Objects First with Java

A Practical Introduction using BlueJ

David J. Barnes

Michael Kölling

Extensions by H.-J. Bungartz, T. Neckel and M. Roderus

Course Contents

- Introduction to object-oriented programming…
- …with a strong software engineering foundation (cf. SWE course in CSE)…
- …aimed at producing and maintaining large, high-quality software systems…
- …but starting with the first steps.

Buzzwords to Come

responsibility-driven design

encapsulation

iterators

inheritance

overriding

coupling

cohesion

interface

javadoc

mutator methods

collections

polymorphism

Goals

- Sound knowledge of programming principles
- Sound knowledge of object-orientation
- Ability to critically assess the quality of a (small) software system
- Ability to implement a small software system (not just a program …) in Java

Book

David J. Barnes & Michael Kölling

Objects First with Java
A Practical Introduction using BlueJ

Fourth edition,
Pearson Education, 2008
ISBN 0-13-606086-2 .

Further Literature

CSE Course Advanced Programming link:

http://www5.in.tum.de/wiki/index.php/Advanced_Programming_-_Winter_10

More references will be given in the Exercises!

Course Overview (1)

- Objects and classes
- Understanding class definitions
- Object interaction
- Grouping objects
- More sophisticated behaviour – libraries (Java collections)
- Well-behaved objects – testing, maintaining, debugging

Course Overview (2)

- Designing classes
- Inheritance
- Polymorphism
- Extendible, flexible class structures
- Handling errors
- Designing applications

Fundamental Concepts

- object
- class
- method
- parameter
- data type

Objects and Classes

- objects
  - represent ‘things’ from the real world, or from some problem domain (ex.: “the red car there in the car park”)
- classes
  - represent all objects of a kind (ex.: “car”: a vehicle with four wheels and an engine, that can carry a small number of passengers, cf. LONGMAN)

Methods and Parameters

- **objects** have operations which can be invoked (Java calls them *methods*)
- **methods**
  - may have parameters to pass additional information needed to execute
  - are no independent entities, but directly related to objects

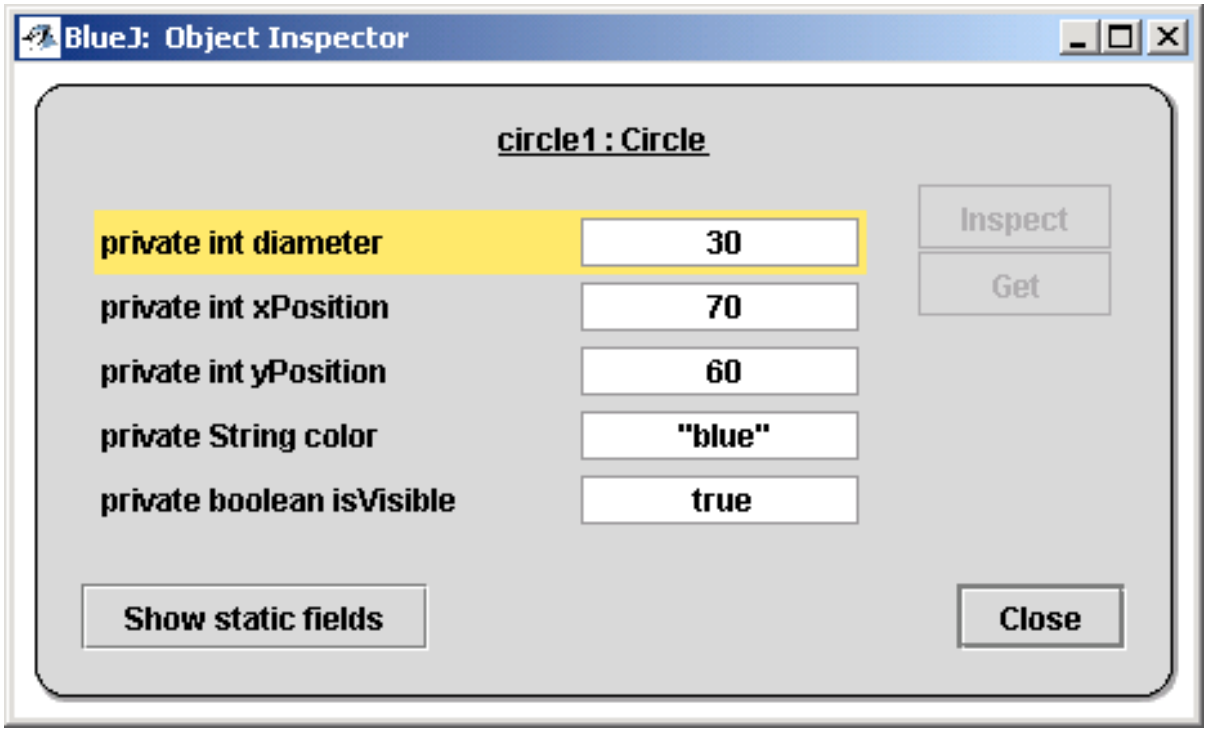
Data Types

- specify what kind of data can be passed to a parameter
- examples:
  - integer – int (4, 6, 0, …)
  - character strings – string (“red”, “BPX”)
  - …

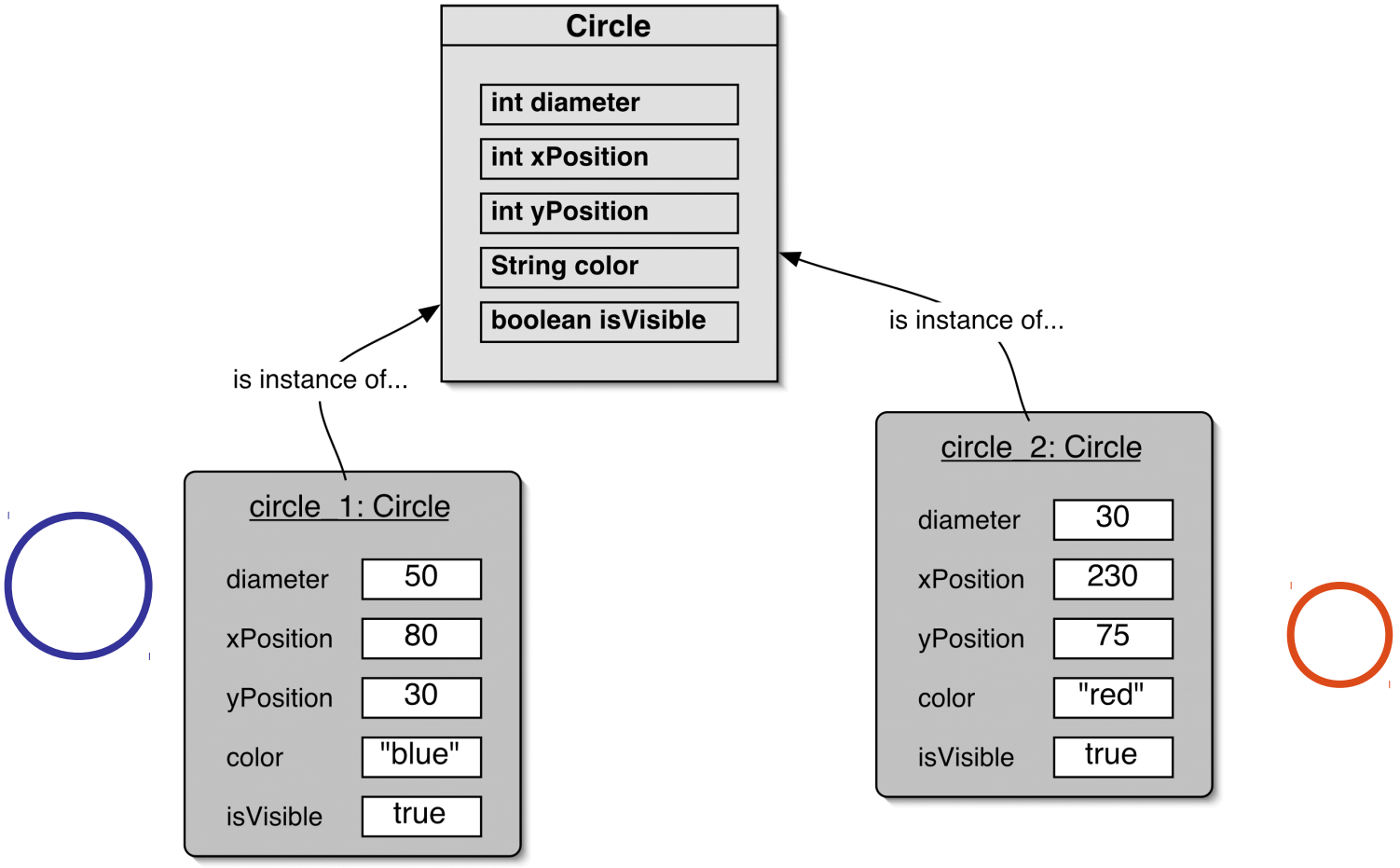
Other Observations

- many *instances* can be created from a single class
- an object has *attributes*: values stored in *fields*
- the class defines what fields an object has, but each object stores its own set of values (the *state* of the object)

State


BlueJ: Object Inspector
circle1 : Circle
private int diameter
30
private int xPosition
70
private int yPosition
60
private String color
"blue"
private boolean isVisible
true
Inspect
Get
Show static fields
Close

Two Circle Objects



Source Code

- ... in each class (Java code)
- ... defines details of a class
  (fields and methods).

Return Values

- Methods may return a result via a return value.
- Example: Parabola

$$y = -2.0 * x*x + 10.0*x – 4.5;$$

Java Reserved Words

abstract	continue	for	new	switch
assert ***	default	goto *	package	synchronized
boolean	do	if	private	this
break	double	implements	protected	throw
byte	else	import	public	throws
case	enum ****	instanceof	return	transient
catch	extends	int	short	try
char	final	interface	static	void
class	finally	long	strictfp **	volatile
const *	float	native	super	while

* not used		***	added in java 1.4
** added in java 1.2		****	added in java 5.0