Programación Orientada a Objetos

Lo abstracto y las interfaces

CEIS

2018-02

Agenda

- Lo abstracto
  - Universidad
  - Otros ejemplos
- Interfaz
  - Universidad
  - Otros ejemplos
- Shapes
  - Refactorización
  - Extensión
  - Manipulando
  - Retomando
- Batalla naval
  - Estructura

Agenda

Cursos

Cursos

```
public abstract class Course {
    // Details omitted.
     public  void enrollStudent(Student s) {
         enrolledStudents.add(s);
     }
     public  final  void assignInstructor(Professor p) {
         setInstructor(p);
     }
     public void initializeCourse(Professor p, String s, String e) {
         assignInstructor(p)
         reserveClassroom();
         establishCourseSchedule(s, e);
     }
     public abstract void establishCourseSchedule(String startDate, String endDate);
}
```

- ¿Qué se está diciendo? (de la clase, de los métodos)

  Reversa

Cursos

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¿Qué métodos

- a) deben ser igual para todos?

Cursos

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¿Qué métodos

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Cursos

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- c) son totalmente diferentes para todos ?

Cursos

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```

¿Qué métodos

- a) deben ser igual para todos? b) pueden ser igual para todos ?
- c) son totalmente diferentes para todos ?
- d) tienen algunas partes iguales para todos ?

Cursos

Cursos- ¿Crear?

```
Course c = new Course();  // Impossible!
```

Here's the error message:

```
Course is abstract; cannot be instantiated
```

No se permite crear un objeto de una clase abstracta

Cursos

Cursos- ¿Crear?

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Cursos - ¿Manipular?

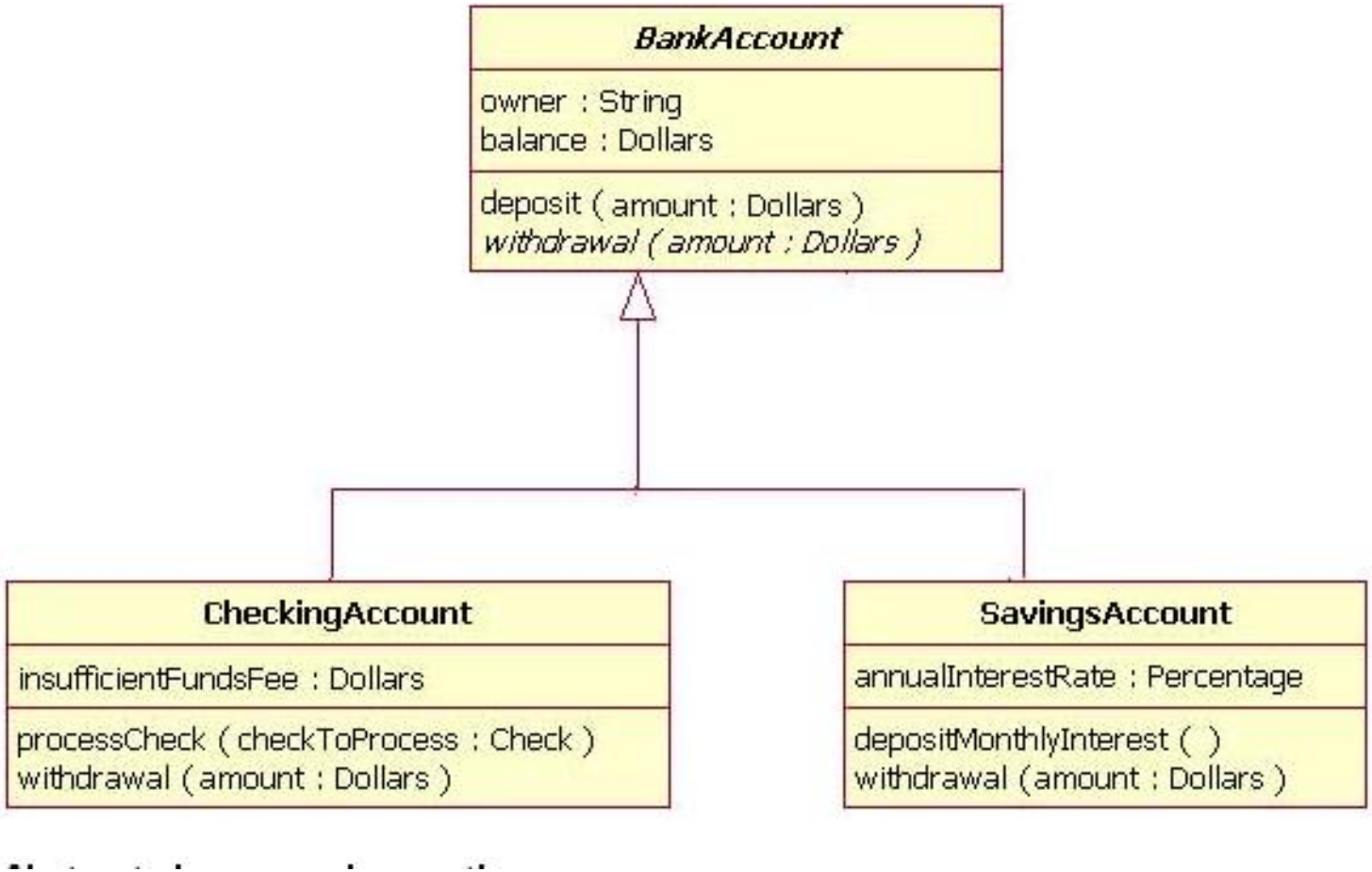
```
ArrayList<Course> courses = new ArrayList<Course>();
// Add a variety of different Course types to the collection.
courses.add(new LectureCourse());
courses.add(new LabCourse());
courses.add(new IndependentStudyCourse());
// etc.
for (Course c : courses) {
    // This next line of code is polymorphic.
    c.establishCourseSchedule("1/24/2005", "5/10/2005");
}
```

Se pueden almacenar, representa a sus subclases.

Se pueden usar los métodos, si todas las subclases lo tienen

Agenda

UML



- ¿Qué se está diciendo?

Manual de referencia. Java.

```
abstract class Point {
        int x = 1, y = 1;
        void move(int dx, int dy) {
                x += dx;
                y += dy;
                alert();
        }
        abstract void alert();
}
abstract class ColoredPoint extends Point {
        int color;
}

class SimplePoint extends Point {
        void alert() { }
}
```

- ¿Qué se está diciendo?

  Reversa

Agenda

Personas y responsabilidades

Para los que investigan

```java
import java.time.LocalDate;

public interface Investigator{

    boolean approveSyllabus(Syllabus s);

}
```

- ¿Qué se está diciendo ?

  Reversa

Personas y responsabilidades

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- ¿Qué se está diciendo ?

  Reversa
- ¿Cómo digo que un estudiante de PHD puede investigar?

  ¿Qué implica lo anterior?

Personas y responsabilidades

Para los que enseñan

```java
import java.time.LocalDate;

public interface Teacher{

    void designedTextbook(TextBook t, Course c);

    Syllabus defineSyllabus(Course c);

    int getHourlyRate();

    default int teachingHourlyRate(){
        return (int)(getHourlyRate()*0.80*(1+(LocalDate.now().getDayOfWeek().getValue()>5 ? 0.1: 0)));
    }
}
```

- ¿Qué se está diciendo ?

  Reversa

Personas y responsabilidades

Para los que enseñan

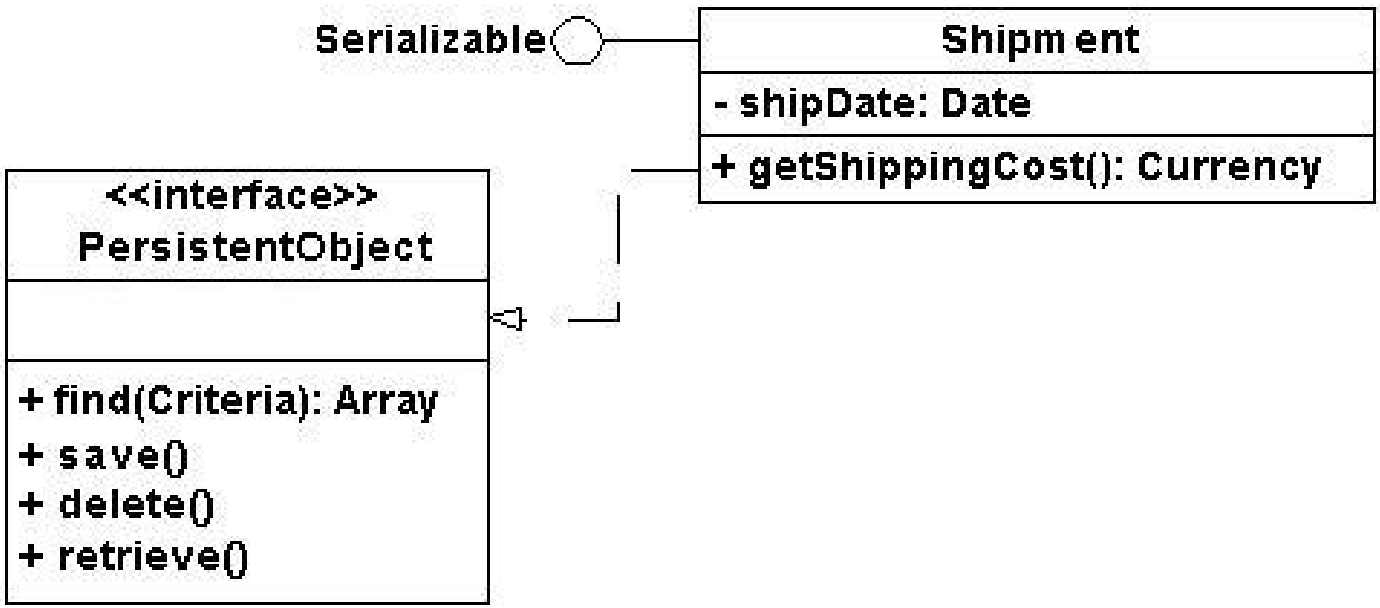
```
public class Professor extends Person implements Teacher,Investigator{
    private static final int HOURLY_RATE = 300000;

    public void designedTextbook(TextBook t, Course c){

    }

    public Syllabus defineSyllabus(Course c){
        ...
    }

    public boolean approveSyllabus(Syllabus s){
        ...
    }

    public int getHourlyRate(){
        return HOURLY_RATE;
    }

    public int todayClassPayment(int hours){
        return teachingHourlyRate()*hours;
    }

}
```

- ¿Qué se está diciendo ?

  Reversa

Agenda

UML



- ¿Qué se está diciendo?

Manual de referencia. Java.

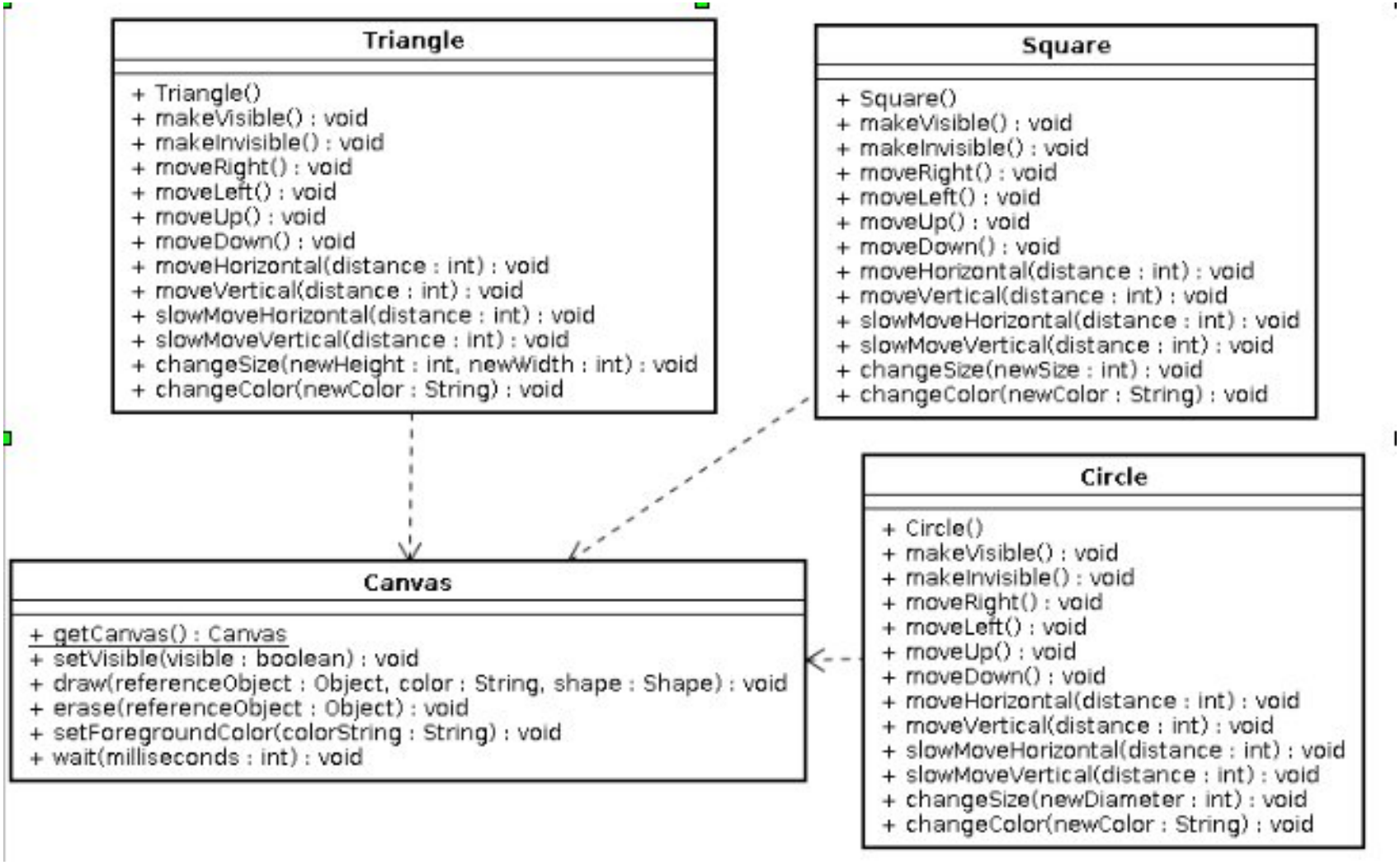
```
public interface Colorable {
        void setColor(byte r, byte g, byte b);
}
class Point { int x, y; }
class ColoredPoint extends Point implements Colorable {
        byte r, g, b;
        public void setColor(byte rv, byte gv, byte bv) {
                r = rv; g = gv; b = bv;
        }
}
class Test {
        public static void main(String[] args) {
                Point p = new Point();
                ColoredPoint cp = new ColoredPoint();
                p = cp;
                Colorable c = cp;
        }
}
```

- ¿Qué se está diciendo?

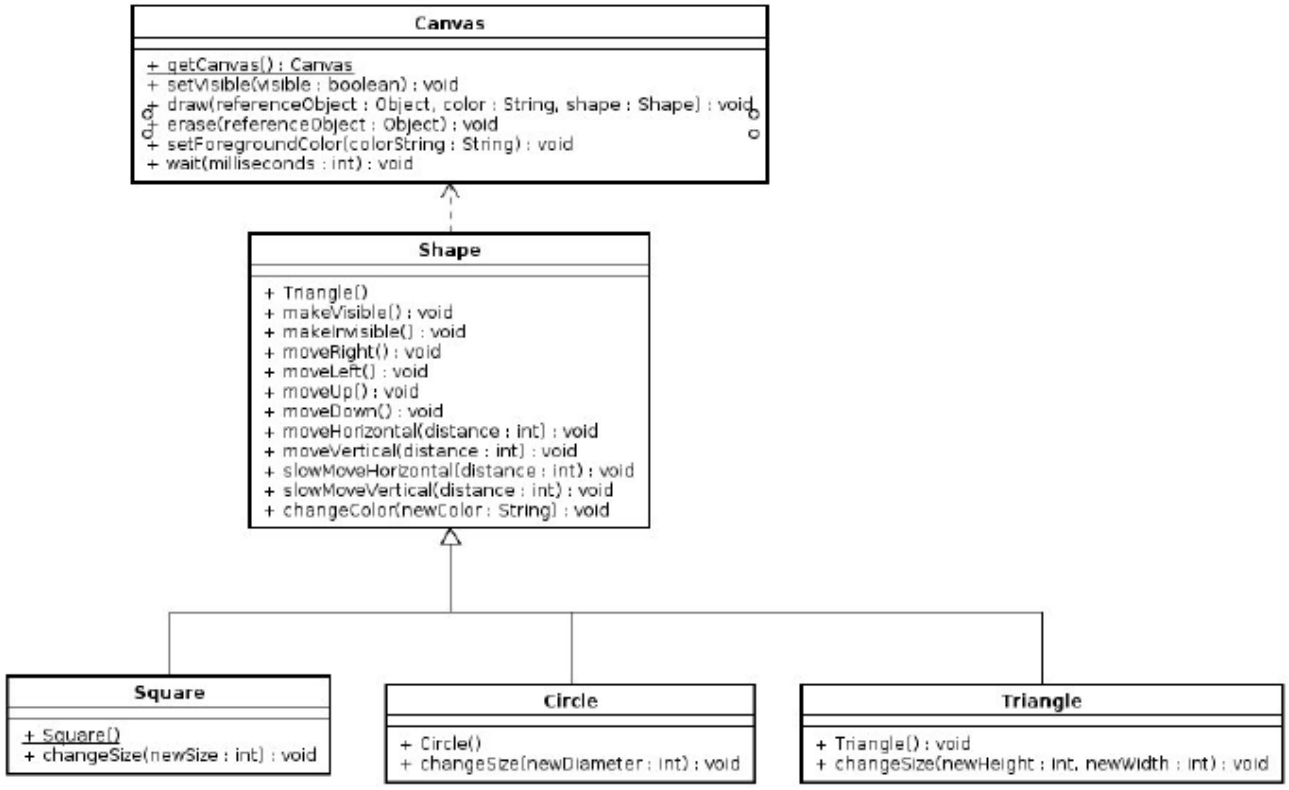
  Reversa

Agenda

Shapes


Triangle
+ Triangle()
+ makeVisible() : void
+ makeInvisible() : void
+ moveRight() : void
+ moveLeft() : void
+ moveUp() : void
+ moveDown() : void
+ moveHorizontal(distance : int) : void
+ moveVertical(distance : int) : void
+ slowMoveHorizontal(distance : int) : void
+ slowMoveVertical(distance : int) : void
+ changeSize(newHeight : int, newWidth : int) : void
+ changeColor(newColor : String) : void
Square
+ Square()
+ makeVisible() : void
+ makeInvisible() : void
+ moveRight() : void
+ moveLeft() : void
+ moveUp() : void
+ moveDown() : void
+ moveHorizontal(distance : int) : void
+ moveVertical(distance : int) : void
+ slowMoveHorizontal(distance : int) : void
+ slowMoveVertical(distance : int) : void
+ changeSize(newSize : int) : void
+ changeColor(newColor : String) : void
Canvas
+ getCanvas() : Canvas
+ setVisible(visible : boolean) : void
+ draw(referenceObject : Object, color : String, shape : Shape) : void
+ erase(referenceObject : Object) : void
+ setForegroundColor(colorString : String) : void
+ wait(milliseconds : int) : void
Circle
+ Circle()
+ makeVisible() : void
+ makeInvisible() : void
+ moveRight() : void
+ moveLeft() : void
+ moveUp() : void
+ moveDown() : void
+ moveHorizontal(distance : int) : void
+ moveVertical(distance : int) : void
+ slowMoveHorizontal(distance : int) : void
+ slowMoveVertical(distance : int) : void
+ changeSize(newDiameter : int) : void
+ changeColor(newColor : String) : void

Shapes


Canvas
+ getCanvas() : Canvas
+ setVisible(visible : boolean) : void
+ draw(referenceObject : Object, color : String, shape : Shape) : void
+ erase(referenceObject : Object) : void
+ setForegroundColor(colorString : String) : void
+ wait(milliseconds : int) : void
Shape
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+ moveUp() : void
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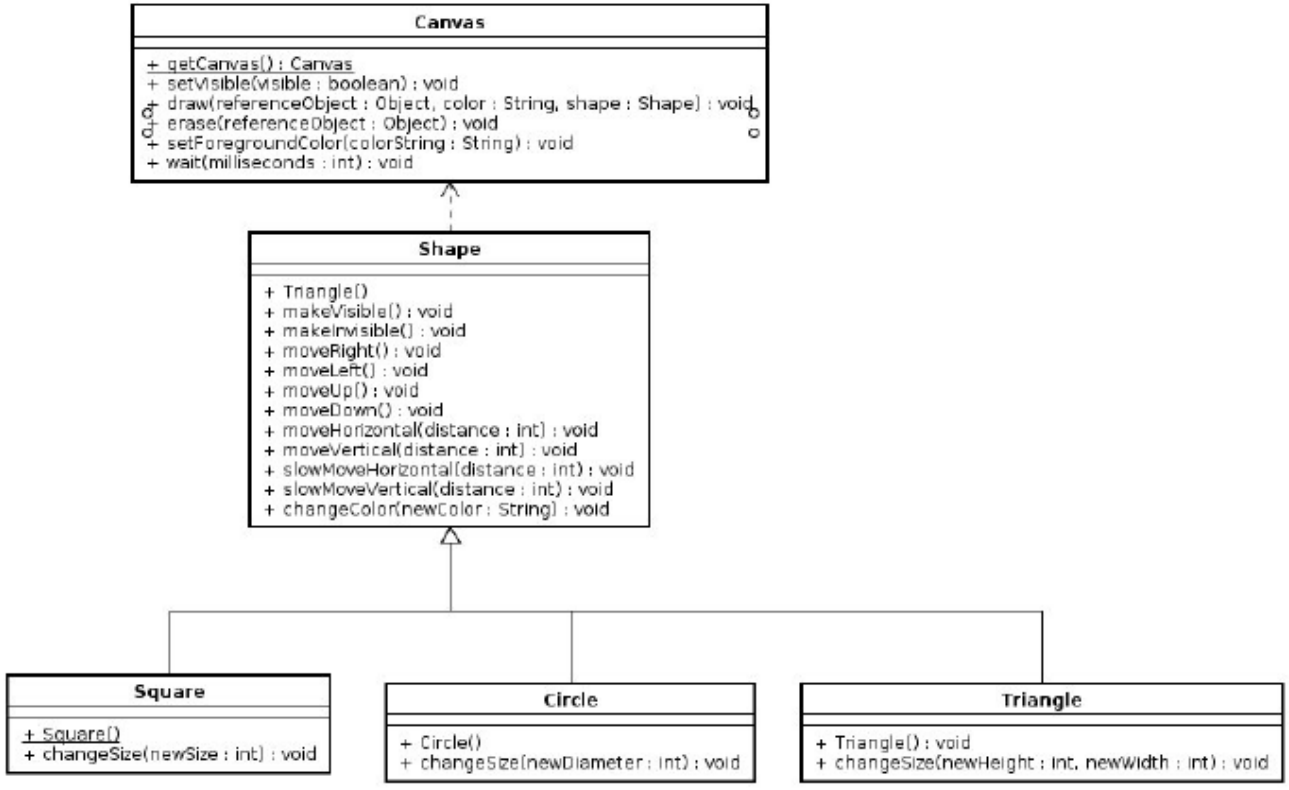
+ moveHorizontal(distance : int) : void
+ moveVertical(distance : int) : void
+ slowMoveHorizontal(distance : int) : void
+ slowMoveVertical(distance : int) : void
+ changeColor(newColor : String) : void
Square
+ Square()
+ changeSize(newSize : int) : void
Circle
+ Circle()
+ changeSize(newDiameter : int) : void
Triangle
+ Triangle() : void
+ changeSize(newHeight : int, newWidth : int) : void

Shapes

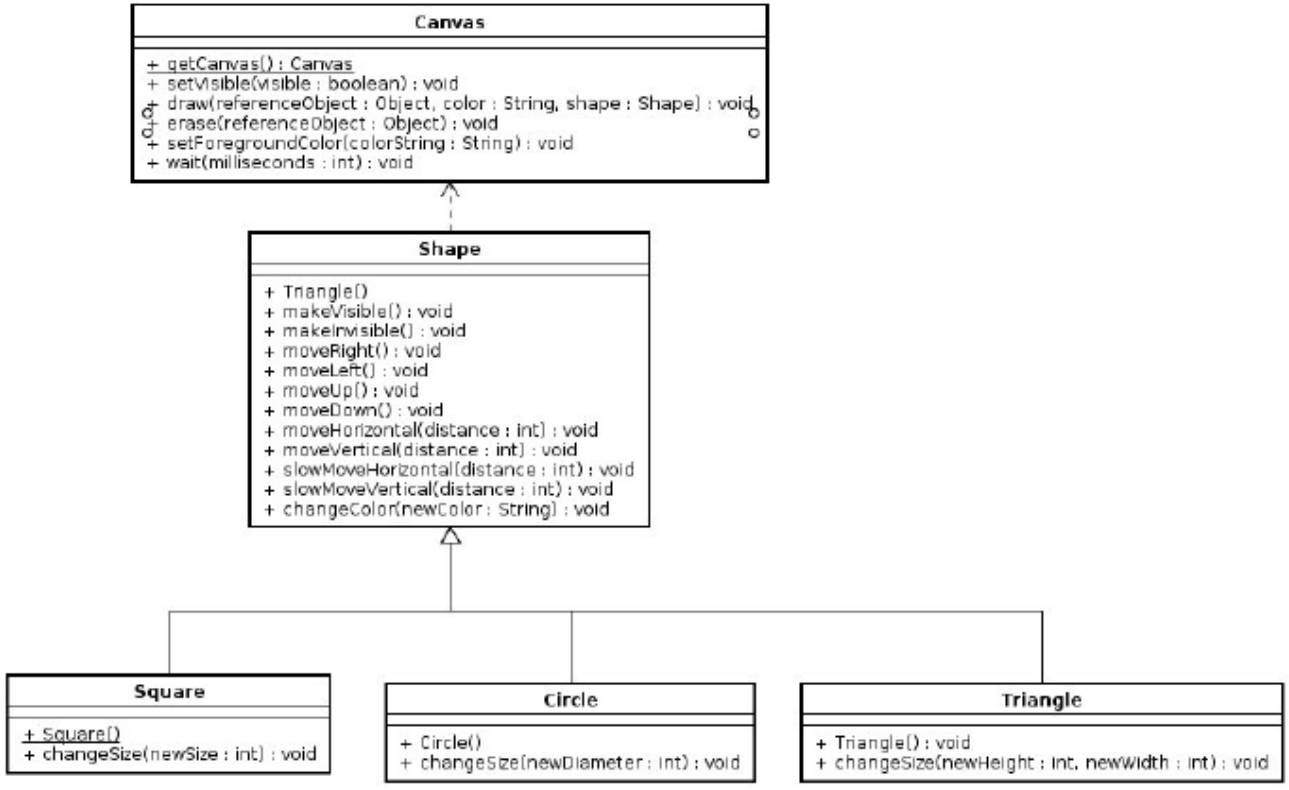


Puliendo

¿Cómo ..

- podemos impedir que se creen figuras sin sentido?

Shapes

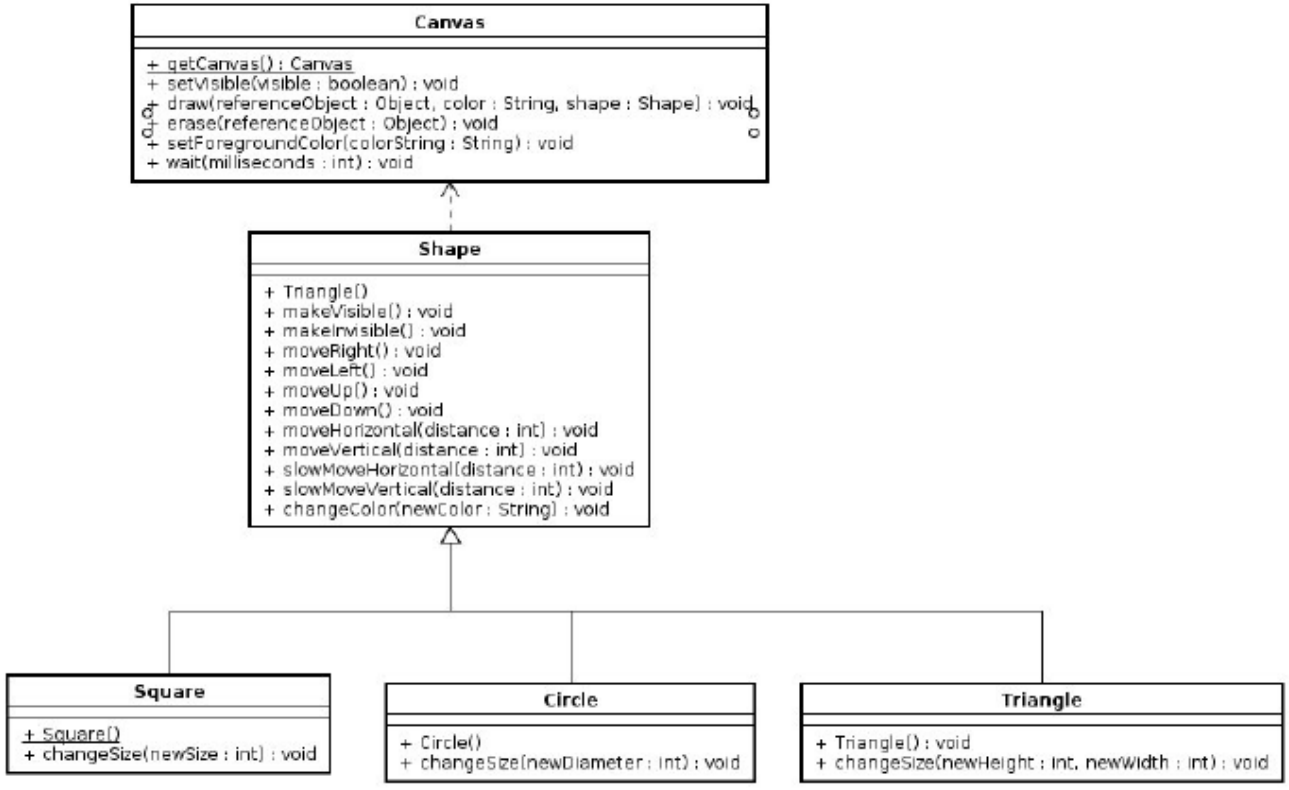


Puliendo

¿Cómo ..

- podemos exigir que todas las figuras hagan zoom?

Shapes



Puliendo

¿Cómo ..

- podemos pedir que algunas figuras retornen cuadrados equivalentes?

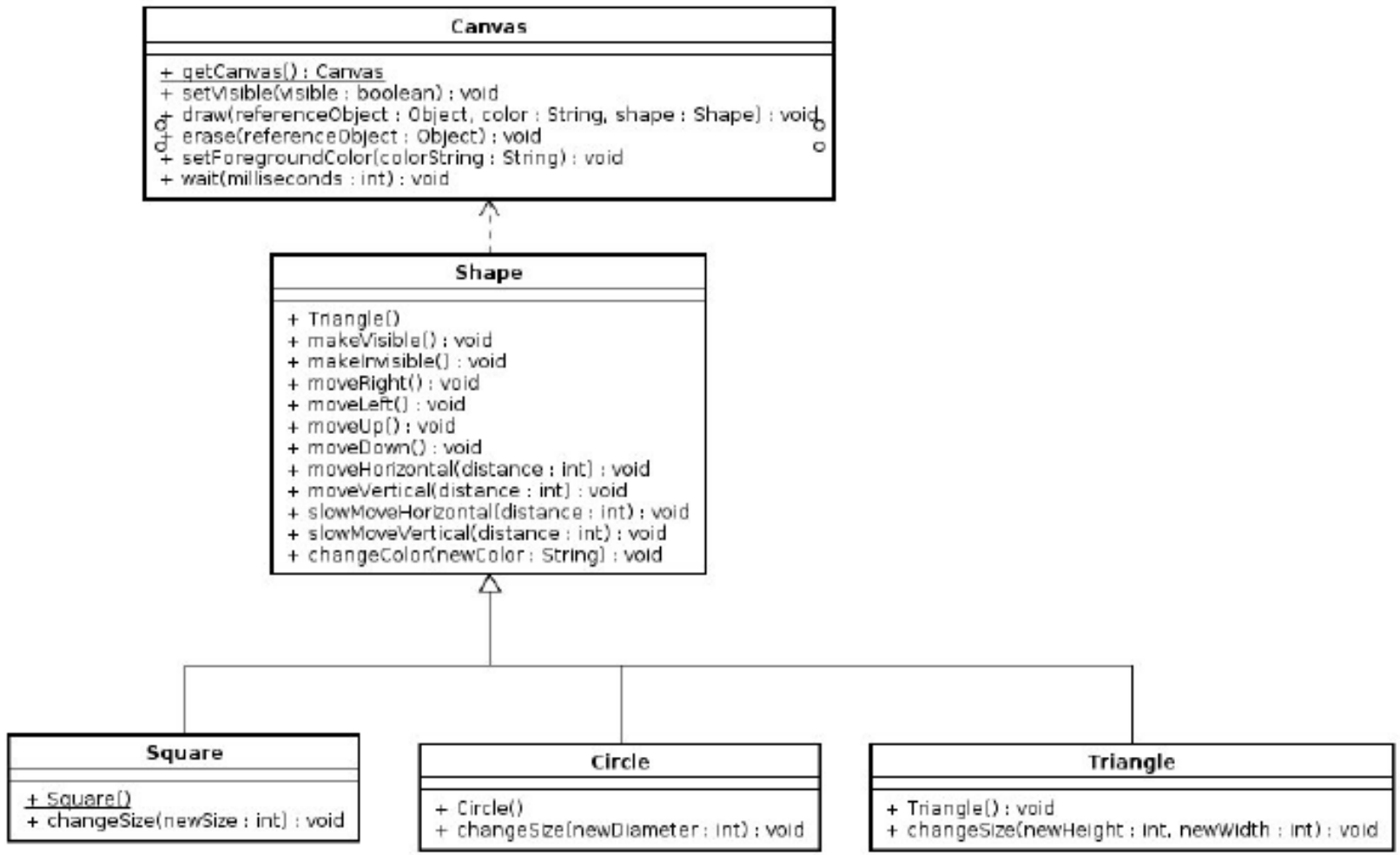
`Squarable - quadrature`

Agenda

Shapes

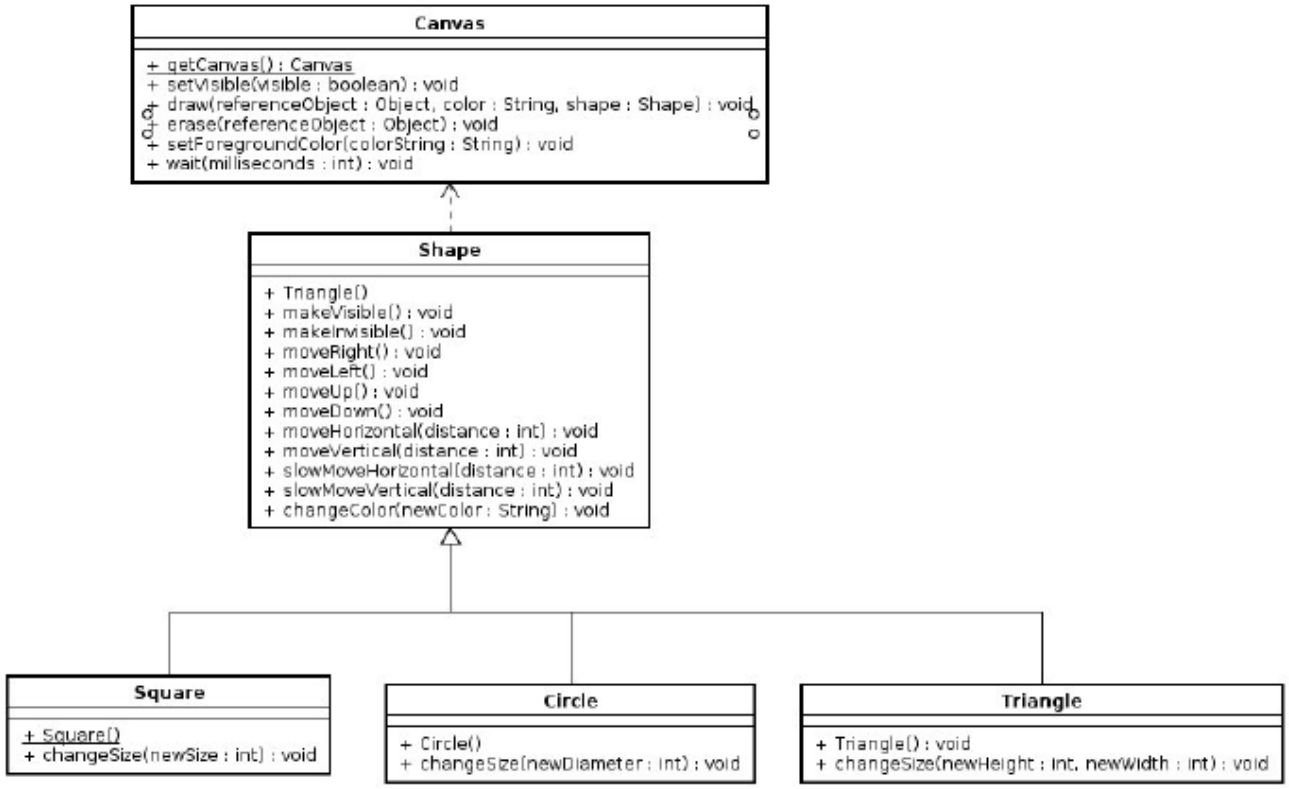
Nueva figura

- Rectángulo



Agenda

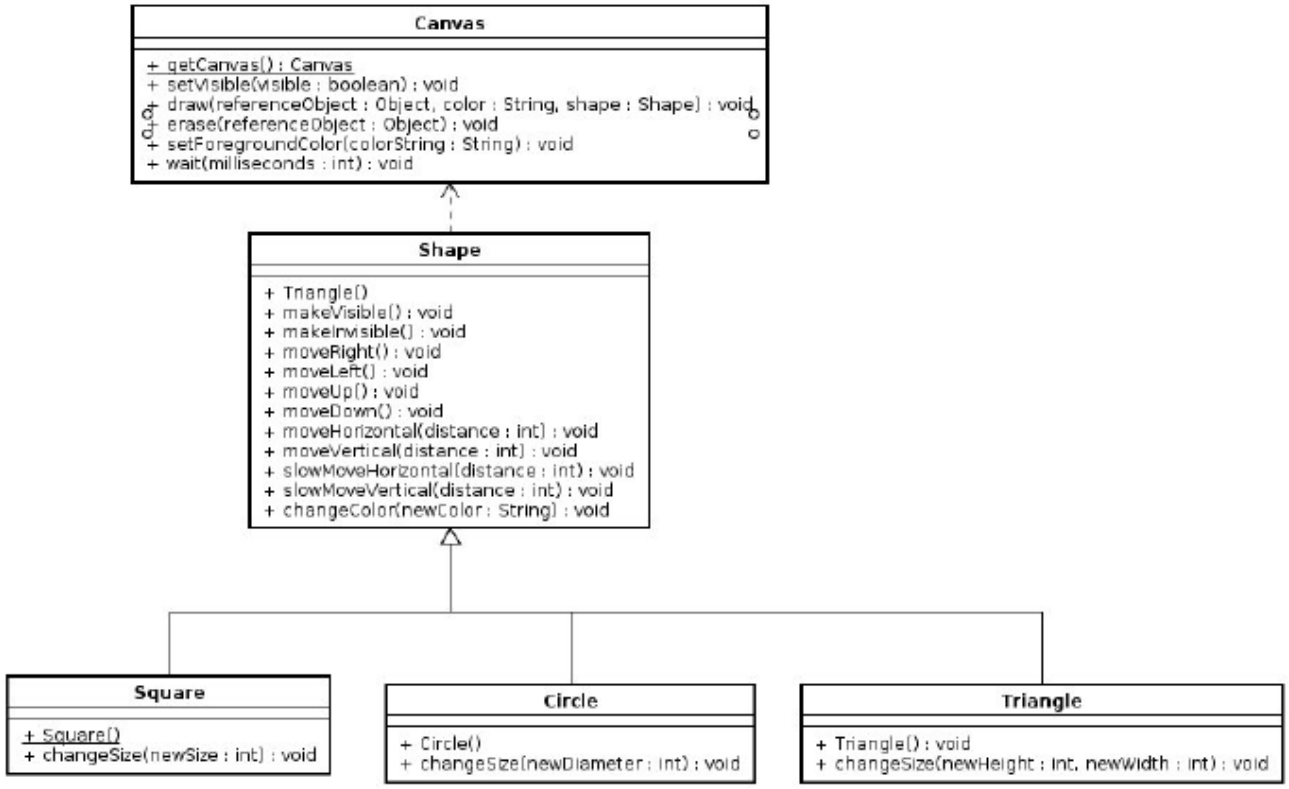
Shapes



`ArrayList <Shape> myShapes`

- Todas las figuras se mueven a la izquierda

Shapes

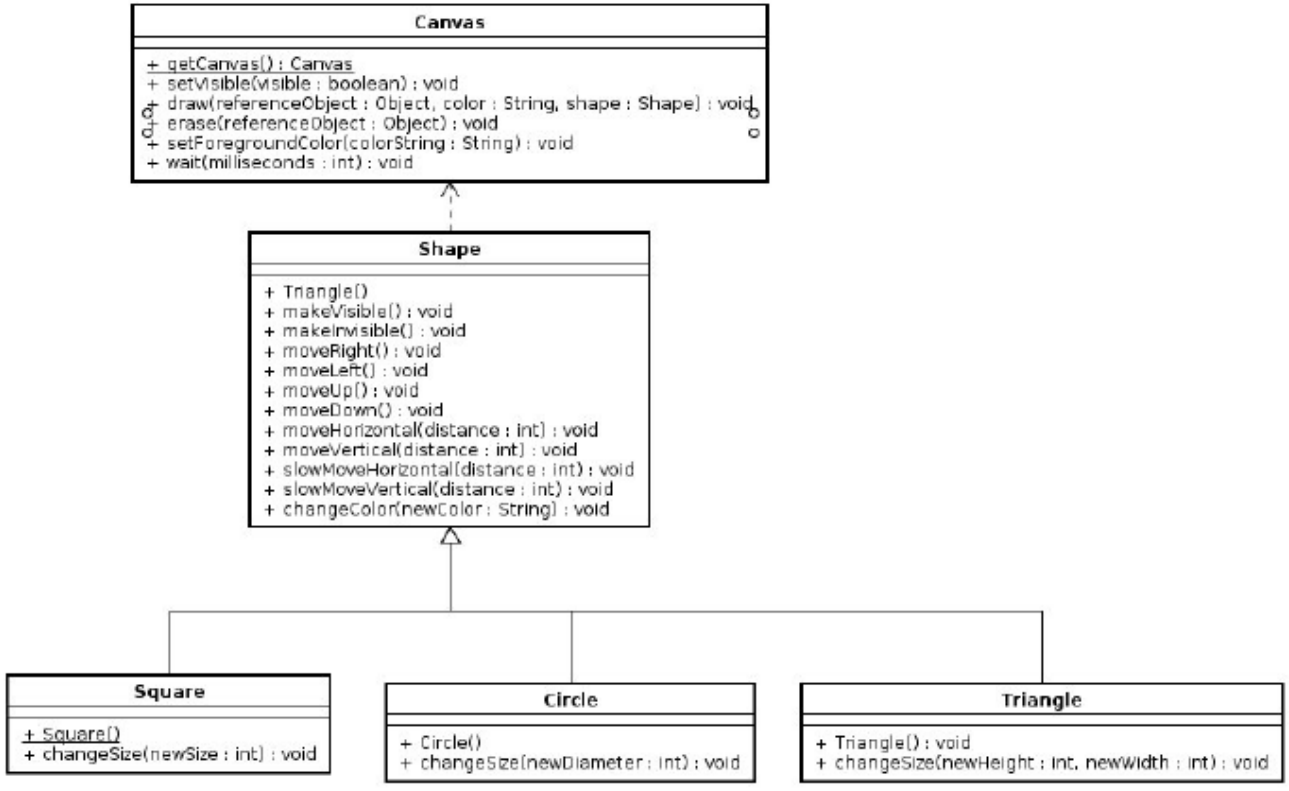


`ArrayList <Shape> myShapes`

- Todos los cuadrados se apagan

  `instanceof`

Shapes



`ArrayList <Shape> myShapes`

- Un tipo especial de figura se agranda. `String special getClass().getName()`

Agenda

Shapes

¿Pintarse?

Circle

```
private void draw()
{
    if(isVisible) {
        Canvas canvas = Canvas.getCanvas();
        canvas.draw(this, color,
            new Ellipse2D.Double(xPosition, yPosition,
            diameter, diameter));
        canvas.wait(10);
    }
}
```

Square

```
private void draw()
{
    if(isVisible) {
        Canvas canvas = Canvas.getCanvas();
        canvas.draw(this, color,
            new Rectangle(xPosition, yPosition, size, size))
        canvas.wait(10);
    }
}
```

Triangle

```
private void draw()
{
    if(isVisible) {
        Canvas canvas = Canvas.getCanvas();
        int[] xpoints = { xPosition, xPosition + (width/2), xPosition - (width/2) };
        int[] ypoints = { yPosition, yPosition + height, yPosition + height };
        canvas.draw(this, color, new Polygon(xpoints, ypoints, 3));
        canvas.wait(10);
    }
}
```

Shapes

```
/**
 * Draw a given shape onto the canvas.
 * @param  referenceObject  an object to define identity for this shape
 * @param  color            the color of the shape
 * @param  shape            the shape object to be drawn on the canvas
 */
 // Note: this is a slightly backwards way of maintaining the shape
 // objects. It is carefully designed to keep the visible shape interfaces
 // in this project clean and simple for educational purposes.
public void draw(Object referenceObject, String color, Shape shape)
{
    objects.remove(referenceObject);   // just in case it was already there
    objects.add(referenceObject);      // add at the end
    shapes.put(referenceObject, new ShapeDescription(shape, color));
    redraw();
}
```

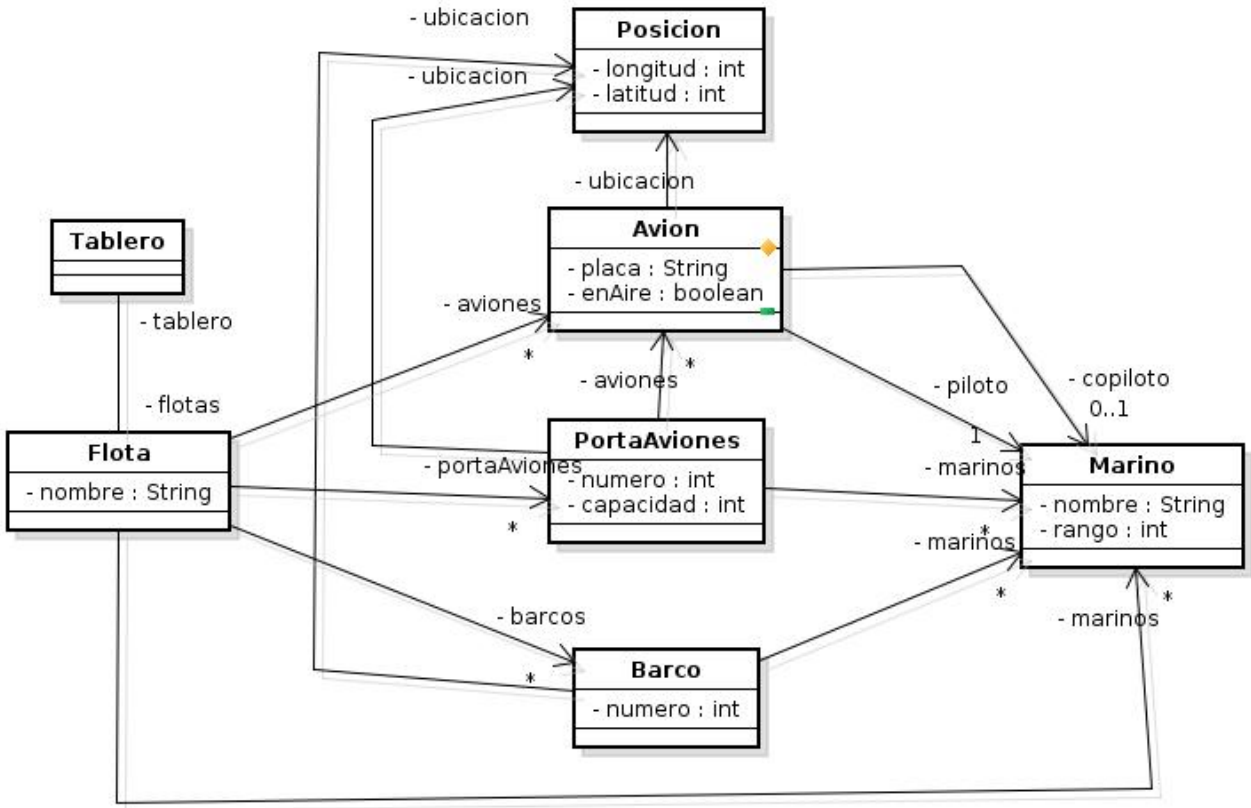
java.awt.Shape

Agenda

Batalla naval

Mejor estructura

- Aprovechando la herencia



Batalla naval

Batalla naval

Batalla naval