

Object Oriented Programming

Why OOP?

- One of the most widely used programming paradigm
- Why is it used?
 - Well suited for building trivial and complex applications
 - Code re-use
 - More productivity
 - Adding new features is simple
 - Less production and maintenance cost
- C++ / Java / C#

OOP building blocks

- Objects models a:
 - Real world object (computer, clock, microwave, book, box)
 - Concept (meeting, telegram group)
 - Process (algorithm, learning models)
- Classes
 - Prototype or blueprint
 - We can create objects from classes
 - We define classes and make objects from them

OOP building blocks

- Class:
 - Attributes or properties
 - Behavior or actions
 - Method
- Objects
 - Data (value for each attribute)
 - Stored in variables
 - Actions
 - Has an identity

Real world example (car)

Class: Car

Attributes:

Color, Model, 0-100, max Speed

Methods:

Start, Accelerate, Reverse, Stop

Object: Sipa131

Attributes:

White, 131, 14.5 s, 170 km/h

Methods:

Start, Accelerate, Reverse, Stop



Object: Tesla Model X

Attributes:

Red, Model X, 2.9 s, 250 km/h

Methods:

Start, Accelerate, Reverse, Stop



Real world example (Person)

Class: Person

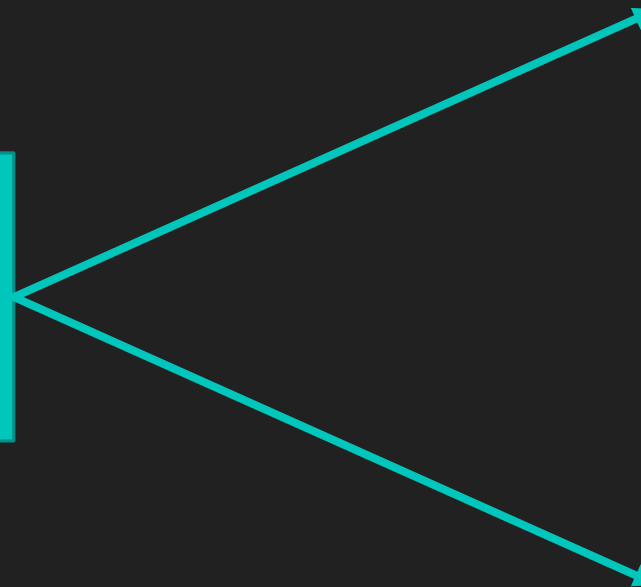
Attributes:
Name, Height, Age
Methods:
Speak, Listen, Eat, Run, Walk, ...

Object: Person1

Attributes:
Shahab, 174, 24
Methods:
Speak, Listen, Eat, Run, Walk

Object: Person2

Attributes:
Simin, 176, 21
Methods:
Speak, Listen, Eat, Run, Walk



Class

- Set of variables
 - To represent attributes
- Set of functions
 - To describe behavior
 - Acts on class variables

Object

- Instance of a class
- Holds data
 - Data are in RAM
- Data can be accessed by its function

What Is OOP

- Paradigm for problem solving
 - Interaction among objects
 - Follows a natural way of solving problems
 - Mohammad wants to start his car

OOP concepts

- Abstraction
- Encapsulation
- Inheritance
- Polymorphism

Abstraction

- Essential properties and behavior
- Abstract class
- Example:
 - Blind date
 - Include all information to recognize
 - Don't tell any other data
 - Make coffee
 - + How to use your coffee machine
 - - How it makes coffee
- Data hiding

Encapsulation

- Combines data and functions
 - Functions manipulate data
 - Make them into single unit
- Object and class enforce encapsulation
- Example:
 - Microwave:
 - Power
 - Change power
 - Rotation

Inheritance

- Create new classes from existing classes
 - New class: derived class
 - Existing class: base class
- Inherit variables and functions
- Re-use existing code
- Has a
- Is a

Inheritance

- Example:
 - Person
 - Employee
 - Customer
 - Pet
 - Dog
 - Cat
 - Shape
 - Rectangle
 - Square
 - Triangle
 - Circle

Polymorphism

- Perform different things according to its object class
- Code for abstract class
- Run for its instance
- Example:
 - Shape
 - Rectangle
 - Square
 - Triangle
 - Circle
 - Draw shape

Advantages of OOP

- Build program from standard working modules
 - Less development time and higher productivity
- Divide and conquer
 - Easy to partition the work
- Easy to upgrade from small to large
- Multiple instances without interference
- Data hiding and more secure programs
- Less redundant code

Disadvantages of OOP

- Much more lines of code
 - Slower execution
- Cant be used everywhere
 - Its not universal language
 - Only applied when it is required
 - Not for all types of problems
- A little bit tricky
 - Design skill, programming skill, proper planning
- It takes time to get used to