Object-Oriented Programming (OOP)

Making Game with Python (1)

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Agenda

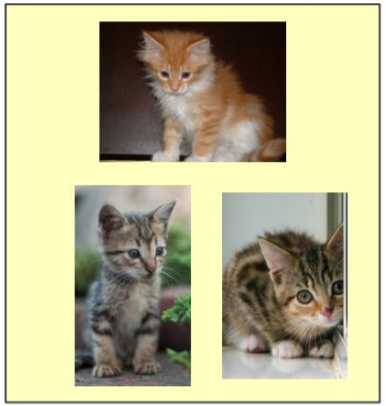
- What is OOP
- Class and Instance
- Example 1:
  - Animal Object
  - Cat Object
  - Rabbit Object
- Example 2:
  - Num Object

What is OOP?

- Mimic real life (object is used to bundle data into a package with attributes and functions)
- Group different objects in a hierarchical way

Animal (attribute: age, etc.; behavior/functions: speak, etc.)

Cat



Rabbit

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Class and Instance

- Class:
  - Define class name
  - Define attributes
  - Define behavior/functions
- Instance:
  - Create a instance of a class
  - do operations on the instance

Animal Object

```
class Animal(object):
    def __init__(self, age):
        self.age = age

    def speak(self):
        print('not defined')

    def __str__(self):
        return f'Animal: age ({self.age})'

obj_animal = Animal(1)
print(obj_animal)
obj_animal.speak()
```

Cat Object

```
class Cat(Animal):
    def __init__(self, age, color='BW'):
        super().__init__(age)
        self.color = color

    def speak(self):
        print('Meow')

    def __str__(self):
        return f'Cat: age ({self.age}), color ({self.color})'

obj_cat = Cat(2, 'Brown')
print(obj_cat)
obj_cat.speak()
```

Rabbit Object

```
class Rabbit(Animal):
    def __init__(self, age, weight):
        super().__init__(age)
        self.weight = weight

    def speak(self):
        print('Squeak')

    def __str__(self):
        return f'Rabbit: age ({self.age}), weight ({self.weight})'

obj_rabbit = Rabbit(1, '2LB')
print(obj_rabbit)
obj_rabbit.speak()
```

Special operators of python base object

- Operators: +, -, ==, <, >, len(), print
- Overwrite the following functions to change their behaviors
  - __add__(self, other)
  - __sub__(self, other)
  - __eq__(self, other)
  - __lt__(self, other)
  - __len__(self)
  - __str__(self)

Num Object

```
class Num(object):
    def __init__(self, data):
        self.data = data

    def __str__(self):
        return f'Num: {self.data}'

    def __add__(self, other):
        sum = self.data + other.data
        return Num(sum)

x = Num(3)
print(x)
y = Num(5)
print(y)
sum = x + y
print(sum)
```

Properties of OOP

- Encapsulation
- Inheritance
- Polymorphism