JAC444 / BTP400 Course Object-Oriented Software Development inJava

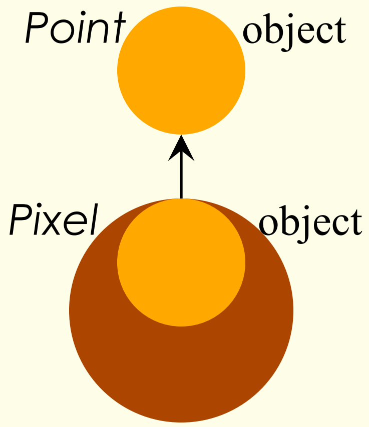
Classes

Segment 4 - Polymorphism

Polymorphism

```
class Point { int x; int y; void clear() { x = 0; y = 0 } }

class Pixel extends Point {
     Color color;
     public void clear() {
          super.clear();
          color = null;
     }
}
```



Pixel extends both data and behavior **of its *Point* superclass.**

All the *Point* code can be used by any one with a *Pixel* in hand.

*A single object like **Pixel** could have many (poly) forms (-morph)*

*It can be used as both a **Pixel** object and a **Point** object.*

Pixel's behavior extends Point's behavior.

`Point point = new Pixel();` Implicit casting – Upcasting
a reference of extended class (Pixel) is assigned to
a reference of the base class (Point)

Constructor Order

- Each constructor has three phases:

  1. Invoke a superclass’s constructor.

  2. Initialize the fields using their initializers and any initialization block.

`0`	for all numeric types,
`false`	for *boolean,*
`\u0000`	for *char,*
`null`	for references.

  3. Execute the body of constructor.

- Each class has a least one constructor

  If class has no constructor the compiler adds the default constructor.

Keyword: *super*

- Accessing fields and methods in superclass through object reference: ***super***

```
public class A {
    public void m() {
        System.out.println("In Superclass.");
    }
}

public class B extends A {
    // overrides m in Superclass
    public void m() {
        super.m();
        System.out.println("In Subclass");
    }
    public static void main(String[] args) {
        B x = new A();
        x.m();
    }
}
```

Constructors - super(); this();

```
class Rectangle extends Shape {
        int width = 0;
        int height = 0;
        Point origin;

        Rectangle(Color c)  {
            super(c);
            origin = new Point();
        }

        Rectagle (Color c, Point p) {
            this(c);
            origin = p;
        }

        public move (Point origin) {
            this.origin = origin;
        }
```

super() **superclass constructor invocation**

this() **explicit constructor invocation**

this **current object reference**

Object SuperClass

- At the top of the class hierarchy tree is the class ***Object***

protected Object clone() throws CloneNotSupportedException

Creates and returns a copy of this object.

public boolean equals(Object obj)

Indicates whether some other object is "equal to" this one.

protected void finalize() throws Throwable

Called by the garbage collector on an object when garbage collection determines that there are no more references to the object

public final Class getClass()

Returns the runtime class of an object.

public int hashCode()

Returns a hash code value for the object.

public String toString()

Returns a string representation of the object.

There are: ***notify, notifyAll, and wait*** methods for synchronizing activities in running Threads

Final Classes / Methods

- A class can be declared as final with the declaration:

```
public final class X { …}
```

- A class that is declared final cannot be subclassed

  Example: `java.lang.String`

- A method can be declared as final with the declaration:

```
public class Y {
  public final void m() {…}
}
```

A method that is declared final cannot be overridden or hidden by subclasses

Packages

- Definition: A package is a grouping of related types providing access protection and name space management

- Create a package with a ***`package`*** statement at the top of every source file
- Use ***`import`*** statement at the beginning of the file to work with package elements
- Conventions:
  - Package names are written in all lower case to avoid conflict with the names of classes or interfaces.
  - The beginning of the package name must be a reversed Internet domain name

    Example: ***`on.senecacollege.cs…`***