**Федеральное агентство связи**

**Ордена Трудового Красного Знамени**

**Федеральное государственное бюджетное образовательное учреждение высшего образования**

**«Московский технический университет связи и информатики»**

**Кафедра Информатики**

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**Отчет по лабораторной работе №5**

по предмету «КТП»:

Выполнил: студент группы БВТ1802

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**1 Цель работы**

Цель работы: изучить алгоритм расчета фрактала, а также познакомиться с java.swing.

**2 Задание**

Добавить два новых типа фракталов и функцию сохранения изображения.

**3 Текст программы**

**FractalExplorer.java**

import javax.swing.\*;  
import java.awt.\*;  
import java.awt.geom.Rectangle2D;  
import java.awt.event.\*;  
import java.io.IOException;  
import javax.swing.filechooser.\*;  
import javax.imageio.ImageIO;  
  
public class FractalExplorer {  
 private int displaySize;  
 private FractalGenerator generator;  
 private Rectangle2D.Double range;  
  
 private JFrame frame;  
 private JImageDisplay display;  
 private JButton resetButton;  
 private JComboBox switchButton;  
 private JButton saveButton;  
  
  
 public static void main(String args[]) {  
 FractalExplorer explorer = new FractalExplorer(800);  
 explorer.createAndShowGUI();  
 explorer.drawFractal();  
 }  
  
 private class actionListener implements ActionListener {  
 @Override  
 public void actionPerformed(ActionEvent actionEvent) {  
  
 if (actionEvent.getSource() == resetButton) {  
 generator.getInitialRange(range);  
 drawFractal();  
 }  
 else if (actionEvent.getSource() == switchButton) {  
 generator = (FractalGenerator) switchButton.getSelectedItem();  
 generator.getInitialRange(range);  
 drawFractal();  
 }  
 else if (actionEvent.getSource() == saveButton) {  
 JFileChooser fileChooser = new JFileChooser();  
 FileFilter filter = new FileNameExtensionFilter("PNG Images", "png");  
 fileChooser.setFileFilter(filter);  
 fileChooser.setAcceptAllFileFilterUsed(false);  
 if (fileChooser.showSaveDialog(null) == JFileChooser.*APPROVE\_OPTION*) {  
 try {  
 ImageIO.*write*(display.img, "png", fileChooser.getSelectedFile());  
 } catch (IOException e) {  
 JOptionPane.*showMessageDialog*(frame, e.getMessage(), "Something went wrong",  
 JOptionPane.*ERROR\_MESSAGE*);  
 }  
 }  
 }  
 }  
 }  
  
 private class MouseListener extends MouseAdapter {  
 @Override  
 public void mouseClicked(MouseEvent e) {  
 int x = e.getX();  
 int y = e.getY();  
  
 double xCoord = generator.*getCoord*(range.x, range.x + range.width, displaySize,x);  
 double yCoord = generator.*getCoord*(range.y, range.y + range.height, displaySize,y);  
 generator.recenterAndZoomRange(range, xCoord, yCoord, 0.5);  
 drawFractal();  
 }  
 }  
  
  
 public FractalExplorer(int ScreenSize) {  
 displaySize = ScreenSize;  
 range = new Rectangle2D.Double();  
 generator = new Mandelbrot();  
 generator.getInitialRange(range);  
 }  
  
  
  
 private void drawFractal() {  
 for (int x = 0; x < displaySize; x++)  
 {  
 for (int y = 0; y < displaySize; y++)  
 {  
 double xCoord = FractalGenerator.*getCoord* (range.x, range.x + range.width, displaySize, x);  
 double yCoord = FractalGenerator.*getCoord* (range.y, range.y + range.height, displaySize, y);  
 int IterNum = generator.numIterations(xCoord, yCoord);  
 if (IterNum == -1) display.drawPixel(x, y, 0);  
 else {  
 float hue = 0.7f + (float) IterNum / 200f;  
 int rgbColor = Color.*HSBtoRGB*(hue, 1f, 1f);  
 display.drawPixel(x, y, rgbColor);  
 }  
 }  
 }  
 display.repaint();  
 }  
  
 public void createAndShowGUI() {  
  
 // setting up a panel with switch and label  
 JPanel panel = new JPanel();  
 switchButton = new JComboBox();  
  
 switchButton.addItem(new Mandelbrot());  
 switchButton.addItem(new Tricorn());  
 switchButton.addItem(new BurningShip());  
 switchButton.addActionListener(new actionListener());  
  
 JLabel label = new JLabel("Fractal type:");  
 panel.add(label);  
 panel.add(switchButton);  
  
  
 display = new JImageDisplay(displaySize, displaySize);  
 display.addMouseListener(new MouseListener());  
  
 resetButton = new JButton("Reset");  
 resetButton.addActionListener(new actionListener());  
 saveButton = new JButton("Save Image");  
 saveButton.addActionListener(new actionListener());  
 JPanel panel2 = new JPanel();  
 panel2.add(resetButton);  
 panel2.add(saveButton);  
  
  
 frame = new JFrame();  
 frame.getContentPane().add(panel, BorderLayout.*NORTH*);  
 frame.getContentPane().add(display, BorderLayout.*CENTER*);  
 frame.getContentPane().add(panel2, BorderLayout.*SOUTH*);  
 frame.setDefaultCloseOperation(JFrame.*DISPOSE\_ON\_CLOSE*);  
  
 frame.pack();  
 frame.setVisible(true);  
 frame.setResizable(true);  
 }  
}

**Tricorn.java**

import java.awt.geom.Rectangle2D;  
  
public class Tricorn extends FractalGenerator {  
 public static final int *MAX\_ITERATIONS* = 2000;  
  
 public void getInitialRange(Rectangle2D.Double range) {  
 range.setRect(-2, -2, 4,4);  
 }  
  
 public int numIterations(double x, double y) {  
 Complex z = new Complex(0, 0);  
 Complex c = new Complex(x, y);  
  
 for (int IterNum = 0; IterNum < *MAX\_ITERATIONS*; IterNum++) {  
 z = z.sopr().mul(z.sopr()).sum(c);  
 if (z.abs() > 4) return IterNum;  
 }  
 return -1;  
 }  
  
 @Override  
 public String toString() {  
 return "Tricorn";  
 }  
}

**BurningShip.java**

import java.awt.geom.Rectangle2D;  
  
public class BurningShip extends FractalGenerator{  
 public static final int *MAX\_ITERATIONS* = 2000;  
  
 public void getInitialRange(Rectangle2D.Double range) {  
 range.setRect(-2, -2.5, 4,4);  
 }  
  
  
 @Override  
 public String toString() {  
 return "Burning Ship";  
 }  
  
  
 public int numIterations(double x, double y) {  
 Complex z = new Complex(0, 0);  
 Complex c = new Complex(x, y);  
  
 double realTemp;  
 for (int IterNum = 0; IterNum < *MAX\_ITERATIONS*; IterNum++) {  
 realTemp = z.real\*z.real - z.imag\*z.imag + x;  
 z.imag = Math.*abs*(2\*z.real\*z.imag + y);  
 z.real = Math.*abs*(realTemp);  
 if (z.abs() > 4) return IterNum;  
 }  
 return -1;  
 }  
}

**Complex.java**

public class Complex {  
 public double real, imag;  
 public Complex(double real, double imag) {  
 this.real = real;  
 this.imag = imag;  
 }  
 public double abs() { return real \* real + imag \* imag; }  
  
 public Complex sum(Complex c) {  
 return new Complex(this.real + c.real, this.imag + c.imag);  
 }  
  
 public Complex mul(Complex c) {  
 double real = this.real \* c.real - this.imag \* c.imag;  
 double imag = this.real \* c.imag + this.imag \* c.real;  
 return new Complex(real,imag);  
 }  
  
 public Complex sopr() { return new Complex(this.real, -this.imag); }  
}

**4 Работа программы**







