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2. Übung zur Vorlesung „Programmierung“

Second Unit
Abgabe am Sonntag, 13. November 2016 - 23:55

Aufgabe 1 - With Class

49 Punkte

Part 1 In the lecture you have seen how class hierarchies are built. Create your own class hierarchy for vehicles (as a diagram, not as a program). Your hierarchy should at least cover cars, steam ships, rowing boats (Ruderboote), and bicycles. However, feel free to add other means of transportation.

A program using one of these vehicle classes should be able to call a `getMaximumVelocity` method to retrieve the maximum velocity of that particular vehicle. Of course, even within a class of vehicles the velocity depends on certain parameters. You should think about what parameters influence the maximum velocity of that kind of vehicle and add them to you class model. For example, a car's maximum velocity may depend (among other things) on the power of the engine which is often measured in horse power (HP). So, you could add the method `setHP` to your car's class. There is no right or wrong here (in your model). You will probably want to add at least one method to most of your classes. Whatever you do, explain your class hierarchy model in detail.

Background information: In a later task set your class hierarchy will be used to calculate the maximum velocity values for particular vehicle instances depending on different parameters. You don't have to create the actual program yet, because you still need to learn how to construct reasonable classes. However, you should think about a meaningful class hierarchy for this upcoming task.

Part 2 Additionally, explain the following terms and give examples:

- Class
- Object
- Superclass
- Subclass
- Inheritance
- Variable
- Operator

Tips

- To get the best possible support in the practical class, think about a meaningful class hierarchy **before** class.
- Please hand in a format that we can open (for example pdf or png).

Aufgabe 2 - Not Losing Interest 49 Punkte

Last week we showed you how to be an architect. This week we want to teach you everything related to financial transactions. For this reason you have to understand the concept of interest.

You are required to write a program `Interest` which extends `ConsoleProgram`. The program reads in two numbers, an account balance and an annual interest rate in percent (simply write *5* for *5%* interest rate). There are no deposits or withdrawals. Your program should then output the new balances after one year and after two years. Keep in mind that the interest adds up cumulatively each year. Don't forget to add meaningful comments to your program.

Hints on tests:

- You are free to print any data **before** the last two lines.
- The second last line has to contain the balance after one year.
- The last line has to contain the balance after two years.
- The balances must **not** be followed by a dot directly.

Aufgabe 3 - At the End of the Rainbow 1 Punkt

You already learned how to place simple elements on the canvas. Now you are required to modify these elements and assign colors. Here's an example of how this can be done with rectangles (adapted from Figure 2.9 from the book, which is not in the draft):

```
GRect rect = new GRect(100, 50, 125, 60);
rect.setFilled(true);
rect.setColor(Color.RED);
```

Write a program `Rainbow` which extends `GraphicsProgram`. The program should use `GArcs` and draw a 6-colored rainbow on a blue(-ish) sky. Don't forget to add meaningful comments to your program.

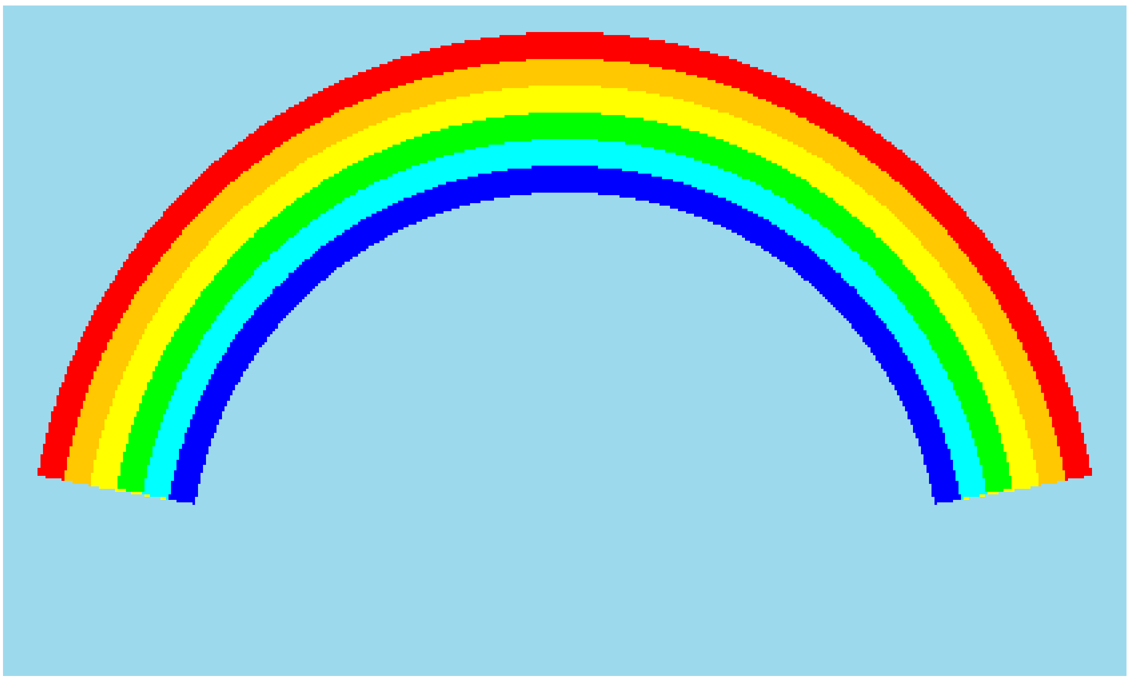

Abbildung 1:

To use colors you can use the predefined constants in the class `Color`.

Optional extension: You can extend the drawing by placing the rainbow on a lush green pasture and drawing a small farm house on the pasture.

Hints on tests:

- The test expects you to use the colors `Color.BLUE`, `Color.CYAN`, `Color.GREEN`, `Color.YELLOW`, `Color.ORANGE` and `Color.RED` for the rainbow.
- The rainbow has to be drawn in the right order.
- The sample picture uses the color `new Color(157, 217, 237)` for the sky.

Zusatzaufgabe 4 - All The Stars In The Sky 1 Punkt

(Remember that this is a more difficult task aimed at students that already have Java experience. You are not expected to solve it, but of course are invited to try.)

Write a Program called `Star` which asks for three numbers:

1. the number of points of the star
2. the radius of the points
3. the inner radius of the 'solid part' of the star

and then draws the star using `GLines`.

One sample ourput could be:

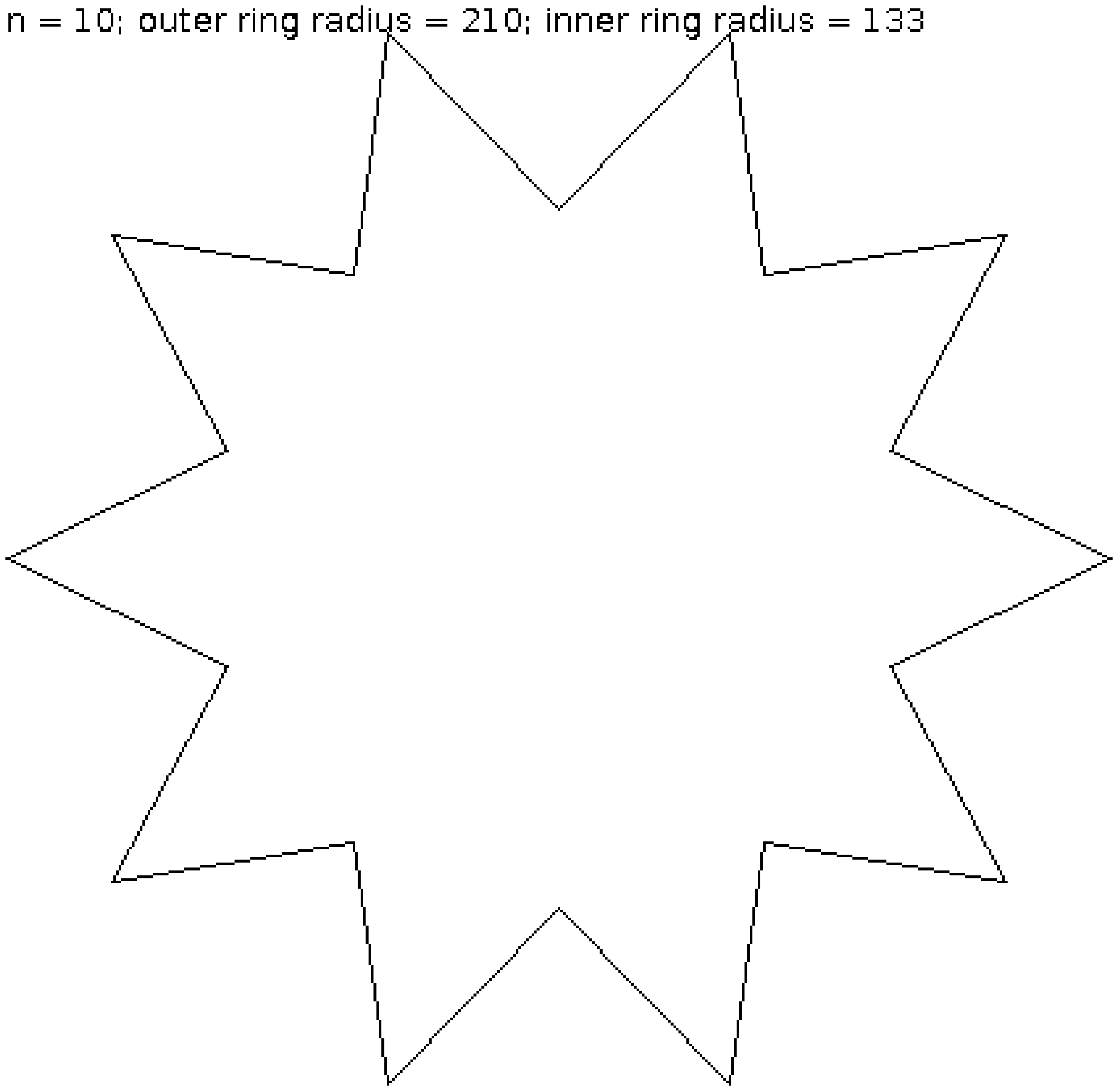

Abbildung 2: