Ariel University, School of Computer Science, 2022

Introduction to Computer Science

<p style="text-align:center">Ex4: Main OOP Assignment</p>

Abstract:

This assignment includes a relatively complex set of classes and interfaces. You are asked to implement a set of geometric shapes, a shape container, a basic GUI, and basic save/load capabilities. Moreover, in this assignment, you are required to implement a JUnit class - to test all your functions (Geo, Collections, save & load. GUI classes are not required to have JUNIT tests).

To Do

1. Download Ex4_V0.1.zip, and uncompress it.

2. Run the Ex4_sol-out.jar file (java -jar Ex4_sol.V0.1-out.jar). This is a complete solution to Ex4 - you should implement your solution accordingly. Try loading the a0 file - you should see an image as shown in Figure 1 (Left and Right). The a2 file is shown in Figure 2.

3. Create a new project (named Ex4), and download all the classes and interfaces of Ex4. These files contain most of the required classes (and all the interfaces). The supplied "skeleton" is runnable (run the Ex4Main t2() function). You should get a simple GUI which will allow you to draw circles.

4. Implement and update your solution to all the GeoShapeable classes: Point2D, Circle2D**,** Rect2D, Segment2D, Triangle2D**, Polygon2D**. Note: the polygon is a relatively complex class - make sure to go over the guidance of area, and contains. With respect to the **area** and the **contains** methods - one may assume that the polygon is **simple** (no self intersection).

5. Implement and update the related needed classes, in particular: Ex4, GUIShape and ShapeCollection (you can add additional classes if needed).

6. Implement detailed JUnit classes (this time there are no skeleton classes given to you - make sure you implement a complete testing suite in classes: Point2DTest, Rect2DTest, Segment2DTest,

Triangle2DTest, Polygon2DTest, GUIShapeTest, ShapeCollectionTest, Ex4Test

7. **Add a detailed documentation (in English) to the Ex4.java** file with the related description for each function.

8. Make sure to submit ALL the needed classes + an "executable" jar fine named Ex4.jar that can be run by double clicking.

Notes:

1. Work in pairs (or alone)! - you can talk about this assignment with anyone in class - but when writing your solution DIY!. Please go over this document which covers the School's honesty policy. Make sure to read the remarks regarding chatGPT at the end of this document.

2. **Make sure you write your IDs (ID1 & ID2) in the files Ex4.java**

3. **The implementation of the function should be as efficient and elegant as possible.**

4. **Keep in mind: we have "planted" few minor "bugs" in the suggested jar file ⇒ in order to force you to use proper testing! (and not just comparing with our solution).**

5. Your solution should be submitted to Moodle according to the instructions - as presented to you in the TA sessions.
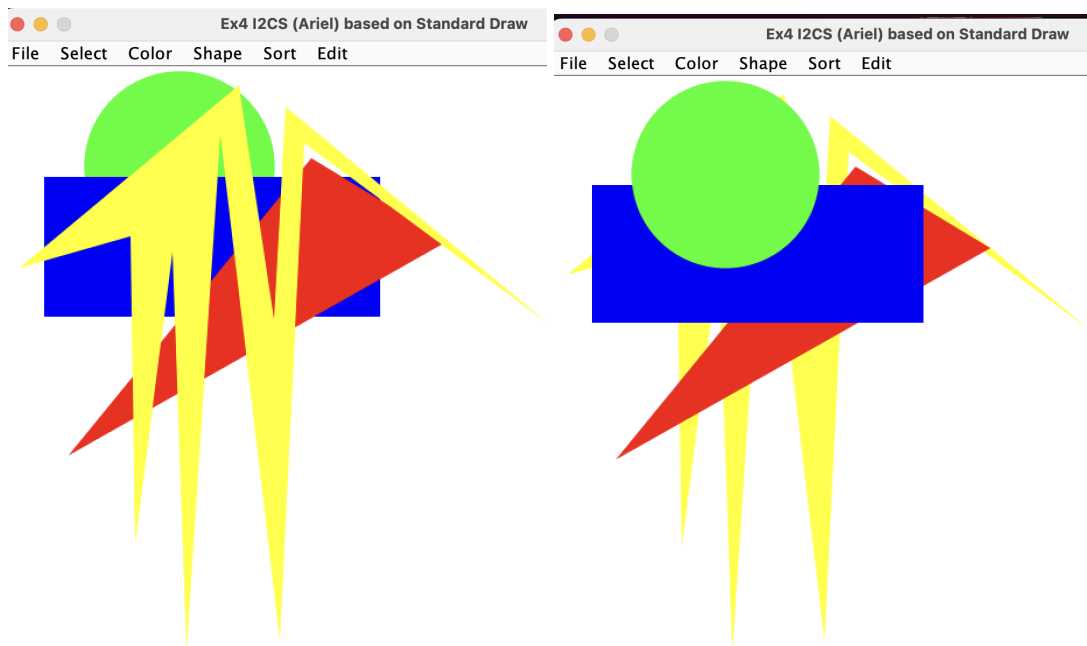
Figure 1: The "a0" file, as opened in the runnable jar. Left ordered by "perimeter" (yellow top - largest). Right: sorted by "antiPerimeter" (green top - smallest). Make sure you play with all tha options - including the sorting, scaling, rotation,save & load.
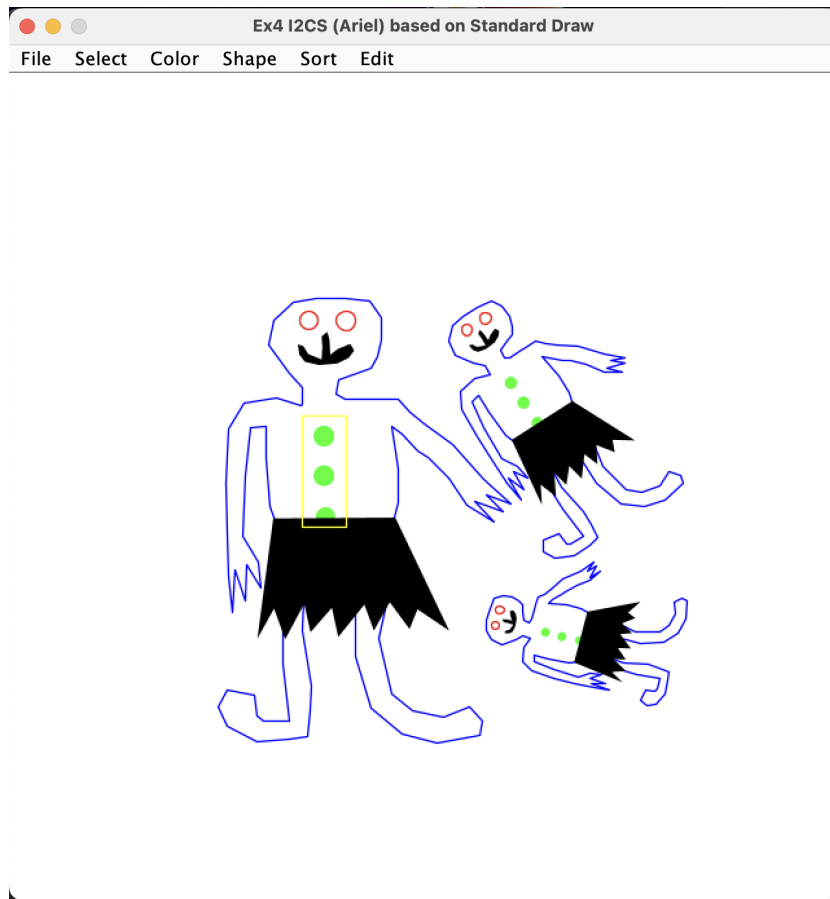

Figure 2: file "a2" - rotation and scaling.

Links:

- [Ex4 101](#): how to start (a zoom talk regarding Ex4)
- [Ex4 201](#): Q & A (Comparator, Polygon, Rotate…)
- Polygon: https://en.wikipedia.org/wiki/Polygon
- Testing if a polygon contains a point :
  https://en.wikipedia.org/wiki/Point_in_polygon

Generate a java class for Polygon

Here is a sample Java class for a Polygon:

Copy code

```java
public class Polygon {
```

Will chatGPT replace programmers

It is unlikely that chatGPT or any other language model will be able to fully replace programmers in the near future. While language models like chatGPT are able to generate human-like text, they are not able to execute tasks or write code. They are primarily used for generating text and for tasks such as language translation, summarization, and question answering.

Programming requires a deep understanding of a wide range of concepts, including algorithms, data structures, and software design principles, as well as the ability to apply these concepts to solve complex problems. It also requires the ability to debug and troubleshoot code, and to write code that is efficient, maintainable, and scalable. These are all skills that are difficult to automate, and are likely to remain the domain of human programmers for the foreseeable future.

Figure 3: chatGPT is a source like any other - make sure to report on any source you are using! → Write your own code!

Q & A

1. Comparator:

```
if(_flag == Ex4_Const.Sort_By_toString) {
        ans = o1.toString().compareTo(o2.toString());
}
if(_flag == Ex4_Const.Sort_By_Area) {
        double d1 = o1.area();
        double d2 = o2.area();
        if(d1<d2) {ans  = -1;}
        if(d2<d1) {ans = 1;}
}
```

https://docs.oracle.com/en/java/javase/12/docs/api/java.base/java/util/Arrays.html#sort(T%5B%5D,java.util.Comparator)

https://docs.oracle.com/javase/7/docs/api/java/util/Collections.html#sort(java.util.List,%20java.util.Comparator)

2. Rotate & Scale (center Point)
   https://docs.oracle.com/javase/8/docs/api/java/lang/Math.html#atan2-double-double-
3. Polygon:
   a. Point inside, given a point p and a polygon Po: is Po containing p: define a outer point Pmin1(Xmin-1, Ymin-1), Pmin2(Xmin-1, p.y);
   b. area: https://www.baeldung.com/cs/2d-polygon-area