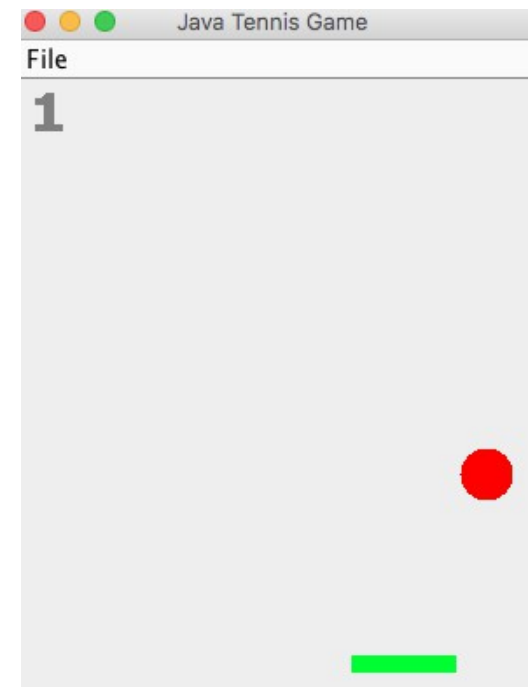


SchoolNova



IT101

Graphical User Interface



Foundation

- Swing is a platform-independent set of Java classes used for user Graphical User Interface (GUI) programming. Abstract Window Toolkit (AWT) is an older Java GUI technology, some of which is still useful.
- Create a new Java Application project in NetBeans;
- Create a main class named TennisGame;
- Import javax.swing.*, java.awt.* and java.awt.geom.* packages into the TennisGame class.
- Make your TennisGame class extend the JPanel class. JPanel is a painting canvas, by extending which you will be able to paint and display objects in TennisGame.
- A painting canvas must be contained in a window frame. JFrame is the class that serves as a frame for our TennisGame canvas. Create a new JFrame object inside the TennisGame's "main" method.
- Create an instance of the TennisGame class and add the TennisGame object reference to the frame.
- Set the frame's size using the frame's setSize method.
- Set the frame's visibility to "true".
- Shut down the Java thread that runs your program when the frame is closed.
- Build and run your program.
- You should see an empty 300px by 300px box.

```
public static void main(String[] args) {  
    JFrame frame = new JFrame("Java Tennis Game");  
    TennisGame tg = new TennisGame();  
    frame.add(tg);  
    frame.setSize(300, 300);  
    frame.setVisible(true);  
    frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);  
}
```

Paint the Objects

- Start painting the tennis ball by overriding the JPanel's paint method: `public void paint(Graphics g);`
- The paint method receives by parameter a Graphics object. We will use a newer object: Graphics2D, which extends from Graphics. In order to do that cast Graphics g into Graphics2D.
- To draw something inside the canvas we should indicate in which position we are going to start painting. For this, each of the points in the canvas has an associated position (x,y) being (0,0) the point of the top-left corner.
- Set the color.
- Fill the tennis ball with color.
- Draw the ball.
- Build and run your program.
- You should see the red tennis ball at the top left of your canvas.

```
@Override  
public void paint(Graphics g) {  
    super.paint(g);  
    Graphics2D g2d = (Graphics2D) g;  
    g2d.setColor(Color.RED);  
    g2d.fillOval(x, y, 30, 30);  
}
```

Animate

- Every time we paint something we have to define its position (x,y). To make the ball move, modify the position (x,y) each time and repaint the circle in the new position.
- In our example, we keep the current position of our circle in two properties called "x" and "y". We also create a method called moveBall() which will increase in 1 both "x" and "y", each time we call it.
- At the end of the main method we start an infinite loop "while (true)" where we repeatedly call moveBall() to change the position of the circle and then call the JFrame's repaint() method.
- "Thread.sleep(10)" tells the processor that the Java thread which is being run must sleep for 10 milliseconds, which allows the processor to execute other threads and in particular the AWT thread which calls the paint method.
- Build and run your program. You should see the red tennis ball moving through the canvas.

```
private int x = 0;
private int y = 0;
/*
 * Animation
 */
private void moveBall() {
    x = x + 1;
    y = y + 1;
}
```

```
public static void main(String[] args) throws InterruptedException {
    JFrame frame = new JFrame("Java Tennis Game");
    TennisGame tg = new TennisGame();
    frame.add(tg);
    frame.setSize(300, 300);
    frame.setVisible(true);
    frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    while (true) {
        tg.moveBall();
        tg.repaint();
        Thread.sleep(10);
    }
}
```

Homework

- We will continue the Tennis Game project next week.
- Review the code we have written in class and make changes to increase or decrease the ball speed, change the field size, change the ball and field colors.
- More information about `java.awt.Color` class can be found in Javadocs:
<https://docs.oracle.com/javase/7/docs/api/java/awt/Color.html>
- JFrame documentation can be found here:
<https://docs.oracle.com/javase/7/docs/api/javafx/swing/JFrame.html> (look for the parent class too - `java.awt.Frame`)