShader(gl.FRAGMENT_SHADER);
  gl.shaderSource(fragmentShader, `${color}`);
  gl.compileShader(fragmentShader);
  const program = gl.createProgram();
  gl.attachShader(program, vertexShader);
  gl.attachShader(program, fragmentShader);
  gl.linkProgram(program);
  const positionLocation = gl.getAttribLocation(program, `position`);
  gl.enableVertexAttribArray(positionLocation);
  gl.vertexAttribPointer(positionLocation, 3, gl.FLOAT, false, 0, 0);
  gl.useProgram(program);
  for (let i = start; i <= end; i += 3) {
    gl.drawArrays(gl.TRIANGLES, i, 3);
  }
}
Triangles(`void main() {gl_FragColor = vec4(0, 0, 1, 1);}`, 6, 9); //Blue
Triangles(`void main() {gl_FragColor = vec4(1, 0, 0, 1);}`, 0, 3); //Red
Triangles(`void main() {gl_FragColor = vec4(1, 1, 1, 1);}`, 12, 230); //White
```

Output:


Nepal Flag WebGL
flagwebgl.netlify.app
Nepal Flag WebGL!
Your screen resolution is: 1920.00x1080.00
Graphics Lab Work
Name: Chandan Kumar Mahato (31)
Group: Computer Engineering
Kathmandu University
Source Code:

Conclusion

By getting familiar with the coordinate system and utilizing the graphics geometrical functions and classes provided by our chosen graphics library, I was able to successfully draw the flag of Nepal. This exercise helped me to develop a better understanding of the coordinate system and the use of graphics geometrical functions and classes to create visually appealing graphics.

Rough Sketch

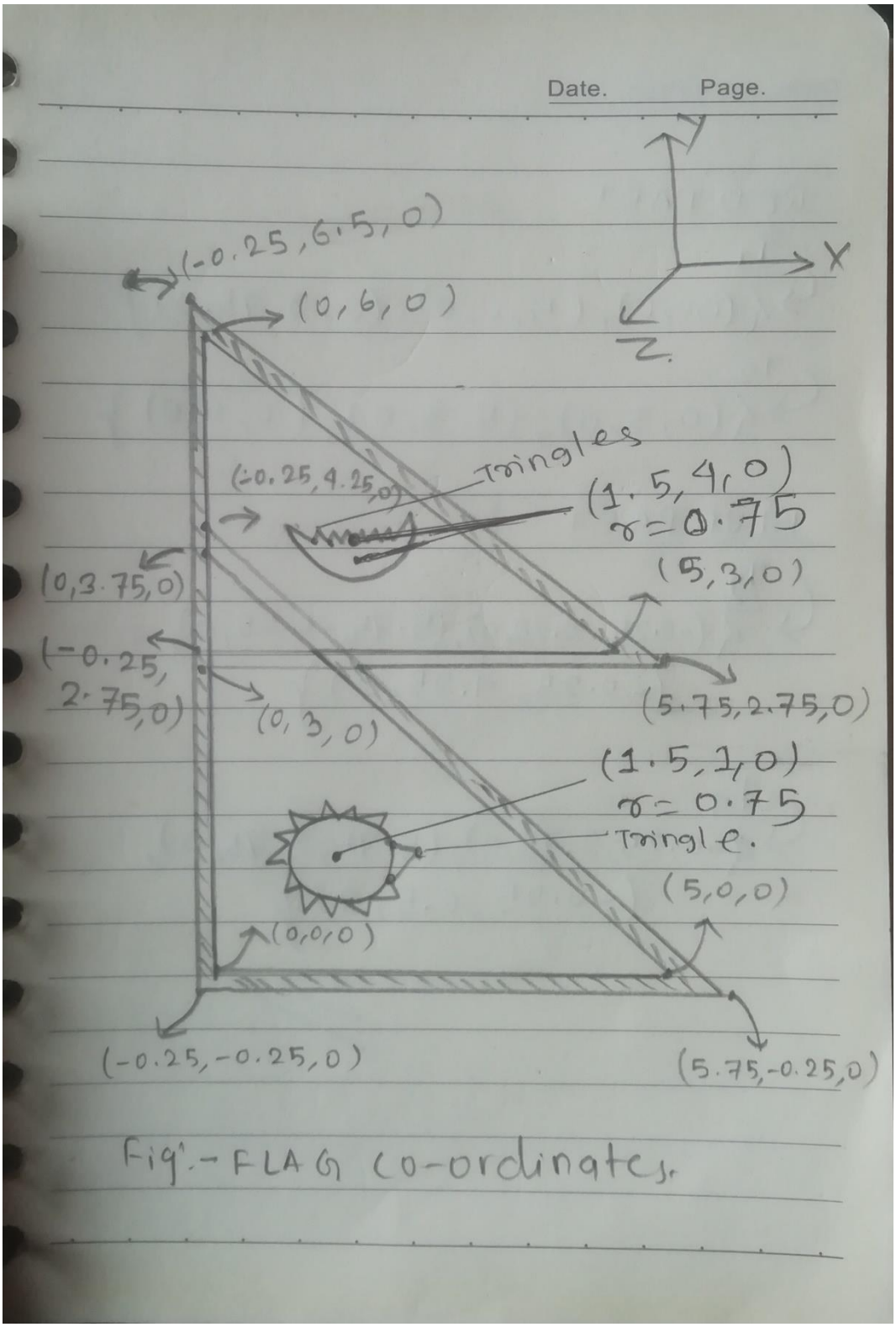
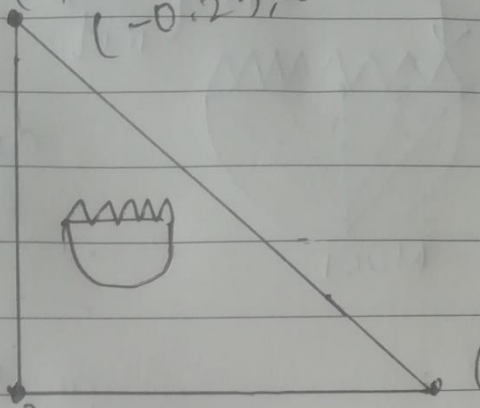
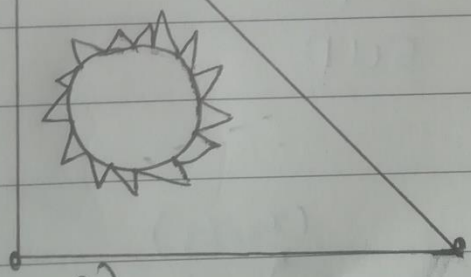


Fig:- FLAG co-ordinates.

Date. Page.

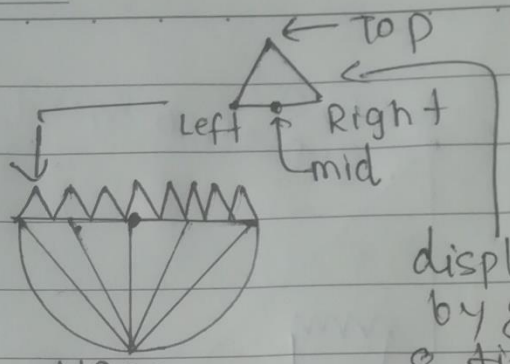


(0, 6, 0)
(-0.25, 6.5, 0)
(0, 3, 0)
(-0.25, 2.75, 0)
(5, 3, 0)
(5.75, 2.75, 0)



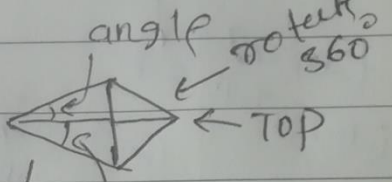
(0, 3.75, 0)
(-0.25, 4.25, 0)
(5, 0, 0)
(0, 0, 0)
(-0.25, -0.25, 0)
(5.75, -0.25, 0)

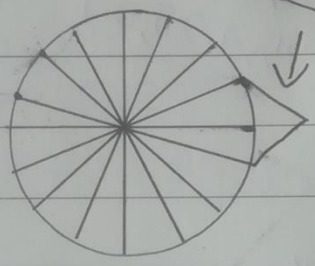
Date. Page.



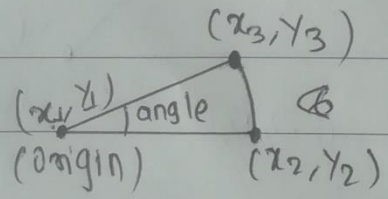
displace by gap 8 times

MOON





SUN



Rotate this 360° - SUN

180° - MOON