

МIНIСТЕРСТВО ОСВIТИ І НАУКИ УКРАЇНИ

НАЦІОНАЛЬНИЙ ТЕХНІЧНИЙ УНІВЕРСИТЕТ УКРАЇНИ

“КИЇВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ”

Факультет прикладної математики

Кафедра програмного забезпечення комп’ютерних систем

**Лабораторна робота № 6**

з дисципліни “Математичні та алгоритмічні основи компютерної графіки”

тема «Анімація тривимірних об’єктів»

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Київ 2020

Тема: Анімація тривимірних об’єктів

**Мета**: Навчитися анімувати складні об’єкти тривимірної сцени.

**Завдання на лабораторну роботу**

Виконати анімацію тривимірної сцени за варіантом.

**Варіант 13: Отже, виконую варінт 3.**

3. Анімація риби fish.obj. Риба повинна рухати плавцями, хвостом, головою,

рухатися по екрану.

**Текст коду програм**

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| Fish.java |
| public class Fish extends JFrame{  public Canvas3D myCanvas3D;  public Fish(){  this.setDefaultCloseOperation(JFrame.EXIT\_ON\_CLOSE);  myCanvas3D = new Canvas3D(SimpleUniverse.getPreferredConfiguration());  SimpleUniverse simpUniv = new SimpleUniverse(myCanvas3D);  simpUniv.getViewingPlatform().setNominalViewingTransform();    // set the geometry and transformations  createSceneGraph(simpUniv);  addLight(simpUniv);  OrbitBehavior ob = new OrbitBehavior(myCanvas3D);  ob.setSchedulingBounds(new BoundingSphere(new Point3d(0.0,0.0,0.0), Double.MAX\_VALUE));  simpUniv.getViewingPlatform().setViewPlatformBehavior(ob);  setTitle("Fish");  setSize(700,700);  getContentPane().add("Center", myCanvas3D);  setVisible(true);  }  public void createSceneGraph(SimpleUniverse su){  // loading object  ObjectFile f = new ObjectFile(ObjectFile.RESIZE);  BoundingSphere bs = new BoundingSphere(new Point3d(0.0,0.0,0.0),Double.MAX\_VALUE);  String name;  BranchGroup fishBranchGroup = new BranchGroup();  TextureLoader t = new TextureLoader("sources//ocean.jpg", myCanvas3D);  Background fishBackground = new Background(t.getImage());    Scene fishScene = null;  try{  fishScene = f.load("models/fish.obj");  }  catch (Exception e){  System.out.println("File loading failed:" + e);  }  Hashtable roachNamedObjects = fishScene.getNamedObjects();  Enumeration enumer = roachNamedObjects.keys();  while (enumer.hasMoreElements()){  name = (String) enumer.nextElement();  System.out.println("Name: " + name);  }    // start animation  Transform3D startTransformation = new Transform3D();  startTransformation.setScale(1.0/6);  Transform3D combinedStartTransformation = new Transform3D();  combinedStartTransformation.rotY(-3\*Math.PI/2);  combinedStartTransformation.mul(startTransformation);    TransformGroup fishStartTransformGroup = new TransformGroup(combinedStartTransformation);  Appearance bodyApp = new Appearance();  setToMyDefaultAppearance(bodyApp, new Color3f(0.2f, 0.25f, 0.25f));  Appearance finsApp = new Appearance();  setToMyDefaultAppearance(finsApp, new Color3f(0.2f, 0.3f, 0.3f));  int movesCount = 100; // moves count  int movesDuration = 500; // moves for 0,3 seconds  int startTime = 0; // launch animation after timeStart seconds  // fin 1  Alpha fin1\_1RotAlpha = new Alpha(movesCount, Alpha.INCREASING\_ENABLE, startTime, 0, movesDuration,0,0,0,0,0);  Shape3D fin1 = (Shape3D) roachNamedObjects.get("fin1");  fin1.setAppearance(finsApp);  TransformGroup fin1TG = new TransformGroup();  fin1TG.addChild(fin1.cloneTree());  Transform3D fin1RotAxis = new Transform3D();  fin1RotAxis.set(new Vector3d(0, -0.101, 0.52));  fin1RotAxis.setRotation(new AxisAngle4d(0, 0, 0, 0));  RotationInterpolator fin1rot = new RotationInterpolator(fin1\_1RotAlpha, fin1TG, fin1RotAxis,(float) 0.0f, (float) Math.PI/3); // Math.PI\*2  fin1rot.setSchedulingBounds(bs);  fin1TG.setCapability(TransformGroup.ALLOW\_TRANSFORM\_WRITE);  fin1TG.addChild(fin1rot);  // fin 2  Alpha fin2\_1RotAlpha = new Alpha(movesCount, Alpha.INCREASING\_ENABLE, startTime, 0, movesDuration,0,0,0,0,0);  Shape3D fin2 = (Shape3D) roachNamedObjects.get("fin2");  fin2.setAppearance(finsApp);  TransformGroup fin2TG = new TransformGroup();  fin2TG.addChild(fin2.cloneTree());  Transform3D fin2RotAxis = new Transform3D();  fin2RotAxis.set(new Vector3d(0, -0.2, 0.3));  fin2RotAxis.setRotation(new AxisAngle4d(0, 0, 0, 0));  RotationInterpolator fin2rot = new RotationInterpolator(fin2\_1RotAlpha, fin2TG, fin2RotAxis,(float) 0.0f, (float) Math.PI/3); // Math.PI\*2  fin2rot.setSchedulingBounds(bs);  fin2TG.setCapability(TransformGroup.ALLOW\_TRANSFORM\_WRITE);  fin2TG.addChild(fin2rot);  // tail  Alpha tail\_RotAlpha = new Alpha(movesCount, Alpha.INCREASING\_ENABLE, startTime, 0, movesDuration,0,0,0,0,0);  Shape3D tail = (Shape3D) roachNamedObjects.get("tail");  tail.setAppearance(finsApp);  TransformGroup tailTG = new TransformGroup();  tailTG.addChild(tail.cloneTree());  Transform3D tailRotAxis = new Transform3D();  tailRotAxis.set(new Vector3d(0, 0, 0));  tailRotAxis.setRotation(new AxisAngle4d(0, 0, 0, 0));  RotationInterpolator tailRot = new RotationInterpolator(tail\_RotAlpha, tailTG, tailRotAxis,(float) -Math.PI/20, (float) Math.PI/20); // Math.PI\*2  tailRot.setSchedulingBounds(bs);  tailTG.setCapability(TransformGroup.ALLOW\_TRANSFORM\_WRITE);  tailTG.addChild(tailRot);      TransformGroup sceneGroup = new TransformGroup();  sceneGroup.addChild(fin1TG);  sceneGroup.addChild(fin2TG);  sceneGroup.addChild(tailTG);  TransformGroup tgBody = new TransformGroup();  Shape3D fishBodyShape = (Shape3D) roachNamedObjects.get("rt\_body");  fishBodyShape.setAppearance(bodyApp);  tgBody.addChild(fishBodyShape.cloneTree());  Shape3D headShape = (Shape3D) roachNamedObjects.get("head");  headShape.setAppearance(finsApp);  tgBody.addChild(headShape.cloneTree());  Shape3D eyeShape = (Shape3D) roachNamedObjects.get("rt\_eye");  tgBody.addChild(eyeShape.cloneTree());  Shape3D venrtalFinShape = (Shape3D) roachNamedObjects.get("ventral\_fin2");  venrtalFinShape.setAppearance(finsApp);  tgBody.addChild(venrtalFinShape.cloneTree());  Shape3D venrtalFin2Shape = (Shape3D) roachNamedObjects.get("ventral\_finq");  venrtalFin2Shape.setAppearance(finsApp);  tgBody.addChild(venrtalFin2Shape.cloneTree());  sceneGroup.addChild(tgBody.cloneTree());  TransformGroup whiteTransXformGroup = translate(  fishStartTransformGroup,  new Vector3f(0.0f,0.0f,0.5f));  TransformGroup whiteRotXformGroup = rotate(whiteTransXformGroup, new Alpha(10,5000));  fishBranchGroup.addChild(whiteRotXformGroup);  fishStartTransformGroup.addChild(sceneGroup);    // adding the car background to branch group  BoundingSphere bounds = new BoundingSphere(new Point3d(120.0,250.0,100.0),Double.MAX\_VALUE);  fishBackground.setApplicationBounds(bounds);  fishBranchGroup.addChild(fishBackground);    fishBranchGroup.compile();  su.addBranchGraph(fishBranchGroup);  }  public static void setToMyDefaultAppearance(Appearance app, Color3f col) {  app.setMaterial(new Material(col, col, col, col, 150.0f));  }  public void addLight(SimpleUniverse su){  BranchGroup bgLight = new BranchGroup();  BoundingSphere bounds = new BoundingSphere(new Point3d(0.0,0.0,0.0), 100.0);  Color3f lightColour1 = new Color3f(1.0f,1.0f,1.0f);  Vector3f lightDir1 = new Vector3f(-1.0f,0.0f,-0.5f);  DirectionalLight light1 = new DirectionalLight(lightColour1, lightDir1);  light1.setInfluencingBounds(bounds);  bgLight.addChild(light1);  su.addBranchGraph(bgLight);  }    TransformGroup translate(Node node,Vector3f vector){  Transform3D transform3D = new Transform3D();  transform3D.setTranslation(vector);  TransformGroup transformGroup =  new TransformGroup();  transformGroup.setTransform(transform3D);  transformGroup.addChild(node);  return transformGroup;  }//end translate    TransformGroup rotate(Node node,Alpha alpha){  TransformGroup xformGroup = new TransformGroup();  xformGroup.setCapability(  TransformGroup.ALLOW\_TRANSFORM\_WRITE);  //Create an interpolator for rotating the node.  RotationInterpolator interpolator =  new RotationInterpolator(alpha,xformGroup);  //Establish the animation region for this  // interpolator.  interpolator.setSchedulingBounds(new BoundingSphere(  new Point3d(0.0,0.0,0.0),1.0));  //Populate the xform group.  xformGroup.addChild(interpolator);  xformGroup.addChild(node);  return xformGroup;  }//end rotate    public static void main(String[] args) {  Fish start = new Fish();  }    } |

**Висновки**

Виконавши дану лабораторну роботу я здобув навички імпорту моделей, побудованих у тривимірних редакторах, об’єктів форматів .obj до бібліотек.