

Subject: Programming in Java

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Graphics Programming and Multimedia

Graphics class

-Graphics is an abstract classes whose object cannot be initiated directly.

-Graphics class contains methods that allows to draw the component on the relative window. This can be main window of an applet a child window of an applet or an stand alone application window.

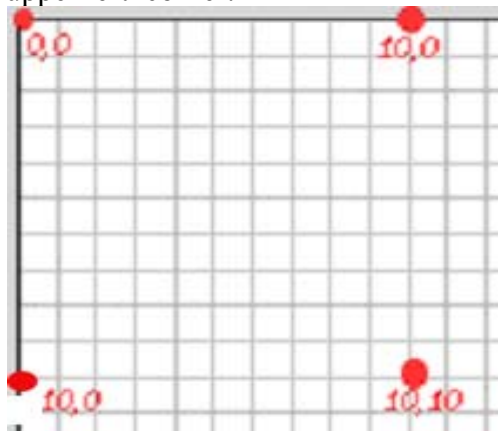
-The Graphics class defines a number of drawing functions .Each shape can be drawn only or filled by currently selected color which is black by default.

-Graphics object is passed into an paint method as a parameter.

Graphics class plays two important roles:

- 1 First of all it's a context. All output to the window takes place through graphics context. A graphic context is information that allows to performs all Graphics operation. Graphics context enable drawing on the screen .Graphics context is encapsulated by the Graphics method.
- 2 Secondly ,Graphics class provides different method drawing simple geometric shape such as lines, rectangle arc etc.

Every applet/application(window based)has its own area of the screen known as canvas. Java coordinate system has co-ordinate(0,0) on the upper left corner.



To draw a shape ,we only needs to use the appropriate method with the required arguments.

The various methods defined in the Graphics class are :

Methods	Description
<code>drawLine(int x1,int y1,int x2,int y2)</code>	Draw a straight line from(x1,x2) to (x2,y2)
<code>drawRect(int x1,int y1,int width,int height)</code>	Draws a rectangle using the current color.
<code>drawRect(int x1,int y1,int width,int height)</code>	Fills a rectangle using the current color.
<code>drawRoundRect(int x1,int y1,int width,int height,int diax,int diay)</code>	Draws a rounded corner rectangle using the current color.
<code>drawRoundRect(int x1,int y1,int width,int height,int diax,int diay)</code>	Draws a filled rounded rectangle.
<code>draw3DRect(int x1,int y1,int width,int height,Boolean b)</code>	Draws a 3-D rectangle.
<code>drawOval(int x1,int y1,int width,int height)</code>	Draws an oval using the current color.

<code>fillOval(int x1,int y1,int width,int height)</code>	Fills an oval using the current color.
<code>drawPolygon(int x[],int y[],int no_points)</code>	Draws a polygon using an array of x points and y points.
<code>fillPolygon(int x[],int y[],int no_points)</code>	Fills a polygon with the current color.
<code>drawArc(int x1,int y1,int width,int height,int startangle,int sweepangle)</code>	Draws an arc using the current color.
<code>fillArc(int x1,int y1,int width,int height int startangle,int sweepangle))</code>	Fills an arc using the current color.
<code>drawString(String str,int xpos,int pos)</code>	Draws a string using the current font and color.
<code>fill3DRect()</code>	Paints a 3-D rectangle filled with the current color.
<code>getColor()</code>	Gets the current color value.
<code>setColor(Color c)</code>	Sets the current color value.
<code>setFont(Font c)</code>	Sets the current Font Value.
<code>getFont()</code>	Gets the current font name.
<code>clearRect(int x1,int y1,int width,int height)</code>	Clears the specified rectangle using the current background color.
<code>clipRect(int x1,int y1,int width,int height)</code>	Clips to a rectangle.

Note: When a graphics object drawn that exceed the dimension of a window,output is automatically clipped.

Example :

```
//Draw a Rectangle
import java.awt.*;
import java.applet.*;
public class Rectangle extends java.applet.Applet {
    public void paint(Graphics g) {
        g.drawRect (50,50,100,150);
    }
}
```

Color class

The Color object represent colors. The Color class define 13 static color constants value .that can be used when you want.

The static color defined in the Color class are

Color constatns	Color	RGB values
<code>public final static red</code>	red	255,0,0 (0xff0000)
<code>public final static green</code>	green	0,255,0 (0x00ff00)
<code>public final static blue</code>	blue	0,0,255 (0x0000ff)
<code>public final static black</code>	black	0,0,0 (0x000000)
<code>public final static white</code>	white	255,255,255 (0xffffffff)
<code>public final static yellow</code>	yellow	255,255,0 (0xffff00)
<code>public final static magenta</code>	magenta	255,0,255 (0xff00ff)
<code>public final static cyan</code>	cyan	0,255,255 (0x00ffff)
<code>public final static darkGray</code>	darkGray	64,64,64
<code>public final static Gray</code>	gray	128,128,128

public final static lightGray	lightGray	192,192,192
public final static pink	pink	
public final static orange	orange	

The various methods defined in the Color class are

getRed()
 getBlue()
 getRGB()
 getAlpha() etc.

the Color Constructors are

public void Color(int r, int g, int b) where r, g, b are in the range of 0-255
 public void Color(float r, float g, float b) where r, g, b are in the range of 0.0f-1.0f
 public void Color(int hexadescimalvalue) etc.

setColor(Color obj) is used to set the current foreground color for the window
 setColor(Color.red) is same as setColor(new Color(255, 0, 0))

getColor() is used to get the current Color object(value)

ie. Color currentColor=g.getColor();

example:

```
import java.applet.*;
import java.awt.*;
public class test extends Applet
{
    String s;
    public void init()
    {
        Color c=new Color(255,0,0);
        setBackground(c);
        //you can replace the above code with setBackground(Color.red)
        // or setBackground(new Color(255,0,0))
    }

    public void paint(Graphics g)
    {
        int x[] = {100,200,250,50,100};
        int y[] = {50,50,200,200,50};
        int a[] = {300,350,400,300};
        int b[] = {200,50,200,200};
        g.drawPolygon(x,y,5);
        g.setColor(Color.blue);
        g.fillPolygon(a,b,4);
    }
}
```

Font Class

Just as the Color class is used to represent colors, objects in the Font class represent the fonts used for textual displays. There are five basic fonts that will be supported on any platform on which java is running. their name are

Helvetica, TimesRoman, Courier, Dialog, DialogOutput

Just as with Colors, there are some Font class constants, used in this case to specify the style of the font. This are Font.BOLD, Font.PLAIN and Font.ITALIC.

Also as with Color, You make a Font object by using the new operator and Font Constructor, to which you send as arguments the font name, style, and size. Newly constructed Font objects are often used with Graphics' setFont() method, like this

```
g.setFont(new Font ("Helvetica", Font.BOLD+Font.ITALIC, 16));
g.drawString("this is a Bold and italics Helvetica font of size 16", 50, 50);
```

Loading Image

Java's Image class provides support for loading, manipulating, and displaying images. Java supports GIF and JPEG image file formats.

To load the image getImage() method defined by Applet class is used. it has the following forms:

```
Image getImage(URL url)
Image getImage(URL url, String imageName)
```

Once you have an image, you can display it by using drawImage() which is a member of a Graphics class. IT has several forms

```
boolean drawImage(Image imageObject, int left, int right, ImageObserver imgOb)
boolean drawImage(Image imageObject, int left, int right, int width, int
height, ImageObserver imgOb)
```

eg.

```
import java.applet.*;
import java.net.*;
import java.awt.*;
public class imageTest extends Applet
{
    Image myimage;
    public void init()
    {
        URL url;
        try
        {
            url=new URL(getDocumentBase(), "pokhara.jpg"); //Pokhara.jpg should be in the same directory
            myimage=getImage(url);
        }
        catch (MalformedURLException e)
        {
        }
    }
    public void paint(Graphics g)
    {
        g.drawImage(myimage, 20, 20, 100, 100, this);
    }
}
```

Loading Sound

There are different format for Loading sounds in a digital form. The AU format is guaranteed to be recognized by every Java Environment (ie any platform). The standard Java API actually only contains one class for working with audio, AudioClip, which is located in the java.applet package. The AudioClip class represents a single piece of digital waveform audio. The AudioClip object is initialized in the init method by calling the

getAudioClip method. This method creates an AudioClip object in memory from an audio file. The start() method then is used to play the audio stream with a simple call to the play method

```
import java.awt.*;
import java.applet.*;
import java.awt.event.*;
public class testSound extends Applet implements ActionListener
{
    AudioClip c;
public void init()
{
    Label lb=new Label("Plz. click the button to play the sound");
    add(lb);
    Button btn1=new Button("play");
    Button btn2=new Button("stop");Button btn3=new Button("loop");
    add(btn1);
    add(btn2);
    add(btn3);
    c=getAudioClip(getCodeBase(),"hello.au");//hello.au is an audio file
    // the above code is same as c=getAudioClip(new URL(getCodeBase,"hello.au"))
    // Note here you need to catch the MalformedURLException

    btn1.addActionListener(this);
    btn2.addActionListener(this); btn3.addActionListener(this);
}

public void actionPerformed(ActionEvent t)
{
    String s=t.getActionCommand();
    if (s.equals("play"))
        c.play();
    if (s.equals("stop"))
        c.stop();
    if (s.equals("loop"))
        c.loop();
}
}
```

Multimedia

One of the major application area of graphics programming is multimedia. Multimedia is the use of sound ,videp,graphics and textto make the application alive.

Multimedia consists *Animation, sound & music .Video .3D graphics .Images . .Morphing .etc*

Multimedia allows you to present the message effectively.It provide excitement to eyes and ear.

It transform the passive recipient of message into active participant in the rich media learning process,

Multimedia serves as :

Method of communication in a meaningful way with moving features and the sound

Note:

MPEG: moving picture expert group(moving pictures)

JPEG: Joint Picture Expert Group.(still picture)

GIF :Graphica interchange Format

Uses of Multimedia:

1. Business

a. Training

b. Marketing

c. ProductDemo

2. School
 - a. Teaching
 - b. Learning
3. Home
 - a. Entertainment
 - b. Design
 - c. Cooking
4. Public Places
 - a. Hospital
 - b. Awareness
 - c. Museum
 - d. Railway Station