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Group 05

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-40)*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.

After 10 simulation rounds, determine the owner of the area which is storing the greatest amount of water. The amount of water is also required to be determined. 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
```

Analysis1

Independent objects in the task are the Area types. They can be divided into 3 different groups: Plain, Greenland and Lake Region.
All of them have a Weather Type and a Water Reserve that can be got. It can be examined what happens to the water reserve when weather changes. The effects on the Area can be calculated in the following way:

Plain:

Weather Type	Water change	Humidity
Sunny	-3	-
Cloudy	-1	-
Rainy	+20	5

(- sign show decreasing, + sign show increasing)

So, if the water level reserves exceed 15km^3 then the Plain Area will change to Grassland.

Grassland:

Weather Type	Water change	Humidity
Sunny	-6	-
Cloudy	-2	-
Rainy	15	10

(- sign show decreasing, + sign show increasing)

Grassland can be changed into Lake Region if the water level goes beyond 50 km^3. And if the water level falls below 16 km^3, Grassland region changes to Plain region.

Lake Region:

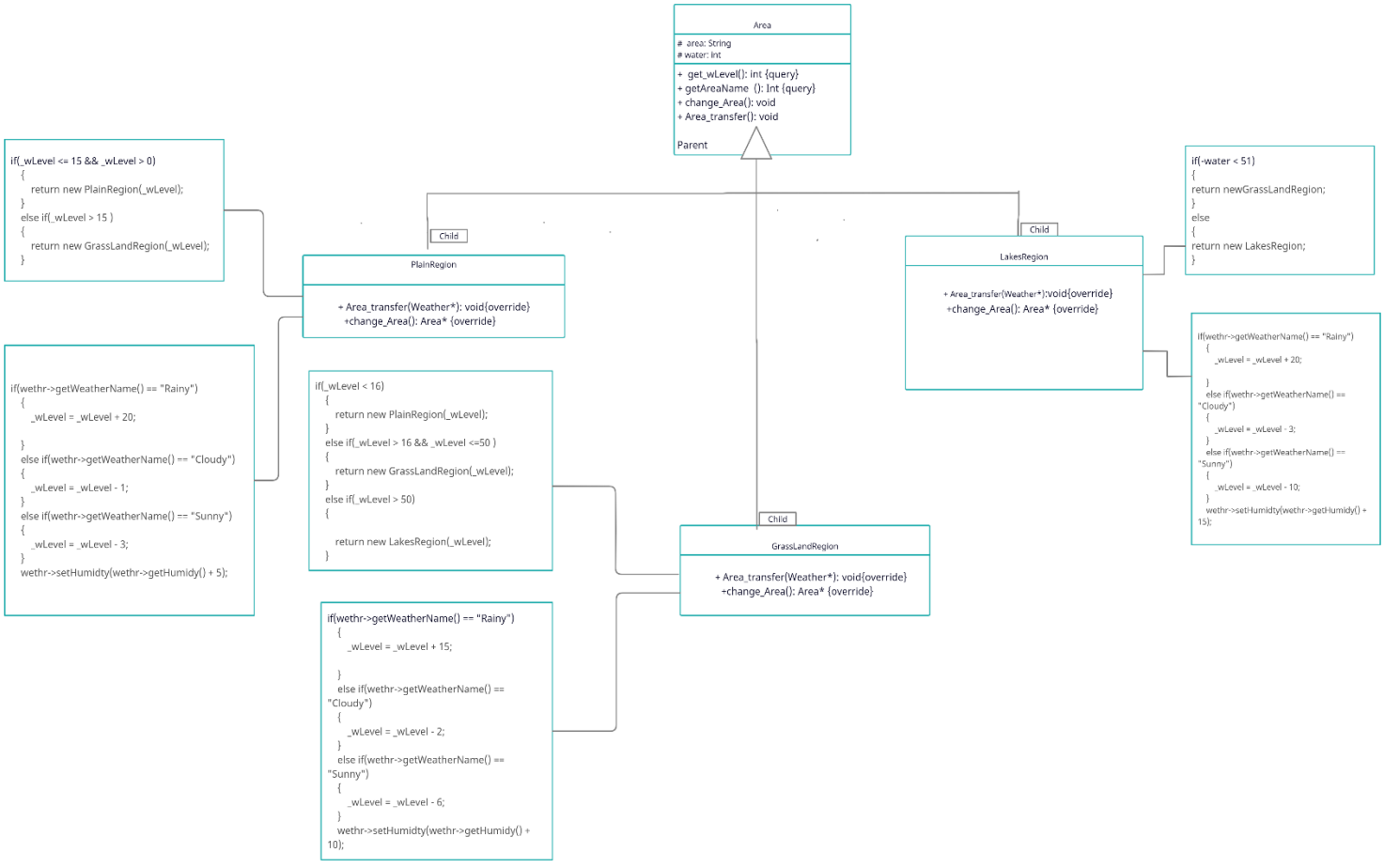
Weather Type	Water change	Humidity
Sunny	-10	-
Cloudy	-3	-
Rainy	20	15

If the amount of water below than 51km^3 then lake region will convert into Grassland region.

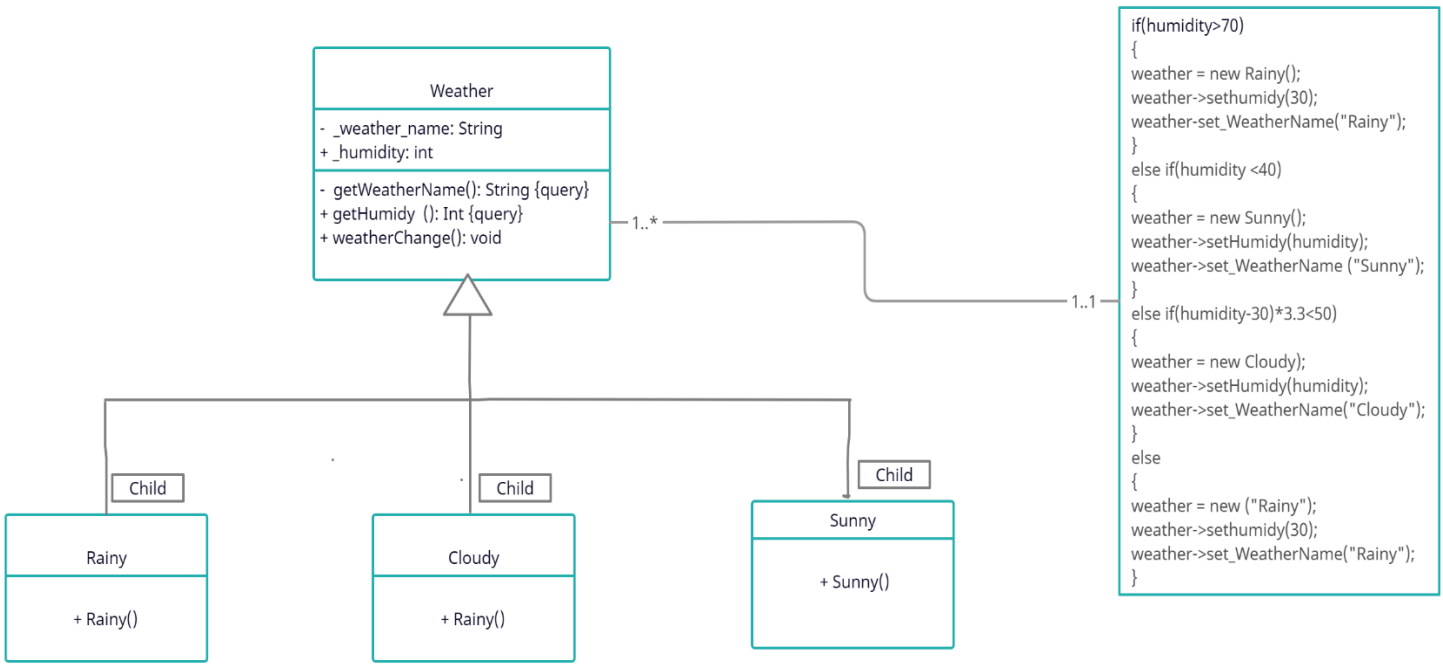
Plan:

Firstly, we will introduce a weather class which will be the base class having three child classes (Rainy, Sunny, Cloudy). Weather has methods. Another base class will also be created as a Ground class with three Child classes (Plain, Grassland, Lake Region). It also contains virtual functions which can be overridden in the child classes. Weather Class will also have Functions. These functions will change the weather according to humidity.it will affect the ground classes so there will be variation.

The UML Diagram of Area Class is given below:



The UML Diagram of Weather Class is given below:



In specification it is very important to calculate with n+1 version of Area. As every ground rounds the given weather. The Rounds function of area class take weather on the base of it's type(weather) so it change the water level accordingly. If water level falls below zero it show the exception. Otherwise WeatherChange () function change the created area classes accordingly to its water level. Then it change the weather at the end of every simulation.

Then we implement the waterLevel() function to check the landlord name who has stored the most water after 10 simulations.

Specification:

A = *ownerList*: Area*Owner*^{n}, proprtyOwner: *String, WaterLevel: Integer*

B = ownerList = ownerList'

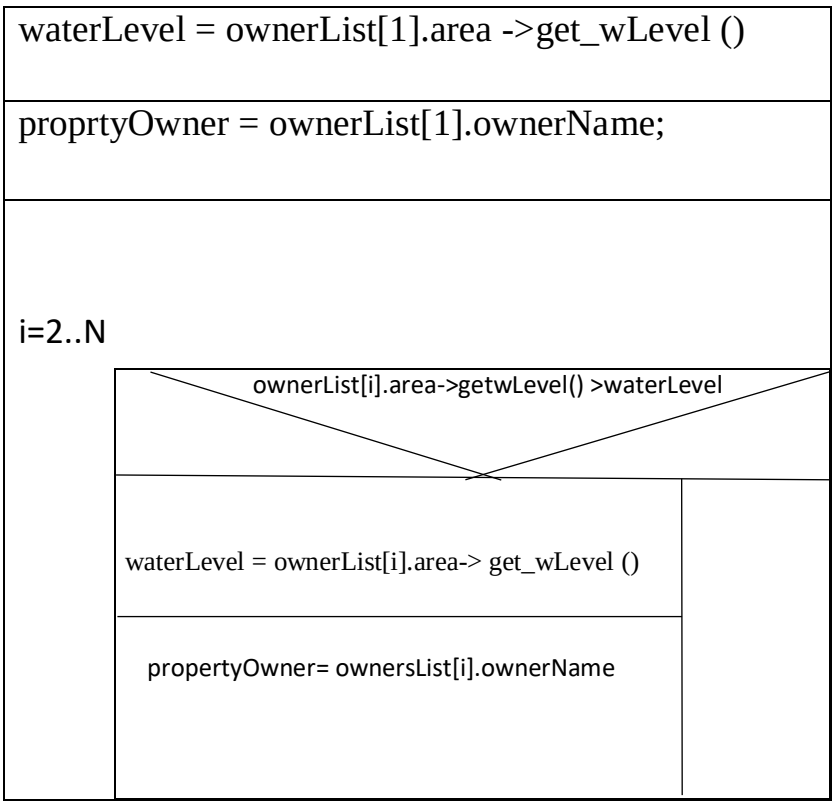
Post = *(*proprtyOwner*, WaterLevel) = MAX*$_{i=1..N}$ *(ownerList[i].water)*

This is for finding the proprtyOwner with maximum amount of water level after 10 simulations.

Analogy: (Max Selection)

Enor(E)	***i=1...n***
f(e)	***ownerList[i].water***
H, <	***Z, <***

Structogram:



Testing

Grey box test cases:

Max Selection:

The following test are done for max selection

1. ***The First propertyOwner has stored more amount of the water***
2. ***The last propertyOwner has stored more amount of the water***
3. ***There is a propertyOwner between first and last who has stored the most amount of water.***

Simulations Function:

Water level falls below 0.

Examination of functions Weather Change and Rounds.

Five different test cases depending on the Ground and the Weather conditions.