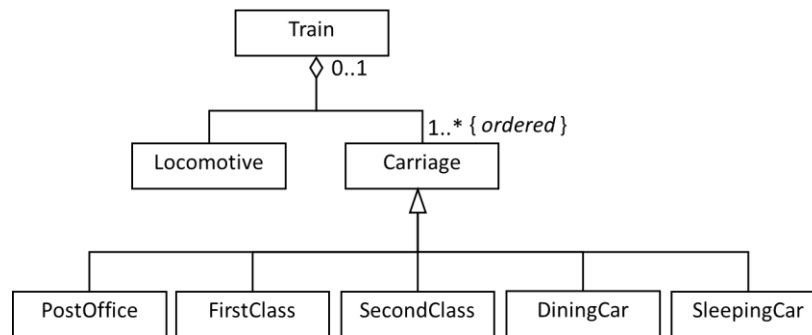


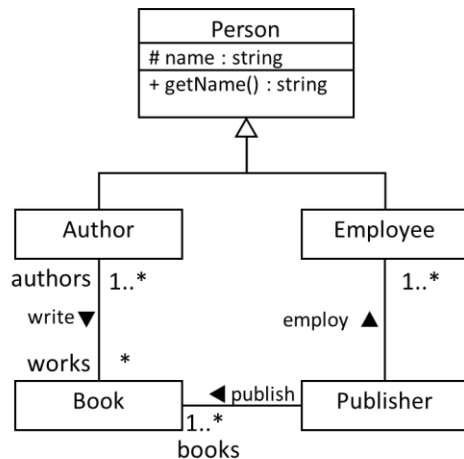
10. Inheritance

Topics: Inheritance, override of virtual functions, runtime polymorphism.

1. A train consists of a locomotive and at least one passenger carriage. A train has the locomotive at the front and carriages are connected to the locomotive according to a given order. A train might contain various types of carriages. The possible types of carriages are: first-class carriage, second-class carriage, railway post office, dining car, sleeping car.



2. Every book has at least one author and it is published exactly by one publisher. A publisher publishes at least one book. A publisher employs at least one employee. An employee is employed by exactly one publisher. Employees and authors are persons, and authors are not employees of publishers. Tasks: How many books has been written by a given author? Which author has written the most number of books published by a given publisher?



Problem: How many books has been written by a given author?

`a : Author, c : int`

`c := | a.works |`

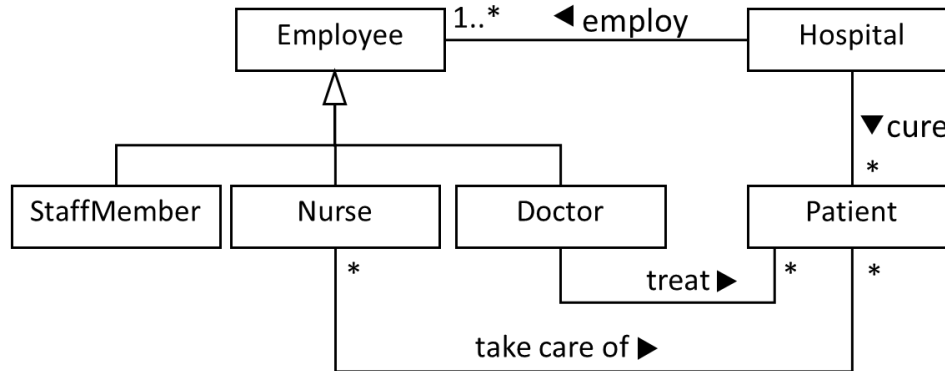
Problem: Which author has written the most number of books published by a given publisher?

`name : string, p : Publisher, b : Bag`

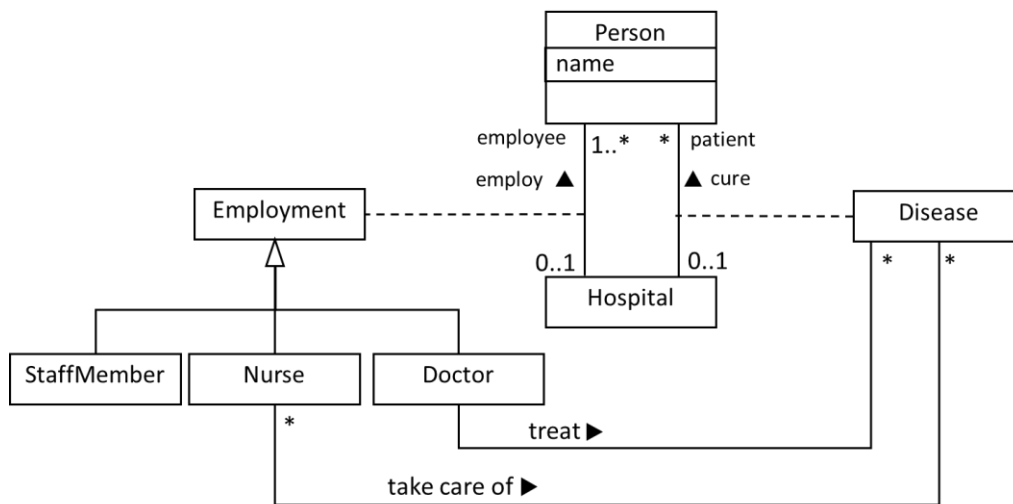
```

b.erase()
forall e in p.books loop
  forall a in e.authors loop
    b.putIn(a)
  endloop
endloop
name := b.mostFrequent().getName()
  
```

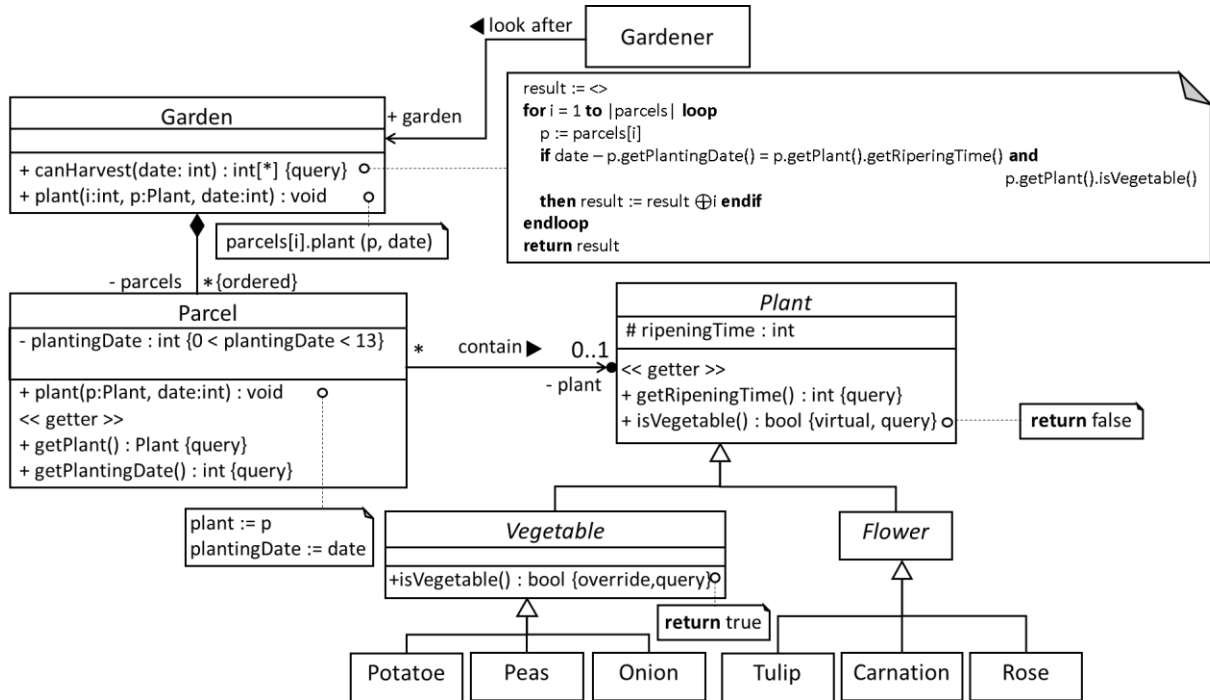
3. In a hospital there is at least one employee – doctor or nurse or hospital staff member. Patients settled in the hospital are treated by doctors and taken care by nurses. A patient is treated exactly by one doctor, and is taken care by any number of nurses. Every doctor can treat any number of patients, also each nurse can take care of any number of patients.



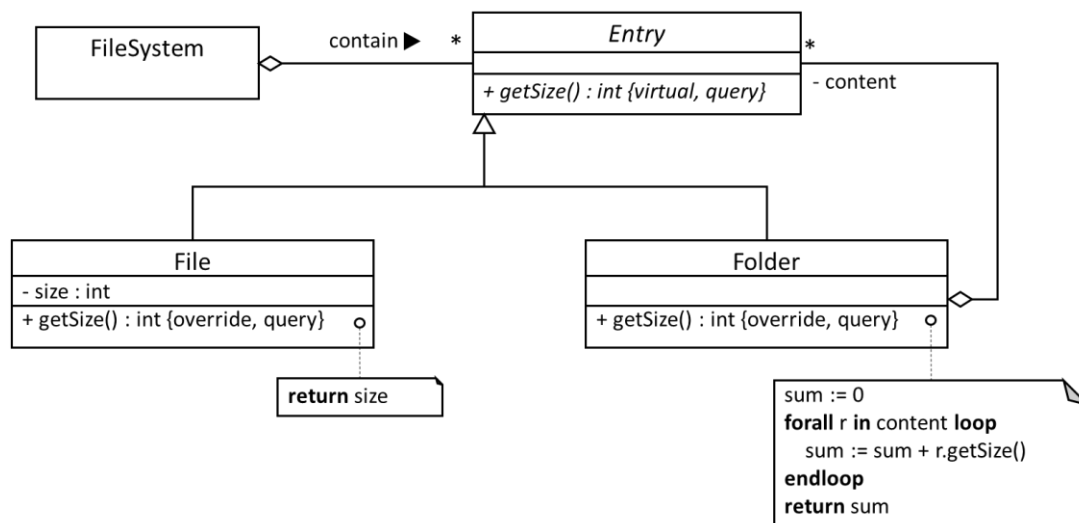
Modify the class diagram according to this case: employees can also get sick, their employment status will not be terminated.



4. A gardener looks after a garden. The garden consists of parcels, only one species of plant can be planted into each. The date of planting (month) is recorded. Plants can be vegetables as potatoe, peas, and onion; or flowers as tulip, carnation, and rose. The ripening time of plants are given in months. List the parcels of vegetables ripening in a given month.



5. In a Windows file system, files are stored in libraries. Every library may contain any number of files or libraries. The topmost library, which is not contained by another library, is called root directory. In the file system, files can be stored directly in the root directory, or in any library. Determine the disk space of a given library.



Exercise:

A hunter (name and age are known) has shot several trophies. The description of a trophy consists of the species of the animal (elephant, rhinoceros, or lion), the place and the date of the hunt, the weight of the shot animal, and a special data: in case of elephant, the length of its tusks (in cm, 2 integers), in case of rhinoceros the weight of its horn, and for lions, their sex (male or female).

Create a method for the hunter which calculates how many male lions he/she has shot.