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Group 5

Task

Task 2: * The task: It is about the hydrological cycle of the earth and how various types of areas are affected by various types of weather.

Some points about the task requirements:

1. We assume the weather is sunny if the humidity level is below 40.

2. If the humidity level (%) is between 40 (inclusive) and 70, the chance of rain is 50-50.

3. If 70% or higher, the weather is considered rainy.

Whenever the weather is rainy, the humidity level for the next round drops to 30 percent. After all the areas are checked and if they

affect the humidity levels, we take the increase from that type of area and add it to the original 30. This sets the humidity level for

the next round.

Analysis[1]

Independent objects in the task are areas. They can be divided into three different groups: Plain, Grass land and Lake region.

All of them have an identifier (‘P’, ‘G’, ‘L’) and a humidity that can be got. Our purpose is to examine the effects of different weather conditions on the amount of water they store, as well as how rainy weather affects the humidity levels of the areas.

Plain:

Weather	Change in water levels
Sunny	-3

Cloudy	-1
Rainy	+20

Grass land:

Weather	Change in water levels
Sunny	-6
Cloudy	-2
Rainy	+15

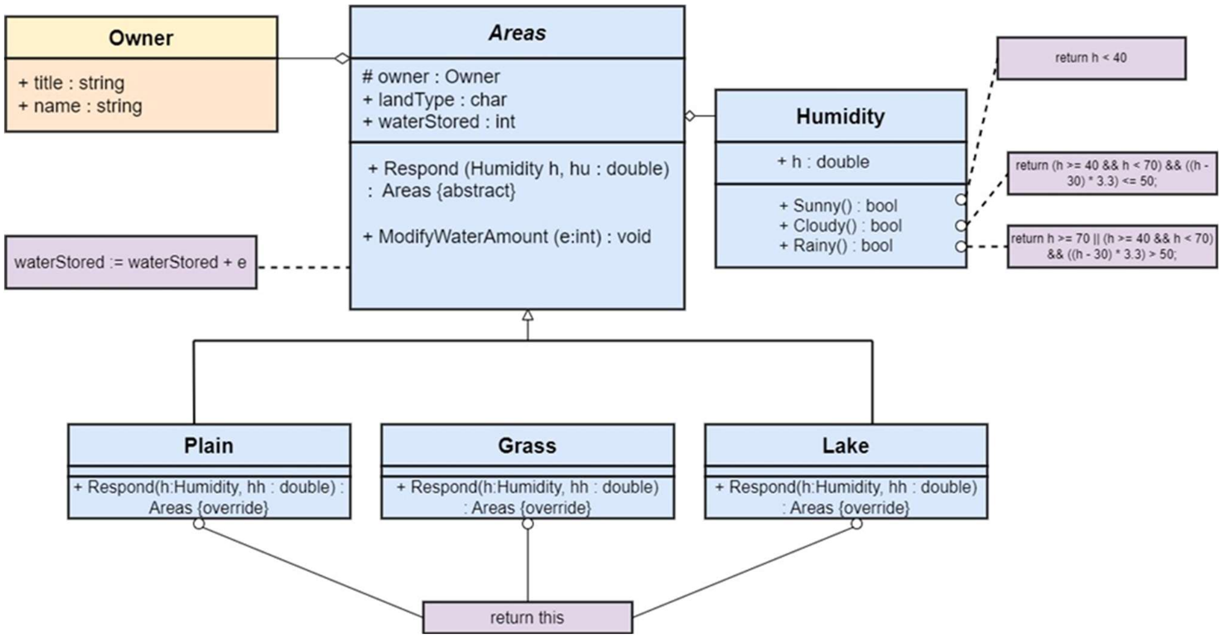
Lakes region:

Weather	Change in water levels
Sunny	-10
Cloudy	-3
Rainy	+20

Plan[2]

To describe the areas, 4 classes are introduced: base class Areas to represent the general properties and 3 children for the concrete areas. Plain, Grass, Lakes region. Regardless the type of areas, they have several common properties, like the name, amount of water, and humidity.

The special areas classes initialize the owner, land type, and the water amount through the constructor of the base class and override the operation *Respond()* in a unique way. Initialization and the override are explained in Section Analysis. According to the tables, in method *Respond()*, conditionals could be used in which the type of the weather would be examined.



Method *Respond()* of the concrete areas expects a humidity and a humidity level sample as an input parameter.

Specification:

A = *area : Areas, h : Humidity, owner : Owner, hh : R*

Pre = $area = area' \wedge h = h' \wedge owner = owner'$

Post = $owner=owner' \wedge \forall i : [1..n]: areas[i] \oplus \langle Respond(h, hh)\rangle$

Analogy:

enor(*E*)	*i = 1 .. n*
f(*e*)	*Respond*(*h*, *hh*)
s	*areas*
H, +, 0	*Areas*, ⊕, *areas*

Algorithm:

hh := 0.0
areas := <>
i := 1...n
areas[i] ⊕<Respond(h, hh)>

Testing

Test cases:

TestSimulation():

- Initial water stored in each area as (**initialWaterArea1**, **initialWaterArea2**, **initialWaterArea3**, **initialWaterArea4**).
- Initial land type of each area (**initialLandTypeArea1**, **initialLandTypeArea2**, **initialLandTypeArea3**, **initialLandTypeArea4**).
- Changes in water stored after responding to humidity (**expectedWaterArea1**, **expectedWaterArea2**, **expectedWaterArea3**, **expectedWaterArea4**).
- Land type transitions based on water stored.

TestRainyWeather():

- Water stored in each area after responding to rainy weather conditions.
- Humidity level after responding to rainy weather.

TestCloudyWeather():

- Values Tested:
- Water stored in each area after responding to cloudy weather conditions.

TestSunnyWeather():

- Values Tested:
- Water stored in each area after responding to sunny weather conditions.