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OOSC
WS 2019/2020

Assignment 3

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Issued: 18.11.2019 Submission: 02.12.2019 Discussion:05.12.2019

3.1. Genericity:

This exercises should support you to achieve a better understanding of genericity in Java. *Your goal should be to try to solve these tasks without using the Java compiler from the very beginning.*

a) Will the following code compile? Please explain why/why not. In case of a negative answer, explain how you would fix it.

```
public class Singleton<T> {
    public static T getInstance() {
        if (instance == null)
            instance = new Singleton<T>();

        return instance;
    }

    private static T instance = null;
}
```

b) Given the following classes:

```
public class Animal {
      /* */
}

public class Monkey extends Animal {
      /* */
}

public class Zoo<T> {
      /* */
}
```

Will the following code compile? Why/why not? If the answer were negative, how would you fix it?

```
public class Test {
      Zoo<Monkey> zm = new Zoo<Monkey>();
      Zoo<Animal> za = zm;
}
```

c) Will the following code compile? If not, why not and what changes should you undergo to correct it?

```
public final class genericsAlgorithm {
    public static T max(T x, T y) {
        return x > y ? x : y;
    }
}
```

d) What is the difference between the following two methods? Write some code snippets in which you exemplify the difference between the two.

```
public static double sumOfListVar1(List<? extends Number> list) {
       double s = 0.0;
       for (Number n : list)
           s += n.doubleValue();
       return s;
}

public static double sumOfListVar2(List<Number> list) {
       double s = 0.0;
       for (Number n : list)
           s += n.doubleValue();
       return s;
}
```

3.2. Design Patterns applied

JHotDraw framework is an application framework for drawing technical and structured graphics (e.g., network layouts and Gantt diagrams). We will use JHotDraw version 7.6 framework for plug-in development.

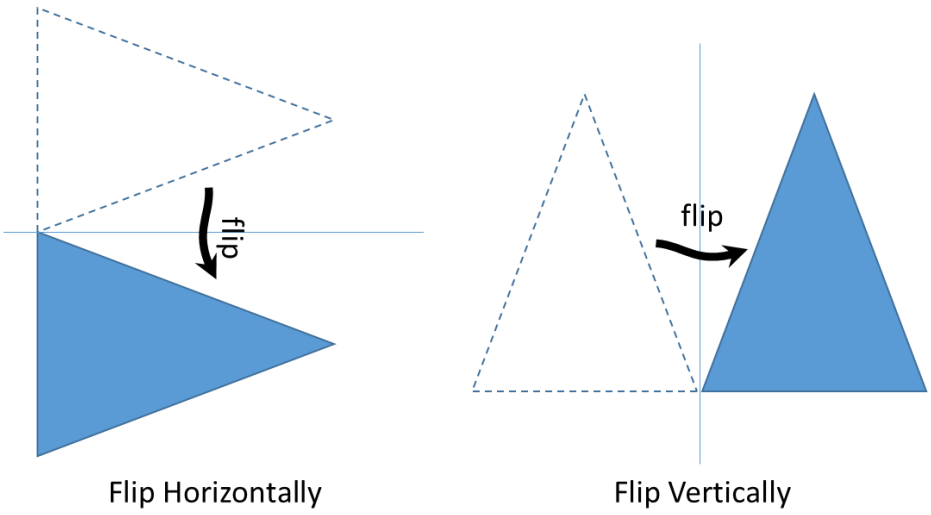

Figure A: Flip Vertically and Horizontally Direction

Imagine you have to **develop a small plug-in that could flip a sketched drawing - either**

***geometric shape* or *text* - in both directions (vertical and horizontal see Figure A for example). You can develop *buttons* for both vertical and horizontal flipping**.

Answer the following questions:

a) Erich Gamma developed JHotDraw as an example implementation for the usage of his patterns.
    a. Identify **5** of the GoF patterns in the JHotDraw Framework and explain how they are used.
    b. Explain how the following **design principles** and **design properties** are supported by these patterns:
        i. Single Responsibility
        ii. Open-Closed Principle
        iii. Separation of Concerns
        iv. Property: composable
        v. Property: local

        If your patterns of part a. don't match the principles above, search for additional ones!
b) Develop the plugin as described above.

Please provide the complete code and an **executable** binary!

You can clone JHotDraw from:
http://supp.swc.rwth-aachen.de/stash/scm/teach/swc.oosc.swcarchitect.git

To understand the framework, you can use various articles and internet resources, which describe it thoroughly and discuss the design patterns applied. See the ***resources section*** for more details.

Resources

- http://www.jhotdraw.org
- https://git.rwth-aachen.de/swc-public/teaching/jhotdraw
- http://www.javaworld.com/article/2074997/swing-gui-programming/become-a-programming-picasso-with-jhotdraw.html
- http://dirkriehle.com/computer-science/research/dissertation/chapter-8.html
- JHotDraw thesis "Review of the JHotDraw framework" - https://www.ifis.uni-luebeck.de/~moeller/publist-sts-pw-and-m/source/papers/2004/savo04.pdf