MSc/ICY Software Workshop
Graphics

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JavaFX

In the following we will introduce JavaFX for the graphical display (JavaFX replaces Swing the previous graphic package). In order to display objects graphically we generate a subclass of `Application`, `public class DrawLine extends Application`.
(We also have to import classes, here by `import javafx.application.Application;`
The class will contain the window, called `stage`, which contains all the objects displayed. It is an argument of the `start` method.
The stage contains a `scene` and a scene a `scene graph` of type `Group`.
We can set the size and the title of the scene by

```
Group root = new Group();
Scene scene = new Scene(root, 600, 300);
```


A Minimal Example

```
public class Minimal extends Application{
    //A red empty window of 600x300 pixels with title.
    @Override
    public void start(Stage stage) throws Exception {
        Group root = new Group();
        Scene scene = new Scene(root, 600, 300);
        stage.setTitle("Minimal");
        stage.setScene(scene);
        scene.setFill(Color.RED);
        stage.show();
    }

    public static void main(String[] args) {
        launch(args);
    }
}
```


Adding a Line

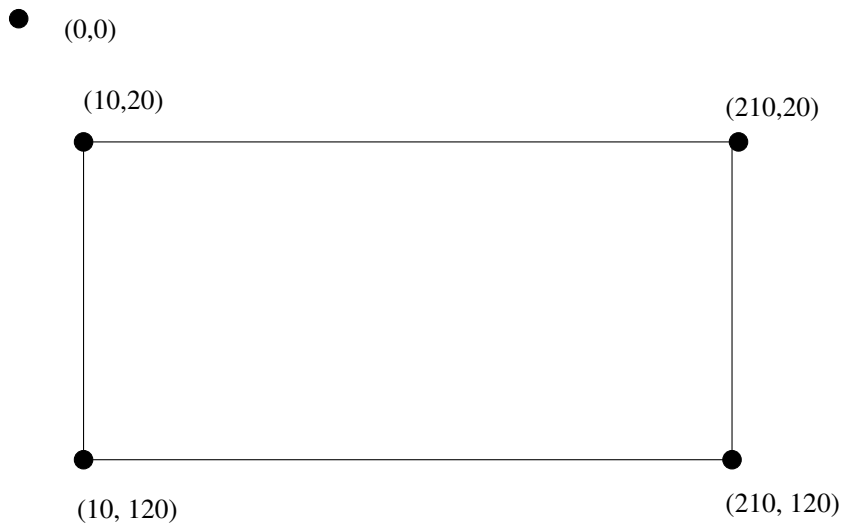
A straight line with the two end points (x1,y1) and (x2,y2) is created with the constructor `Line(x1,y1, x2,y2)` and can be added to the group.

```
@Override
public void start(Stage stage) throws Exception {
    // Creating a line object with end points (100,150)
    // and (500,180).
    Line line = new Line(100,150, 500,180);
    //Create a Group (scene graph) with the line as member
    Group root = new Group(line);
    // The scene consists of just one group.
    Scene scene = new Scene(root, 600, 300);
    stage.setTitle("Line");
    stage.setScene(scene);
    stage.show();
}
```

Adding a Rectangle

- Create a Rectangle object `Rectangle rectangle = new Rectangle(x, y, width, height)`
- `rectangle.setFill(Color.BLUE);`
  (Colour is BLACK if not otherwise specified.)

Note that the `x` and `y` give the coordinate of the left upper point of the rectangle. E.g., `Rectangle(10, 20, 200, 100)`

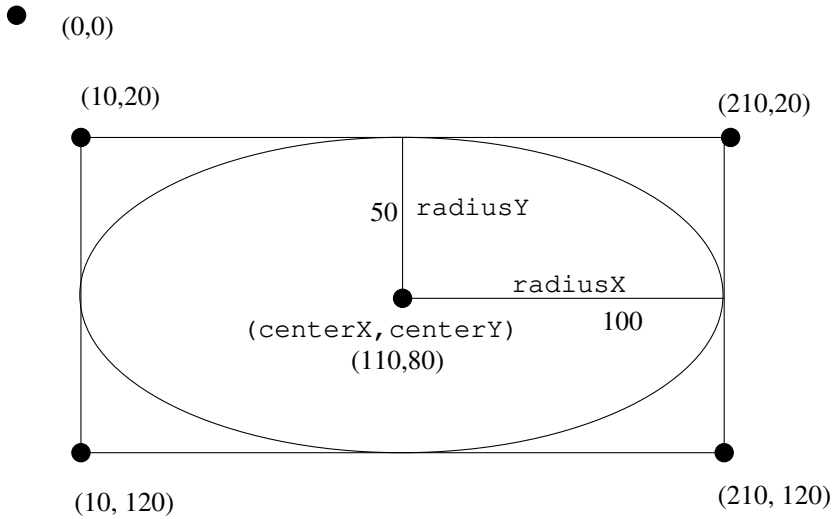


Adding a Circle and an Ellipse

- Create a Circle and Ellipse object:

```
Circle circle = new Circle(centerX,centerY,radius)
Ellipse oval =
      new Ellipse(centerX,centerY,radiusX,radiusY);
```

`centerX` and `centerY` give the coordinates of centres of the circle and the ellipse.
E.g., `Ellipse(110, 80, 100, 50)`



Adding a Polyline and a Polygon

- Create a Polyline object:

```
Polyline polyline =
        new Polyline(210,10, 10,210, 410,210);
```

Likewise

- Create a Polygon object:

```
Polygon polygon =
        new Polygon(210,10, 10,210, 410,210);
```

In a Polygon there is a line from last point to the first.

```
Polygon polygon = new Polygon(210,10, 10,210, 410,210);
// do not fill polygon by:
polygon.setFill(null);
// make borderlines visible
polygon.setStroke(Color.BLACK);
// Create a Group (scene graph) with the polygon
Group root = new Group(polygon);
```


Adding Text

```
Text text = new Text(100.0,150.0, "Hello World");

//Changing the font to "verdana" at a size of 70 pt
text.setFont(Font.font("verdana", 70));

/* FontWeight accepts nine values: BLACK,BOLD,EXTRA_BOLD,
 * EXTRA_LIGHT,MEDIUM, NORMAL, SEMI_BOLD, and THIN.
 * FontPosture two values: REGULAR and ITALIC.
 */
text.setFont(Font.font("verdana", FontWeight.BOLD,
                        FontPosture.ITALIC, 100));
//The text gets a horizontal line in the middle through it.
text.setStrikethrough(true);

//The text is underlined.
text.setUnderline(true);
```


Using Colour

Some colours are predefined by constants such such as Color.BLACK, Color.RED and so on. They can also be defined by Color.rgb(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: rgb(0,0,0)
RED: rgb(255,0,0)
GREEN: rgb(0,255,0)
BLUE: rgb(0,0,255)
ORANGE: rgb(255,200,0)
PINK: rgb(255,175,175)
CYAN: rgb(0,255,255)
```

```
MAGENTA: rgb(255,0,255)
YELLOW: rgb(255,255,0)
WHITE: rgb(255,255,255)
LIGHT_GRAY: rgb(192,192,192)
GRAY: rgb(128,128,128)
DARK_GRAY: rgb(64,64,64)
SOME_COLOUR: rgb(164,255,64)
```


Adding an Image

Create an Image and add it as an ImageView to a Group.

```
private static Image image;
public void start(Stage stage) throws Exception {
    //Setting the image view
    ImageView imageView = new ImageView(image);
    imageView.setX(150);
    imageView.setY(100);
    Group root = new Group(imageView);
    ...
}
public static void main(String[] args) {
    //Initializing the image
    image = new Image("images/firstCar.jpg");
    //image = new Image("http://www.cs.bham.ac.uk/...");
    launch(args);
}
```

Animation

We show an example Animation with two regular polygons, one rotating, one shrinking and expanding.

```
public void start(Stage stage) throws Exception {
    RotateTransition rotateTr = new RotateTransition();
    rotateTr.setDuration(Duration.millis(10000));
    rotateTr.setByAngle(360);
    rotateTr.setCycleCount(5);
    rotateTr.setAutoReverse(false);
    rotateTr.setNode(polygons[0]);
    rotateTr.play();

    ScaleTransition scaleTr = new ScaleTransition();
    scaleTr.setDuration(Duration.millis(1000));
    scaleTr.setNode(polygons[1]);
    scaleTr.setByY(-0.5);
    scaleTr.setByX(-0.5);
    scaleTr.setCycleCount(50);
    scaleTr.setAutoReverse(true);
    scaleTr.play();
    ...
}
```


Much More

There is a lot of information available online, e.g., by Oracle:
https://docs.oracle.com/javafx/2/get_started/hello_world.htm

There are also online tutorials:
https://docs.oracle.com/javafx/2/get_started/jfxpub-get_started.htm

https://www.tutorialspoint.com/javafx
The latter was used heavily in the preparation of the slides and the examples to this lecture.

