SPRAWOZDANIE

Zajęcia: Grafika komputerowa
Prowadzący: prof. dr hab. Vasyl Martsenyuk

Laboratorium 8
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Temat: Three.js

Wariant 9

Gabriel Mrzygłód
Informatyka I stopień,
niestacjonarne,
4 semestr,
Gr.2a

1. Polecenie:

Celem jest konstruowanie złożonego modelu za pomocą three.js - animowanej karuzeli (podstawa karuzeli jest wielokątem odpowiednio z konfiguracją zadania) i co najmniej jednego innego wybranego modelu

2. Wprowadzane dane:

Trzynastokąt

3. Wykorzystane komendy:

a) kod źródłowy

```
<!DOCTYPE html>
<head>
<meta charset="UTF-8">
<title>CS 424 Lab 9</title>
<script src="https://cdn.jsdelivr.net/npm/three@0.115/build/three.js"></script>
<script src="https://cdn.jsdelivr.net/npm/three@0.115/examples/js/controls/
OrbitControls.js"></script>
<script src="https://cdn.jsdelivr.net/npm/three@0.115/examples/js/loaders/GLTFLoader.js"></
script>
<script>

"use strict";

var canvas, renderer, scene, camera; // Standard three.js requirements.

var controls;  // An OrbitControls object that is used to implement
               // rotation of the scene using the mouse.  (It actually rotates
               // the camera around the scene.)

var animating = false;  // Set to true when an animation is in progress.
var frameNumber = 0;  // Frame number is advanced by 1 for each frame while animating.

var floor;
var pole1,pole2,pole3,pole4,pole5;
var pivot1,pivot2,pivot3,pivot4,pivot5;
var roof;
var roof2;
var k1,k2,k3,k4,k5,k6;
/**
 *  The render function draws the scene.
 */
```

```
function render() {
   renderer.render(scene, camera);
}


/**
 * This function is called by the init() method to create the world.
 */
function createWorld() {

   renderer.setClearColor("white"); // Background color for scene.
   scene = new THREE.Scene();

   // ------------------- Make a camera with viewpoint light ----------------------

   camera = new THREE.PerspectiveCamera(30, canvas.width/canvas.height, 0.1, 100);
   camera.position.z = 40;
        camera.position.y = 20;
   var light;  // A light shining from the direction of the camera; moves with the camera.
   light = new THREE.DirectionalLight();
   light.position.set(0,0,1);
   camera.add(light);
   scene.add(camera);

   //------------------- Create the scene's visible objects ----------------------
        floor =  new THREE.Mesh(
          new THREE.CylinderGeometry(13.5,13.5,0.6,13,1),
          new THREE.MeshPhongMaterial({
            color: 0x331c84,
            specular: 0x222222,
            shininess: 16,
            shading: THREE.FlatShading
          })
   );
   floor.rotation.y = Math.PI/12;
   scene.add(floor);

var geometry = new THREE.SphereGeometry(3.7, 32, 32);
var textureLoader = new THREE.TextureLoader();
textureLoader.load(
   'earth.jpg',  // Make sure this path is correct!
   function(texture) {
      console.log('Texture loaded successfully');
      var material = new THREE.MeshPhongMaterial({ map: texture });
      var sphere = new THREE.Mesh(geometry, material);
      sphere.position.y = 3.8;
      scene.add(sphere);
   },
```

```
    undefined,  // Progress handler can be added if needed.
    function(error) {
        console.error('An error occurred while loading the texture:', error);
    }
);

var texture = textureLoader.load();

var material = new THREE.MeshPhongMaterial({ map: texture });
var sphere = new THREE.Mesh(geometry, material);
sphere.position.y = 3.8; // Przesunięcie w osi Y, aby umieścić kulę na podłożu.

scene.add(sphere);

        pole1 =  new THREE.Mesh(
          new THREE.CylinderGeometry(0.3,0.3,7.5,30,1),
          new THREE.MeshPhongMaterial({
            color: 0x7c5426,
            specular: 0x222222,
            shininess: 8,
            shading: THREE.FlatShading
          })
    );
    pole1.position.x=11.2;
    pole1.position.y=3.9;
    pole1.position.z=0.55;
    pole1.rotation.y = Math.PI/12;
    scene.add(pole1);

        pole2 =  new THREE.Mesh(
          new THREE.CylinderGeometry(0.3,0.3,7.5,30,1),
          new THREE.MeshPhongMaterial({
            color: 0x7c5426,
            specular: 0x222222,
            shininess: 8,
            shading: THREE.FlatShading
          })
    );
    pole2.position.x=-9.5;
    pole2.position.y=3.9;
    pole2.position.z=6.2;
        pole2.rotation.y = Math.PI/12;
        scene.add(pole2);

        pole3 =  new THREE.Mesh(
          new THREE.CylinderGeometry(0.3,0.3,7.5,30,1),
          new THREE.MeshPhongMaterial({
            color: 0x7c5426,
```

```
            specular: 0x222222,
            shininess: 8,
            shading: THREE.FlatShading
          })
    );
    pole3.position.x=2.95;
    pole3.position.y=3.9;
    pole3.position.z=11;
        pole3.rotation.y = Math.PI/12;
        scene.add(pole3);

    pole4 =  new THREE.Mesh(
          new THREE.CylinderGeometry(0.3,0.3,7.5,30,1),
          new THREE.MeshPhongMaterial({
            color: 0x7c5426,
            specular: 0x222222,
            shininess: 8,
            shading: THREE.FlatShading
          })
    );
    pole4.position.x=4;
    pole4.position.y=3.9;
    pole4.position.z=-10.5;
        pole4.rotation.y = Math.PI/12;
        scene.add(pole4);


    pole5 =  new THREE.Mesh(
          new THREE.CylinderGeometry(0.3,0.3,7.5,30,1),
          new THREE.MeshPhongMaterial({
            color: 0x7c5426,
            specular: 0x222222,
            shininess: 8,
            shading: THREE.FlatShading
          })
    );
    pole5.position.x=-8.7;
    pole5.position.y=3.9;
    pole5.position.z=-7.1;
        pole5.rotation.y = Math.PI/12;
        scene.add(pole5);

        roof = new THREE.Mesh(
    new THREE.CylinderGeometry(0, 13.4, 3, 13, 1, true), // Sześciokątny cylinder z podstawą o
promieniu 12 i wysokości 3.
    new THREE.MeshPhongMaterial({
       color: 0x441c84,
       specular: 0x222222,
```

```
      shininess: 8,
      shading: THREE.FlatShading
    })
);
roof.position.y = 9.1;
roof.rotation.y =(Math.PI / 180) * 15;
scene.add(roof);


      roof2 =  new THREE.Mesh(
        new THREE.CylinderGeometry(13.1,13.1,0.3,13,1),
        new THREE.MeshPhongMaterial({
          color: 0x441c84,
          specular: 0x222222,
          shininess: 8,
          shading: THREE.FlatShading
        })
    );
    roof2.position.y=7.5;
    roof2.rotation.y =(Math.PI / 180) * 15;
        scene.add(roof2);

    var loader = new THREE.GLTFLoader();

    var horse1 = loader.load( 'https://threejs.org/examples/models/gltf/Horse.glb', function ( gltf )
{
    gltf.scene.scale.multiplyScalar( 0.03 );
    gltf.scene.position.x =3;
    gltf.scene.position.x = 11;
            gltf.scene.position.z = 1;
            gltf.scene.position.y = 1;
            gltf.scene.rotation.y = Math.PI;
    pivot1.add(gltf.scene);
});

var horse2 = loader.load( 'https://threejs.org/examples/models/gltf/Horse.glb', function ( gltf ) {
    gltf.scene.scale.multiplyScalar( 0.03 );
    gltf.scene.position.x =3;
            gltf.scene.position.z = 11;
            gltf.scene.position.y = 1;
            gltf.scene.rotation.y = -1.5+Math.PI;
    pivot2.add(gltf.scene);
});



var horse3 = loader.load( 'https://threejs.org/examples/models/gltf/Horse.glb', function ( gltf ) {
    gltf.scene.scale.multiplyScalar( 0.03 );
```

```
    gltf.scene.position.x =4;
            gltf.scene.position.z = -10.5;
            gltf.scene.position.y = 1;
            gltf.scene.rotation.y = 1.2+Math.PI;
    pivot3.add(gltf.scene);
});

var horse4 = loader.load( 'https://threejs.org/examples/models/gltf/Horse.glb', function ( gltf ) {
    gltf.scene.scale.multiplyScalar( 0.03 );
    gltf.scene.position.x =-10;
            gltf.scene.position.z = 6;
            gltf.scene.position.y = 1;
            gltf.scene.rotation.y = -2.7+Math.PI;
    pivot4.add(gltf.scene);        // Add the horse to its pivot point
});

var horse5 = loader.load( 'https://threejs.org/examples/models/gltf/Horse.glb', function ( gltf ) {
    gltf.scene.scale.multiplyScalar( 0.03 );
    gltf.scene.position.x =-9;
            gltf.scene.position.z = -7;
            gltf.scene.position.y = 1;
            gltf.scene.rotation.y = -3.5+Math.PI;
    pivot5.add(gltf.scene);        // Add the horse to its pivot point
});




        var box1 = new THREE.Box3().setFromObject(pole1,horse1);
    var box2 = new THREE.Box3().setFromObject(pole2);
    var box3 = new THREE.Box3().setFromObject(pole3);
    var box4 = new THREE.Box3().setFromObject(pole4);
    var box5 = new THREE.Box3().setFromObject(pole5);

    box1.center( pole1.position );
    box2.center( pole2.position );
    box3.center( pole3.position );
    box4.center( pole4.position );
    box5.center( pole5.position );

        pivot1 = new THREE.Group();
    pivot2 = new THREE.Group();
    pivot3 = new THREE.Group();
    pivot4 = new THREE.Group();
    pivot5 = new THREE.Group();

    scene.add(pivot1);
    scene.add(pivot2);
```

```
   scene.add(pivot3);
   scene.add(pivot4);
   scene.add(pivot5);



   pivot1.add(pole1);
   pivot2.add(pole2);
   pivot3.add(pole3);
   pivot4.add(pole4);
   pivot5.add(pole5);
        pivot3.add(horse1);


} // end function createWorld()


/**
 *  This function is called once for each frame of the animation, before
 *  the render() function is called for that frame.  It updates any
 *  animated properties.  The value of the global variable frameNumber
 *  is incrementd 1 before this function is called.
 */
function updateForFrame() {

   floor.rotation.y += 0.01;
        roof.rotation.y += 0.01;
        roof2.rotation.y += 0.01;

        pivot1.rotation.y += 0.01;
   pivot2.rotation.y += 0.01;
   pivot3.rotation.y += 0.01;
   pivot4.rotation.y += 0.01;
   pivot5.rotation.y += 0.01;

}


/* ---------------------------- MOUSE AND ANIMATION SUPPORT ------------------

/**
 *  This page uses THREE.OrbitControls to let the user use the mouse to rotate
 *  the view.  OrbitControls are designed to be used during an animation, where
 *  the rotation is updated as part of preparing for the next frame.  The scene
 *  is not automatically updated just because the user drags the mouse.  To get
 *  the rotation to work without animation, I add another mouse listener to the
 *  canvas, just to call the render() function when the user drags the mouse.
 *  The same thing holds for touch events -- I call render for any mouse move
```

```
 *  event with one touch.
 */
function installOrbitControls() {
   controls = new THREE.OrbitControls(camera,canvas);
   controls.noPan = true;
   controls.noZoom = true;
   controls.staticMoving = true;
   function move() {
      controls.update();
      if (! animating) {
         render();
      }
   }
   function down() {
      document.addEventListener("mousemove", move, false);
   }
   function up() {
      document.removeEventListener("mousemove", move, false);
   }
   function touch(event) {
      if (event.touches.length == 1) {
         move();
      }
   }
   canvas.addEventListener("mousedown", down, false);
   canvas.addEventListener("touchmove", touch, false);
}

/*  Called when user changes setting of the Animate checkbox. */
function doAnimateCheckbox() {
  var run = document.getElementById("animateCheckbox").checked;
  if (run != animating) {
     animating = run;
     if (animating) {
        requestAnimationFrame(doFrame);
     }
  }
}

/*  Drives the animation, called by system through requestAnimationFrame() */
function doFrame() {
   if (animating) {
      frameNumber++;
      updateForFrame();
      render();
      requestAnimationFrame(doFrame);
   }
}
```

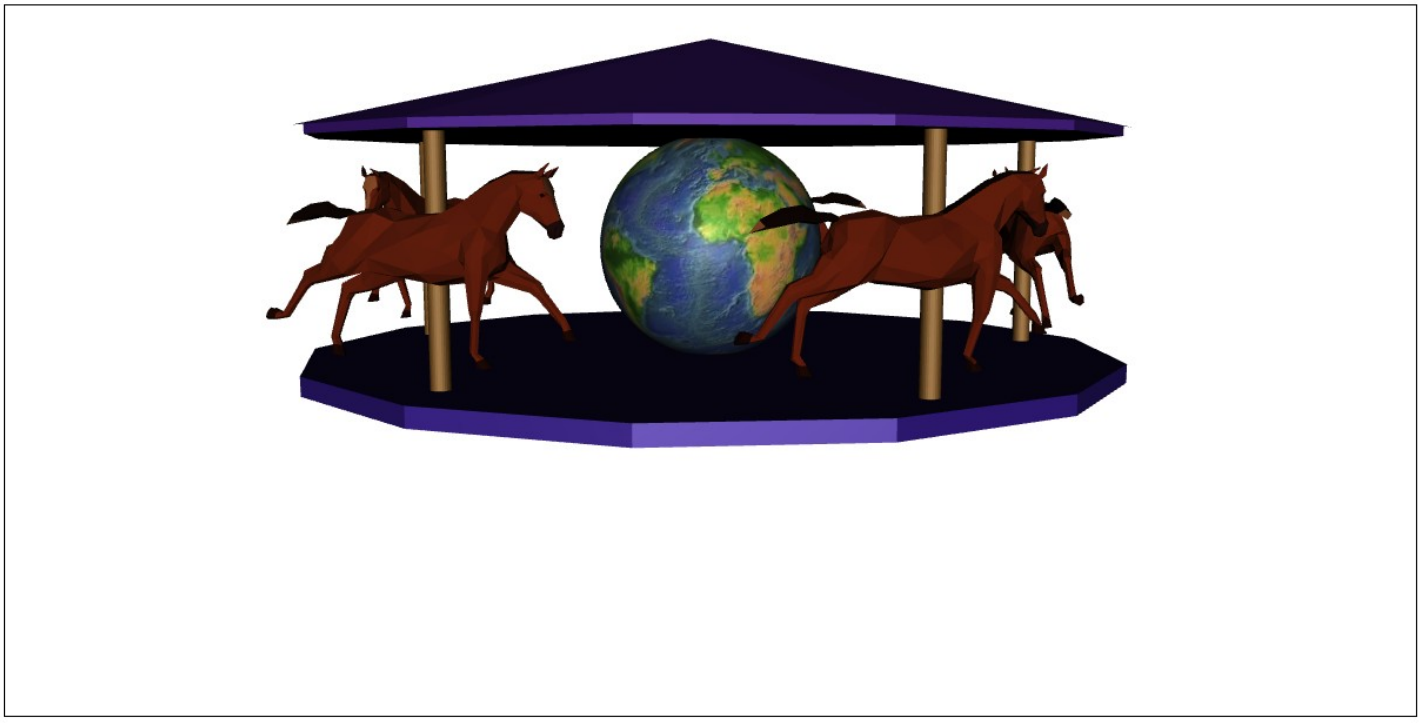
```
/*---------------------------- INITIALIZATION ------------------------------------

/**
 *  This function is called by the onload event so it will run after the
 *  page has loaded.  It creates the renderer, canvas, and scene objects,
 *  calls createWorld() to add objects to the scene, and renders the
 *  initial view of the scene.  If an error occurs, it is reported.
 */
function init() {
   try {
      canvas = document.getElementById("glcanvas");
      renderer = new THREE.WebGLRenderer({
         canvas: canvas,
         antialias: true,
         alpha: false
      });
   }
   catch (e) {
      document.getElementById("message").innerHTML="<b>Sorry, an error occurred:<br>" +
            e + "</b>";
      return;
   }
   document.getElementById("animateCheckbox").checked = false;
   document.getElementById("animateCheckbox").onchange = doAnimateCheckbox;
   createWorld();
   installOrbitControls();
   render();
}

</script>
</head>
<body onload="init()">

<h2>Three.js Modeling Demo: Merry-Go-Round</h2>

<noscript>
  <p style="color: #AA0000; font-weight: bold">Sorry, but this page requires JavaScript!</p>
</noscript>

<p style="color:#AA0000; font-weight: bold" id="message">
</p>

<p>
  <label><input type="checkbox" id="animateCheckbox"><b>Animate</b></label>
  <b style="margin-left:50px">Use the mouse to rotate the model.</b>
</p>
```

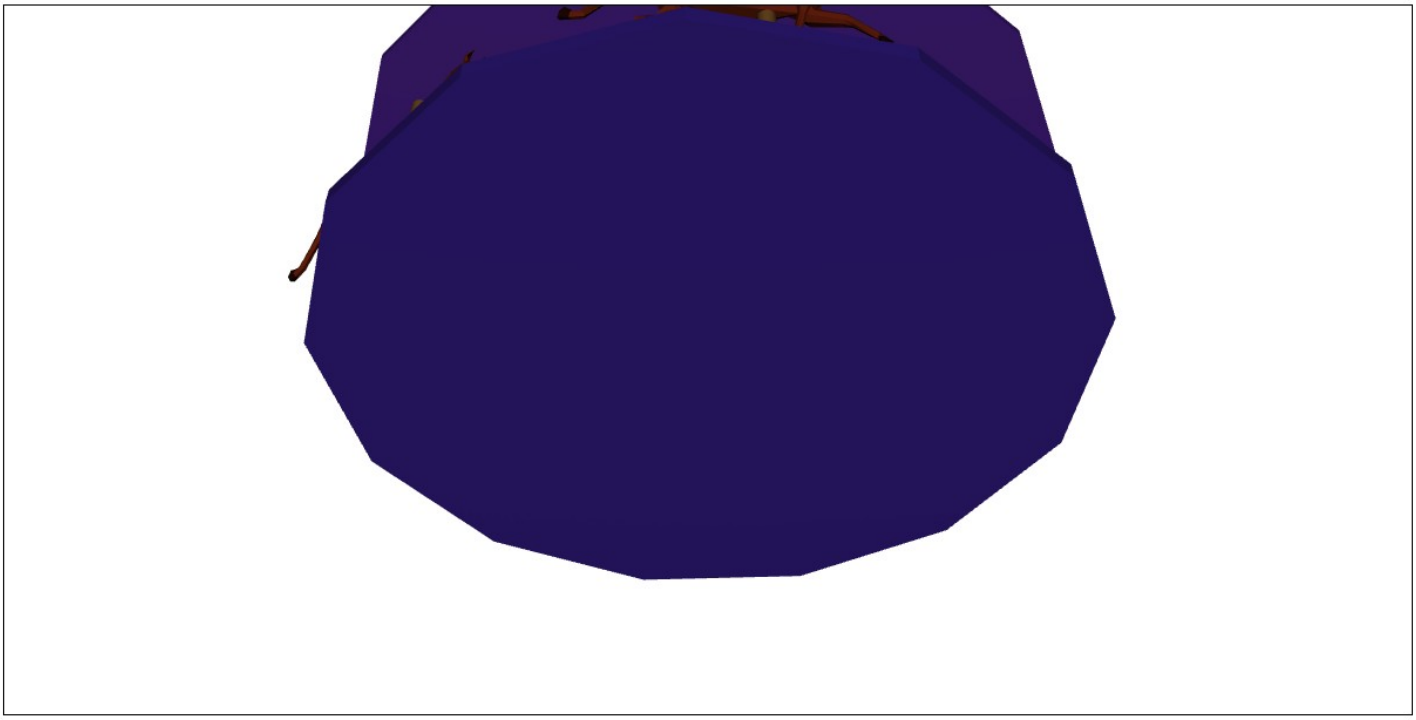
```
<div id="canvas-holder" style="float:left; border: thin solid black; background-color: white">
  <canvas width=1200 height=600 id="glcanvas"></canvas>
</div>

</body>
</html>
```

GitHub: https://github.com/GabrielMrzyglod/Grafika_Lab8

4. Wynik działania:

Zadanie a





5. Wnioski:

Ćwiczenie to umożliwiło mi praktyczne zastosowanie zaawansowanych technik programowania graficznego, takich jak tworzenie niestandardowych geometrii, zarządzanie sceną i implementacja animacji. Wniosek z tego ćwiczenia podkreśla znaczenie praktycznego doświadczenia w rozwijaniu umiejętności rozwiązywania problemów i innowacyjnego myślenia w dziedzinie grafiki komputerowej oraz programowania. Dzięki temu doświadczeniu, zyskałem również lepsze zrozumienie, jak można wykorzystać Three.js w różnych kontekstach projektowych, co będzie cenne w mojej dalszej edukacji i potencjalnych projektach zawodowych.