Object-Oriented Programming

2. Lecture
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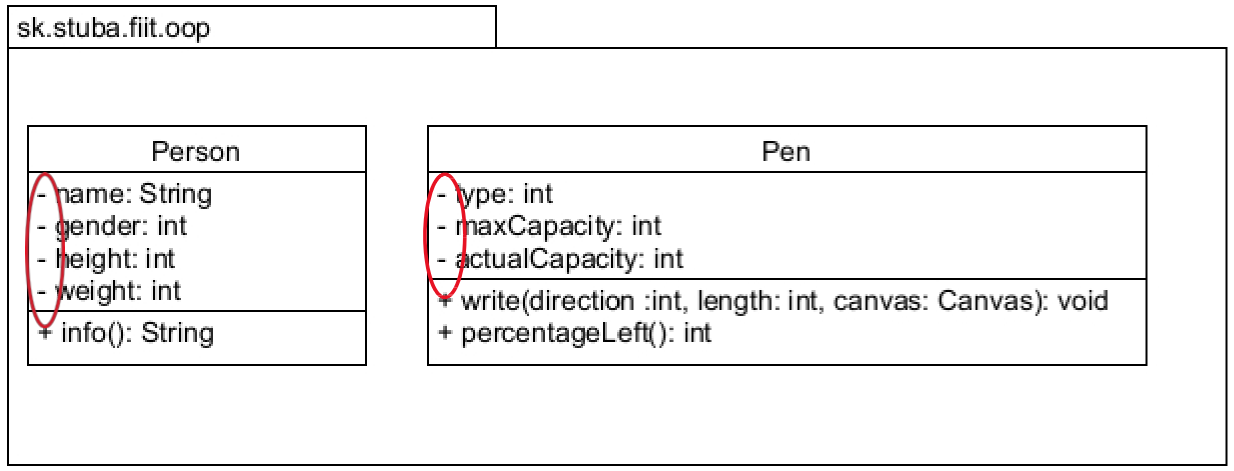
Back to the roots

- Let's return to the basic principles of OOP

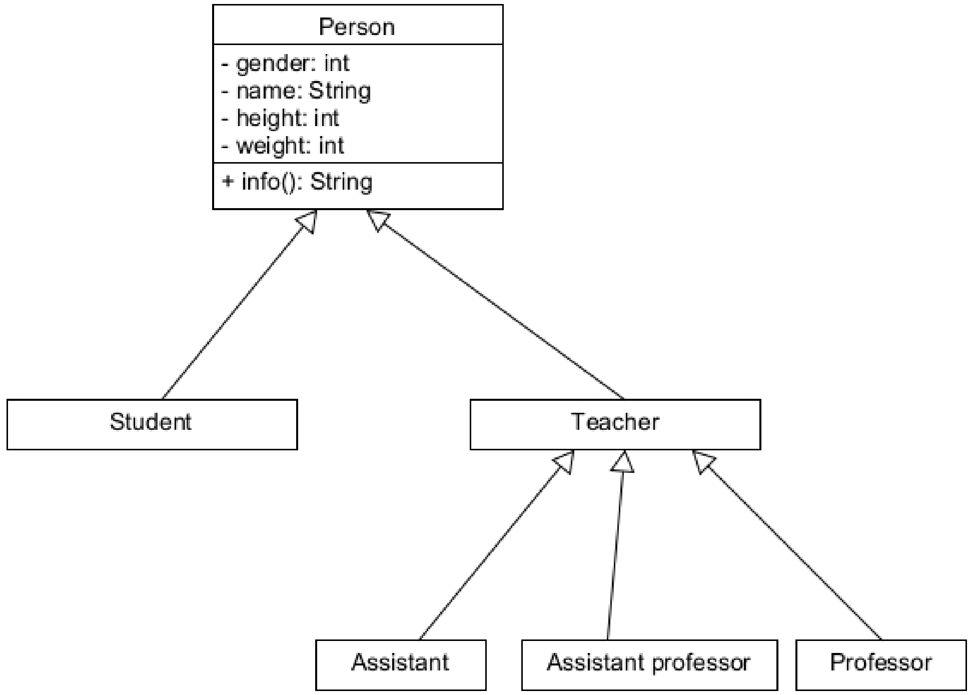
Encapsulation

- We do not manipulate data directly, but using methods
- In Java, for example, the keyword private (helps to achieve this)
- Mutators, but not only that – it is the overall concept that I do not work directly with data outside the class



Inheritance

- Allows classes to be "derived" from other classes
- A tree is created
- In Java, the keyword extends



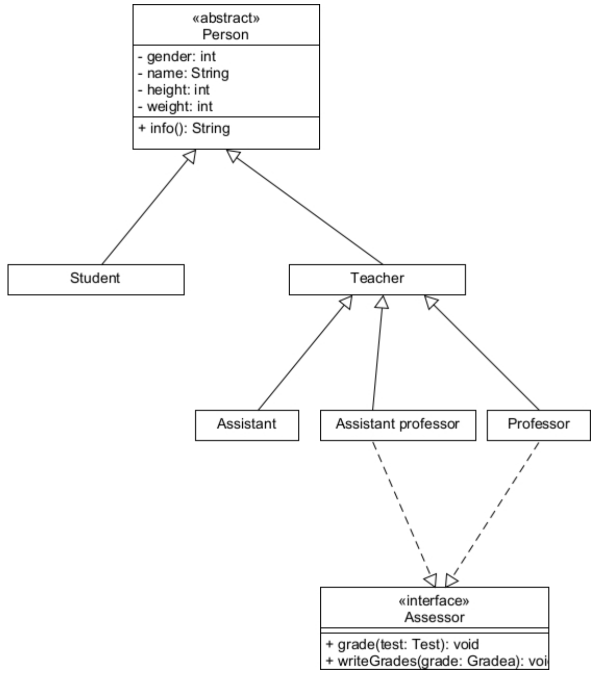
Polymorphism

- Compile time
  - Method overloading – same method name, different parameters
- Runtime
  - Method overriding – inheritance, specificity of behavior
  - *Virtual functions*

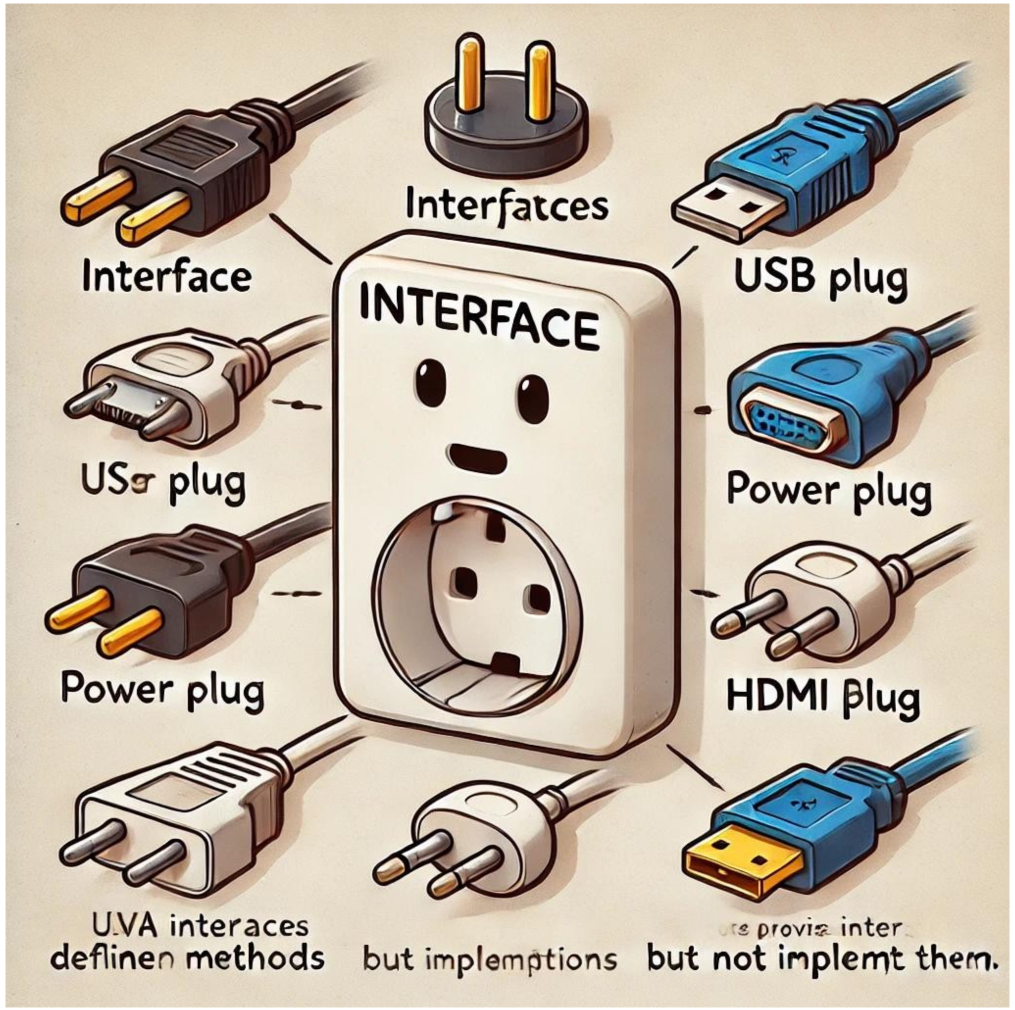
Abstraction

- “Hiding” internal implementation
- Abstraction is at the design level, encapsulation is at the implementation level
- In Java, for example, Abstract class and

    Interface (also help)



Interface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Interface
INTERFACE
USB plug
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Interface II.

INTERFACE
ABSTRACT CLASS
Corporate needs you to find the differences between this picture and this picture.
They're the same picture.
imgflip.com

Classes II.

- Constructors:
  - Object initialization
  - Not inherited
  - If there is none, an empty one is automatically created
- this vs super

Methods

- Java is **pass by value (copy)**
- Any number and type of parameters
- We return max one "object"

Class attributes vs. local variables

- Class attributes (instance variables) are declared in the class, not in the method
- Local variables are declared in the method

- Class attributes always have a default value
- Local variables must be initialized before use

- == vs equals()

Access modifiers

- Classes
  - Public – everywhere
  - *Default* – only from the same package
- Attributes, methods, constructors
  - Public – accessible to all classes
  - Private – only in own class
  - *Default* – only from the same package
  - Protected – only from the same package and subclasses

Class design and implementation

- What should the class do?
- What attributes?
- What methods?
- *Tests*
- Pseudocode for methods
- Implementation
- Testing
- Debugging and correction

Project

- Create a game in Java with a graphical user interface (GUI). The goal is not to focus on graphics (2D or 3D) or multiplayer networking, but on the use of (proper) object-oriented programming and the features of the Java language. As an aid to thinking, use, for example, a list of game genres (https://en.wikipedia.org/wiki/List_of_video_game_genres).
- NOT Minecraft-like games

Project

- Develop a project focus (maximum length 250 words), a more specific description of what you are going to do, but NOT a technical description of what you are going to do. Imagine that you are going to present the game to the manager of a game studio (i.e., someone who knows basically nothing about programming).
- Create a simplified specification (requirements) of what the game should "do," assign them a priority (at least 10 functional and 3 non-functional), and then implement your project according to this priority.
- Identify the most important classes and their most important methods, and draw them in a simplified UML class diagram.
- Remember that you are studying OOP, so when designing your project, keep in mind that you will need to use an object-oriented paradigm in the implementation itself.
- Consult the focus with the instructors

Quiz time