MSc/ICY Software Workshop
Graphics

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JFrame

In the following we will look at packages called AWT Graphics and Swing for the graphical display. In order to display objects graphically in a subclass of `JPanel`,
`public class NewClass extends JPanel`,
we always first create a JFrame of a particular size by
`JFrame frame = new JFrame()`

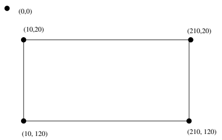
We can set the size and the title of the frame by
```
final int FRAME_WIDTH = 600;      600 pixels
final int FRAME_HEIGHT = 400;     400 pixels
frame.setSIZE(FRAME_WIDTH, FRAME_HEIGHT);
frame.setTITLE("Example frame");
```

Usually we want the application to terminate when the frame is closed and want it to be visible:
```
frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
frame.setVisible(true);
```

JPanel

We add to a frame a so-called `JPanel`.
`JPanel panel = new JPanel();`
On the panel we draw objects by overriding the method
`public void paintComponent(Graphics g)` e.g.

```
@Override
public void paintComponent(Graphics g) {
  g.drawRectangle(10,20,200,100);
}
```

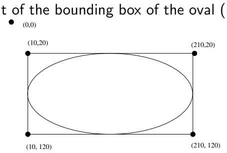


What to Add to a Panel?

Note that the dimensions are given in pixels from the left-right corner of the frame.
We can draw:

- outline of a Rectangle `drawRect(x, y, width, height)`
- filled Rectangle `fillRect(x, y, width, height)`
- outline of an Oval `drawOval(x, y, width, height)`
- filled Oval `fillOval(x, y, width, height)`

Note that the x and y in case of an oval (ellipse) give the left uppermost point of the bounding box of the oval (not the oval itself).



What to Add to a Panel? (Cont'd)

We can add a line from `(x0,y0)` to `(x1,y1)` by adding the line to the body of `paintComponent`, that is, by

```
@Override
public void paintComponent(Graphics g) {
   g.drawLine(x0, y0, x1, y1);
}
```

What to Add to a Panel? (Cont'd)

By setting a font by something like
`setFont(new Font("Dialog",1,12))` we can add some text by:
`g.drawString("Some text added here",10,10)` at position (10,10).
We can draw arbitrary polygons by specifying the x- and y-values of the vertices by two arrays:

```
        int[] xPoints = new int[vertices];
        int[] yPoints = new int[vertices];
        g.drawPolygon(xPoints, yPoints, vertices);
```

`vertices` is the number of vertices of the Polygon. We can also create a Polygon object by
`Polygon pol = new Polygon(xPoints, yPoints, vertices)`
Likewise, `drawPolyline` (does not draw line back to the start).

Adding an image

We can add an image (in `paintComponent(Graphics g)`) by
`g.drawImage(loadImage(image), xPos, yPos, null)` with arguments: an image, the xPosition, the yPosition, and an ImageObserver not used in our context.

Colour

Some colours are predefined by constants such such as BLACK, RED and so on. They can also be defined by Color(r,g,b) where r,g,b are values between 0 and 255. r=red, g=green, and b=blue. 0,0,0 stands for black, 255,0,0 for red, 0,255,0 for green, and 0,0,255 blue with other values in between.

```
BLACK: Color(0,0,0)
RED: Color(255,0,0)
GREEN: Color(0,255,0)
BLUE: Color(0,0,255)
ORANGE: Color(255,200,0)
PINK: Color(255,175,175)
CYAN: Color(0,255,255)
MAGENTA: Color(255,0,255)
YELLOW: Color(255,255,0)
WHITE: Color(255,255,255)
LIGHT_GRAY: Color(192,192,192)
GRAY: Color(128,128,128)
DARK_GRAY: Color(64,64,64)
Color(164,255,64)
```

Many more Methods

E.g., in `public void paintComponent(Graphics g)` use `g.copyArea(0,0,100,100,300,300)` [to copy the area in the rectangle from (0,0) to (100,100) to one starting at (300,300)]

For more methods, see e.g.
http://docs.oracle.com/javase/8/docs/api/java/awt/Graphics.html
See, also examples.