Лабораторная работа №6

по дисциплине

“Объектно-ориентированное программирование”

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группы БФИ1901

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**Цель:**

Реализовать возможность рисования фрактала с несколькими фоновыми потоками, и блокирование интерфейса при отрисовке фрактала.

**Код программы:**

public class FractalExplorer {  
 private int displaySize;  
  
 private JImageDisplay display;  
  
 private FractalGenerator fractal;  
  
 private Rectangle2D.Double range;  
  
 private int rowRemaining;  
  
 private JButton saveButton;  
 private JButton resetButton;  
 private JComboBox comboBox;  
  
 public FractalExplorer(int size) {  
 displaySize = size;  
  
 fractal = new Mandelbrot();  
 range = new Rectangle2D.Double();  
  
 fractal.getInitialRange(range);  
 display = new JImageDisplay(displaySize, displaySize);  
 }  
  
 public void createAndShowGUI() {  
 display.setLayout(new BorderLayout());  
  
 resetButton = new JButton("Reset");  
 Resetter resetHandler = new Resetter();  
 resetButton.addActionListener(resetHandler);  
  
 saveButton = new JButton("Save");  
 Saver saveHandler = new Saver();  
 saveButton.addActionListener(saveHandler);  
  
 Clicker click = new Clicker();  
 display.addMouseListener(click);  
  
 FractalGenerator mandelbrotFractal = new Mandelbrot();  
 FractalGenerator tricornFractal = new Tricorn();  
 FractalGenerator burningShipFractal = new BurningShip();  
  
 comboBox = new JComboBox();  
  
 comboBox.addItem(mandelbrotFractal);  
 comboBox.addItem(tricornFractal);  
 comboBox.addItem(burningShipFractal);  
  
 Chooser fractalChooser = new Chooser();  
 comboBox.addActionListener(fractalChooser);  
  
 JLabel label = new JLabel("Fractal:");  
  
 JPanel panel = new JPanel();  
 panel.add(label);  
 panel.add(comboBox);  
  
 JPanel myBottomPanel = new JPanel();  
 myBottomPanel.add(saveButton);  
 myBottomPanel.add(resetButton);  
  
 JFrame myFrame = new JFrame("Fractal Explorer");  
  
 myFrame.setDefaultCloseOperation(JFrame.*EXIT\_ON\_CLOSE*);  
 myFrame.add(myBottomPanel, BorderLayout.*SOUTH*);  
 myFrame.add(display, BorderLayout.*CENTER*);  
 myFrame.add(panel, BorderLayout.*NORTH*);  
  
 myFrame.pack();  
 myFrame.setVisible(true);  
 myFrame.setResizable(false);  
 }  
  
 private void drawFractal() {  
 enableUI(false);  
  
 rowRemaining = displaySize;  
  
 for (int y = 0; y < displaySize; y++){  
 FractalWorker drawRow = new FractalWorker(y);  
 drawRow.execute();  
 }  
 }  
  
 private void enableUI(boolean value) {  
 comboBox.setEnabled(value);  
 resetButton.setEnabled(value);  
 saveButton.setEnabled(value);  
 }  
  
 private class Resetter implements ActionListener {  
 public void actionPerformed(ActionEvent e) {  
 if (e.getActionCommand().equals("Reset")) {  
 fractal.getInitialRange(range);  
 drawFractal();  
 }  
 }  
 }  
  
 private class Chooser implements ActionListener {  
 public void actionPerformed(ActionEvent e) {  
 Object source = e.getSource();  
 if (source instanceof JComboBox) {  
 JComboBox comboBox = (JComboBox) source;  
  
 fractal = (FractalGenerator) comboBox.getSelectedItem();  
 assert fractal != null;  
  
 fractal.getInitialRange(range);  
 drawFractal();  
 }  
 }  
 }  
  
 private class Saver implements ActionListener {  
 public void actionPerformed(ActionEvent e) {  
 if (e.getActionCommand().equals("Save")) {  
 JFileChooser fileChooser = new JFileChooser();  
  
 FileFilter extensionFilter = new FileNameExtensionFilter(  
 "PNG",  
 "png"  
 );  
  
 fileChooser.setFileFilter(extensionFilter);  
  
 fileChooser.setAcceptAllFileFilterUsed(false);  
  
 int userSelection = fileChooser.showSaveDialog(display);  
  
 if (userSelection == JFileChooser.*APPROVE\_OPTION*) {  
 java.io.File file = fileChooser.getSelectedFile();  
 String filePath = file.getPath();  
  
 if (!filePath.contains(".png")) file = new File(filePath + ".png");  
 try {  
 BufferedImage displayImage = display.getImage();  
 javax.imageio.ImageIO.*write*(displayImage, "png", file);  
 } catch (Exception exception) {  
 JOptionPane.*showMessageDialog*(display,  
 exception.getMessage(), "Cannot Save Image",  
 JOptionPane.*ERROR\_MESSAGE*);  
 }  
 }  
 else return;  
 }  
 }  
 }  
  
 private class Clicker extends MouseAdapter {  
 @Override  
 public void mouseClicked(MouseEvent e) {  
 if (rowRemaining != 0) return;  
  
 int x = e.getX();  
 double xCoord = FractalGenerator.*getCoord*(range.x,  
 range.x + range.width, displaySize, x);  
  
 int y = e.getY();  
 double yCoord = FractalGenerator.*getCoord*(range.y,  
 range.y + range.height, displaySize, y);  
  
 fractal.recenterAndZoomRange(range, xCoord, yCoord, 0.5);  
  
 drawFractal();  
 }  
 }  
  
 private class FractalWorker extends SwingWorker<Object, Object> {  
 int row;  
 int[] rgbValues;  
  
 private FractalWorker(int row) { this.row = row; }  
  
 @Override  
 protected Object doInBackground() {  
 rgbValues = new int[displaySize];  
  
 for (int x = 0; x < rgbValues.length; x++) {  
 double xCoord = FractalGenerator.*getCoord*(range.x,  
 range.x + range.width, displaySize, x);  
  
 double yCoord = FractalGenerator.*getCoord*(range.y,  
 range.y + range.height, displaySize, row);  
  
 int iteration = fractal.numIterations(xCoord, yCoord);  
  
 if (iteration == -1) {  
 display.drawPixel(x, row, 0);  
 } else {  
 float hue = 0.5f + (float) iteration / 50;  
 int rgbColor = Color.*HSBtoRGB*(hue, 1f, 1f);  
  
 rgbValues[x] = rgbColor;  
 }  
 }  
 return null;  
 }  
  
 protected void done() {  
 for (int x = 0; x < rgbValues.length; x++) {  
 display.drawPixel(x, row, rgbValues[x]);  
 }  
  
 display.repaint(0, 0, row, displaySize, 1);  
  
 rowRemaining--;  
 if (rowRemaining == 0) enableUI(true);  
 }  
 }  
  
 public static void main(String[] args)  
 {  
 FractalExplorer displayExplorer = new FractalExplorer(800);  
 displayExplorer.createAndShowGUI();  
 displayExplorer.drawFractal();  
 }  
}

**Примеры работы программы:**

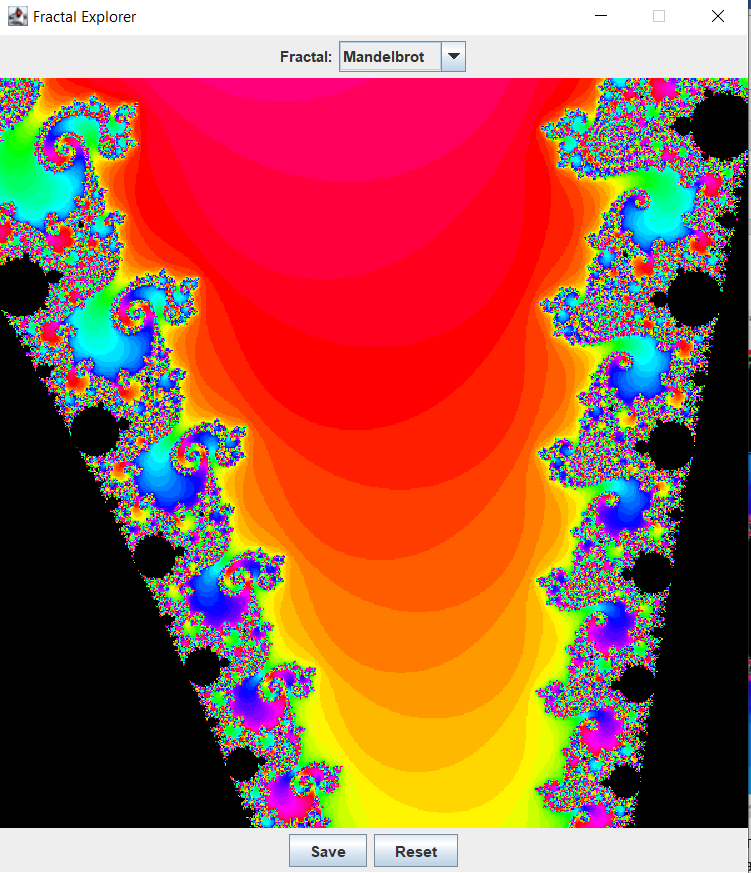


Рисунок 1 – Наглядное представление построчного вычисления и блокирования интерфейса