Advanced Object-Oriented Design

Inheritance and lookup

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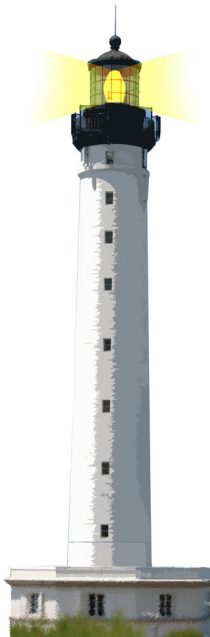


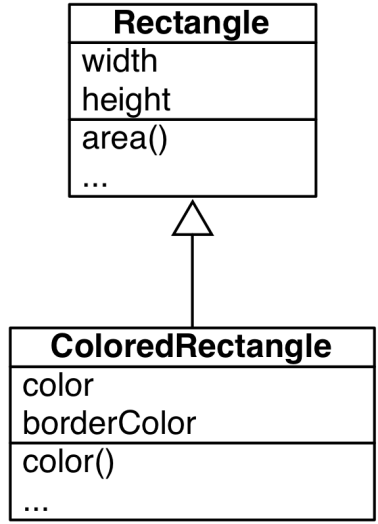
Pharo

http://www.pharo.org

Remember Inheritance

a subclass

- can add state and behavior:
  - color, borderColor, ...
- can use superclass behavior and state
- can specialize and redefine superclass behavior



Example: state

```
public class Rectangle {
  protected int length;
  protected int width;

  public int getArea() {
    return length * width;
  }
```

```
class Box extends Rectangle{
  protected int height;
}
```

Box constructors

```
class Box extends Rectangle{
  public Box(){
    super();
    height = 0;
  }
```

```
  public Box(int length, int width, int height) {
    super(length, width);
    this.height = height;
  }
```

Constructors and inheritance

- Each subclass should call its superclass constructor explicitly
  - as a first line of the constructor
- The call to the default constructor can be omitted (but the compiler does it for you)
- super in that case indicates the superclass.

A constructor is a static function not a method

- There is NO LOOKUP/Inheritance of constructors

Simple Lookup

Methods of the superclass can be invoked on subclass instances

```
Box b = new Box (10,20,20);
System.out.println(b.getArea());
```

Subclass can enrich its API

```
public class Box extends Rectangle {
  ...
  public double getVolume() {
    return getArea() * height;
  }
```

Lookup

```
class A {
  public int bar() { return foo();}
  public int foo() { System.out.println("A"); return 1;}
}
class B extends A {
  public int foo() { System.out.println("B"); return 2; }
}

class Runner {
  public static void main(String[] args) {
    A a = new A();
    B b = new B();
    a.bar();
    b.bar();
  }
}
```

We will revisit it in the self (this)/super lecture...

Subclass may want to access hidden superclass

```
public class Box extends Rectangle {
  ...
  public double getArea() {
    return (super.getArea() + height * length + width * height) * 2;
  }
```

- super.getArea() executes the method rectangle.getArea on the box instance

Lookup with Super

```
class A {
  public void bar() { foo(); }
  public void foo() { print("A"); }
}
class B extends A {
  public void bar() { super.bar(); }
  public void foo() { print("B"); }
}
```

```
(new A()).bar();
(new B()).bar();
```

super in super.myMethod();

- super refers to the object the receiver of the message
  - super == this
- super changes the method lookup to start in the superclass of the class using super.
- super does not start lookup in the superclass of the class of the receiver

Static variables

- Modifier 'static'
- Linked to the class
- Variable unique and shared between all instances of the class
- Kind of global since the class is a global too

```
class Circle {
  static float PI = 3.14159265f;
  float rayon; //instance level
  float circonference() {
    return 2*PI*rayon; // or Circle.PI
    }
  }
```

Static methods

- They are not methods! Just functions
- No dynamic binding!
- No possibility to use classes are registration mechanisms
  - for the same you need a singleton and a factory
- check Class Method at Work from http://mooc.pharo.org (W4S6)

About main and command line

- one single parameter: a table of strings
- argv.length

```
public class Echo {
  public static void main(String[] argv) {
    for (int i=0; i<argv.length; i++)
      System.out.print(argv[i]+" ");
      System.out.println(); }
  }
>>>java Echo OOP is COOL, Java less
>>>OOP is COOL, Java less
```

A course by

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