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Group 6

2nd assignment / 2. Task

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Task

In the hydrological cycle of the Earth, various areas affect the weather as well as areas are also affected by various weathers. Areas involved in the simulation: plain, grassland, lakes region. Each area has a name, and the amount of water stored in the certain area is also given in km3. The humidity of the air over the areas is also given in percentage.
The possible types of weather are the following: sunny, cloudy, rainy, depending on the humidity of the air. In case the humidity exceeds 70%, the weather gets rainy and the humidity decreases to 30%.
In case the humidity is between 40-70%, the calculation of the chance of rainy weather is: (humidity-30)*3,3%, otherwise the weather is cloudy. Humidity below 40% leads to sunny weather.
In the following, we declare how the certain areas respond to the different type of weathers.
First the amount of water stored by the area varies then the weather will be affected. There is no type of areas with negative amount of water stored.

> In case the type is plain, if the weather is sunny, the amount of water will be decreased by 3 km3; if cloudy, it will be decreased by 1 km3; for rainy weather it will be increased by 20 km3. The humidity of the air is increased by 5%. If the amount of the stored water is greater than 15 km3, the plain area changes into grassland.
> In case of type grassland: in sunny weather, the amount of water is decreased by 6 km3, for cloudy it will be decreased by 2 km3, but and for rainy, it will be increased by 15 km3. The humidity of the air is increased by
> 10%. The area becomes lakes region obtaining amount of water over 50 km3, whereas in case the amount of stored water goes below 16 km3, the area changes to plain.
> In case of type lakes region: in sunny weather, the amount of water is decreased by 10 km3, for cloudy it will be decreased by 3 km3, for rainy it will be increased by 20 km3. The humidity will be increased by 15%. Beyond an amount of water of 51 km3 the area changes into grassland.

The program reads data from a text file. The first line of the file contains a single integer N indicating the number of areas. Each of the following N lines contains the attributes of an area separated by spaces: the owner of the area, the type of the area, and the amount of water stored by the area. In the last line, the humidity of the air is given in percentage. The type is identified by a character: P – plain, G – grassland, L – lakes region.

We continue the simulation until each area has the same type. The program should print all attributes of the certain areas by simulation rounds!

The program should ask for a filename, then print the content of the input file. You can assume that the input file
is correct. Sample input:

```
4
Mr Bean L 86
Mr Green G 26
Mr Dean P 12
Mr Teen G 35
98
```

Analysis

Independent objects in the task are the areas. They can be divided into 3 different groups:
plain, grassland and lakes.
All of them have a name, water level and humidity percentage. Simulation effects the areas and the weather in the following way:

plain

Weather	Water change	Area change
sunny	-3	if water > 15: Grassland
cloudy	-1	
rainy	+20	

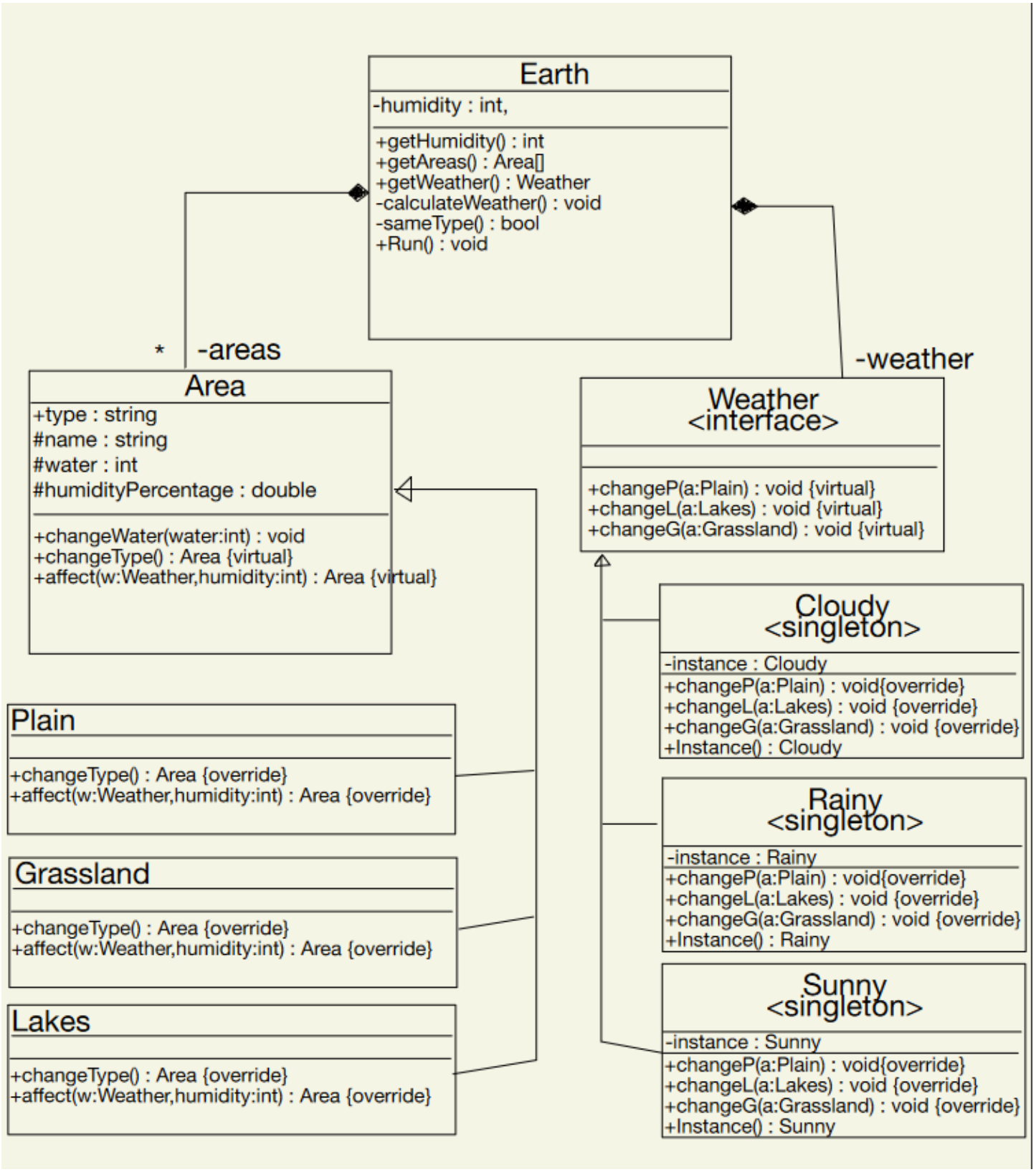
grassland

Weather	Water change	Area change
sunny	-3	if water > 15: Grassland
cloudy	-1	
rainy	+20	

lakes

Weather	Water change	Area change
sunny	-3	if water > 15: Grassland
cloudy	-1	
rainy	+20	

Plan



A = areas: Area list, weather: Weather?, humidity: int

Pre = areas = initial_areas ∧ weather = initial_weather ∧ humidity = initial_humidity

Post = areas = final_areas ∧ weather = final_weather ∧ humidity = final_humidity ∧ ∀i∈[1..n]:areas[i]=affect(weather,humidity)∀i∈[1..n]:areas[i]=affect(weather,humidity)

Testing

Grey box testing

1. **Common behavior** ——————————————————————{testcases/1.ok}
    a. check initial data (provided input = expected result)
        i. humidity is correct
        ii. weather is not set (null)
        iii. areas are correct (length + each data)
    b. check the data after run (simulation is ended properly)
        i. humidity is correct
        ii. weather is correct and non-null
        iii. areas are correct (length is not changed + result data as expected)
        iv. all areas has same type (condition to end the program)
2. **Least data possible (0 entities)** ——————————————————————{testcases/2.ok}
    a. check that initial data is correct
        i. humidity is set properly (0)
        ii. weather is not set (null)
        iii. areas are empty: length=0
    b. check data after run (nothing is expected to change, but weather is set)
        i. humidity is unchanged, as set to 0
        ii. weather is sunny, as humidity is 0
        iii. areas are still empty: length=0
        iv. all has same type: check skipped as we have nothing to check
3. **Exception : format** ——————————————————————{testcases/1.bad}
    a. Attempt to load a file that has wrong format:
        i. Explanation: line [1..N] should have 4 words separated by spaces
        ii. Error cause: line has only 1 word
4. **Exception : format** ——————————————————————{testcases/2.bad}
    a. Attempt to load a file that has wrong format:
        i. Explanation: line [1..N] should have 4 words separated by spaces
        ii. Error cause: line has 5 words (1 is given extra)
5. **Exception : area** ——————————————————————{testcases/3.bad}
    a. Attempt to read an area symbol that is not recognized by app
        i. Explanation: 3rd word should be a character of [L, P, G]
        ii. Error cause: character A was given as an input
6. **Exception : file** ——————————————————————{<does not exist>}
    a. Attempt to read the file that does not exists
        i. Explanation: reader tries to access the file that cannot be found
        ii. Error cause: no such file, data cannot be accessed…