Algorithmic Thinking and Structured Programming (in Greenfoot)

Teachers:

Renske Smetsers-Weeda

Sjaak Smetsers

Ana Tanase

Today’s Lesson plan (9)

- Retrospective
  - Previous lesson
  - Discuss Quiz and Task

- Exercises

Retrospective

- Constructors, instance variables

The Constructor

- When Java creates a new object, it calls the class's constructor.

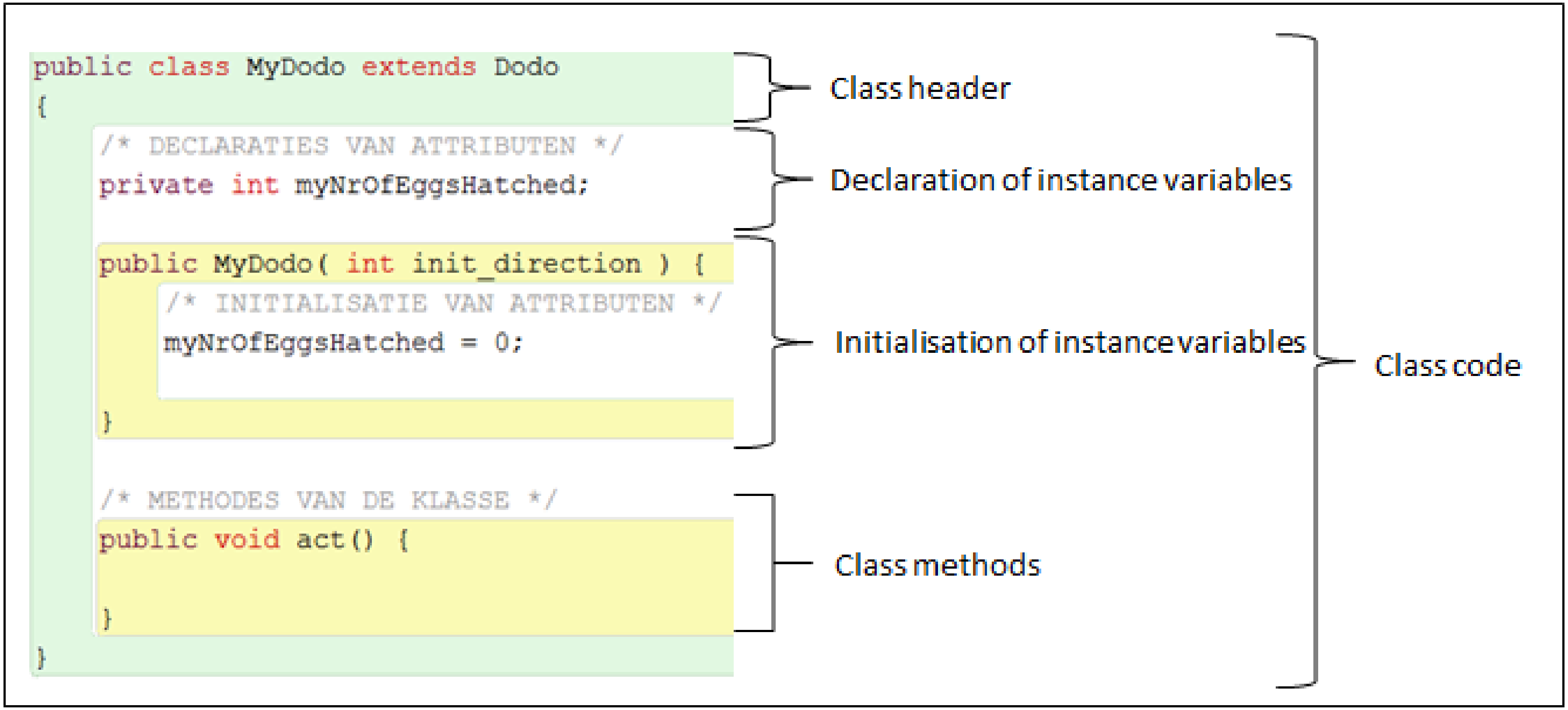
```
public class MyDodo extends Dodo
{
    private int myNrOfEggsHatched;

    public MyDodo( int init_direction ) {
        super ( init_direction );
        myNrOfEggsHatched = 0;
    }
    …
}
```

The constructor has the same name as the class.

Instance variable

super( ) calls the constructor of Dodo.

Class code



```
public class MyDodo extends Dodo
{
    /* DECLARATIES VAN ATTRIBUTEN */
    private int myNrOfEggsHatched;

    public MyDodo( int init_direction ) {
        /* INITIALISATIE VAN ATTRIBUTEN */
        myNrOfEggsHatched = 0;

    }

    /* METHODES VAN DE KLASSE */
    public void act() {

    }
}
```

Class header

Declaration of instance variables

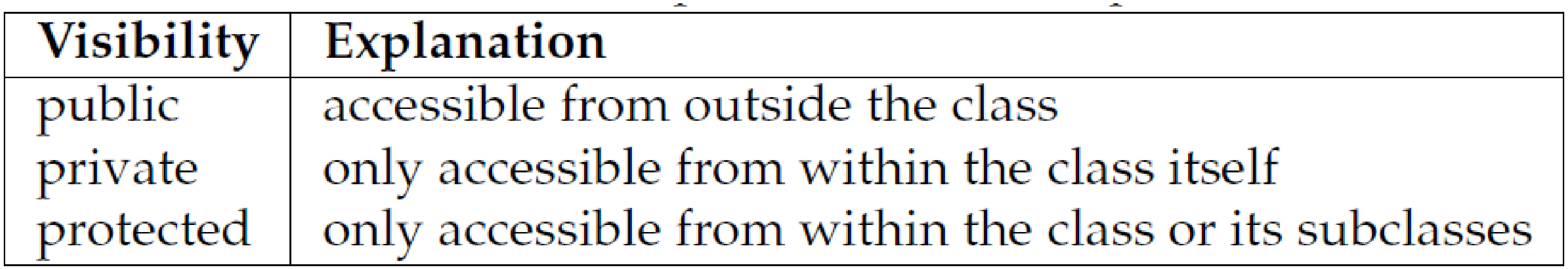
Initialisation of instance variables

Class methods

Class code

Information hiding

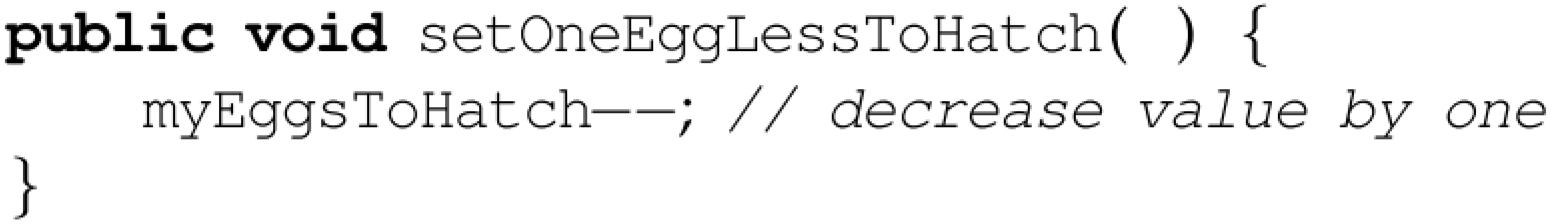
- Rule: make instance variables **private**



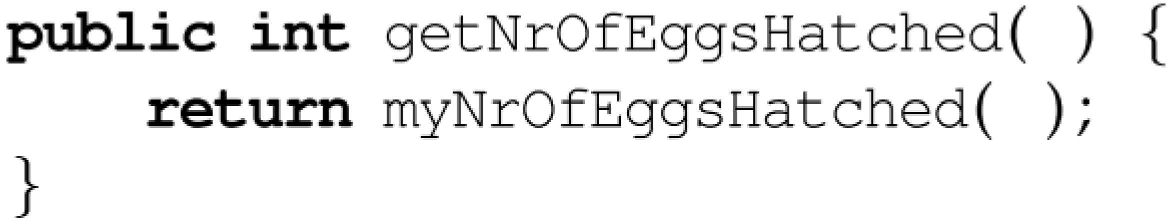
Visibility	Explanation
public	accessible from outside the class
private	only accessible from within the class itself
protected	only accessible from within the class or its subclasses

- This means: other objects can’t reach it!
- Solution: create (if needed)
  - **public getter** method
  - **public setter** method

Setter and getter methods (examples)



```
public void setOneEggLessToHatch( ) {
    myEggsToHatch--; // decrease value by one
}
```

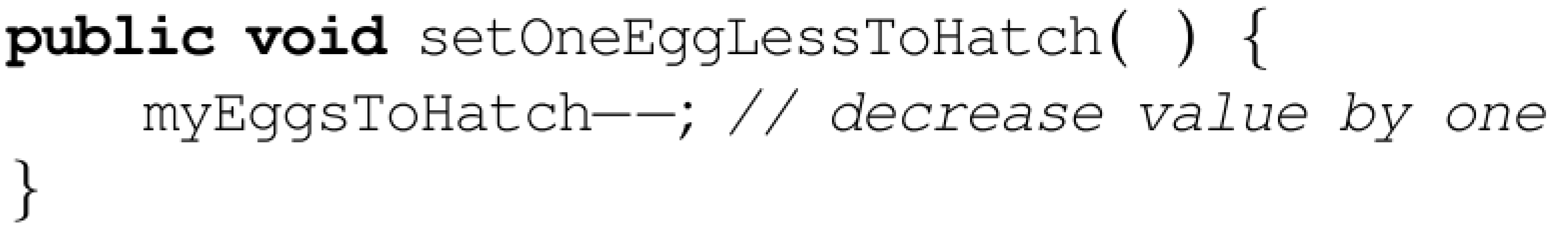


```
public int getNrOfEggsHatched( ) {
    return myNrOfEggsHatched( );
}
```

Calling a method from another class

Example:

MyDodo object called Mimi with method:

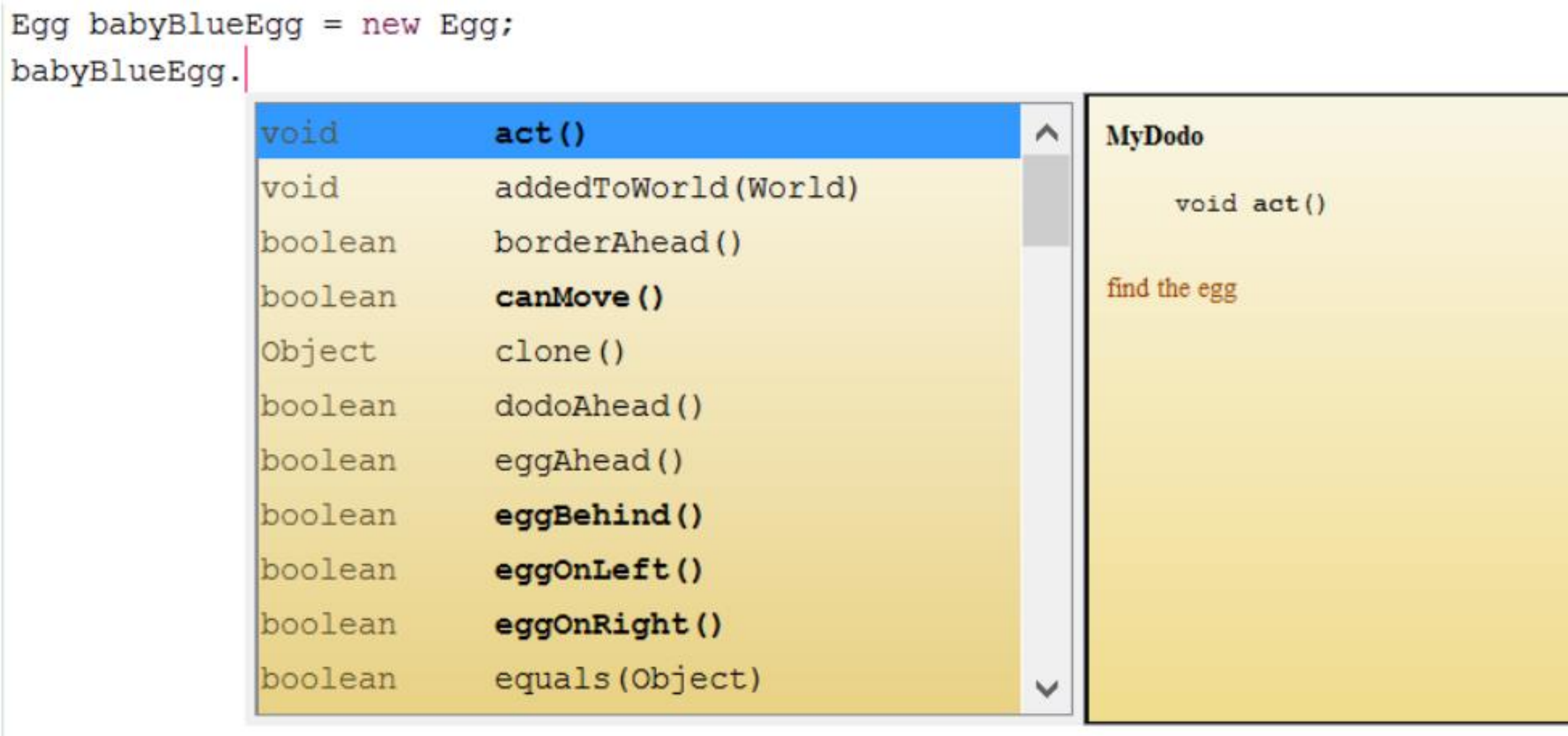


```
public void setOneEggLessToHatch( ) {
    myEggsToHatch--; // decrease value by one
}
```

then Farmer can call:

Mimi.setOneEggLessToHatch ( ) ;

Tip: type ‘.’ and then <Ctrl>+<Space>



```
Egg babyBlueEgg = new Egg;
babyBlueEgg.
```

void	**act()**
void	addedToWorld(World)
boolean	borderAhead()
boolean	**canMove()**
Object	clone()
boolean	dodoAhead()
boolean	eggAhead()
boolean	**eggBehind()**
boolean	**eggOnLeft()**
boolean	**eggOnRight()**
boolean	equals(Object)

MyDodo

`void act()`

find the egg

Steps for using instance variables

1. **Declare** instance variable in top of **class**:

   ```
   private int nrEggs;
   ```

2. **Initialize** (set intial value) in **constructor**:

   ```
   nrEggs = 10;
   ```

3. Write **public getter accessor** method

   ```
   public int getNrEggs (){
           return nrEggs;
   }
   ```

4. Write **public setter mutator** method:

   ```
   public void setNrEggs( int newNrEggs ){
           nrEggs = newNrEggs;
   }
   ```

Class variables: life-long memory

- Now that you know how to use class variables
- You can write complex algorithms
- Dodo has life-long memory!

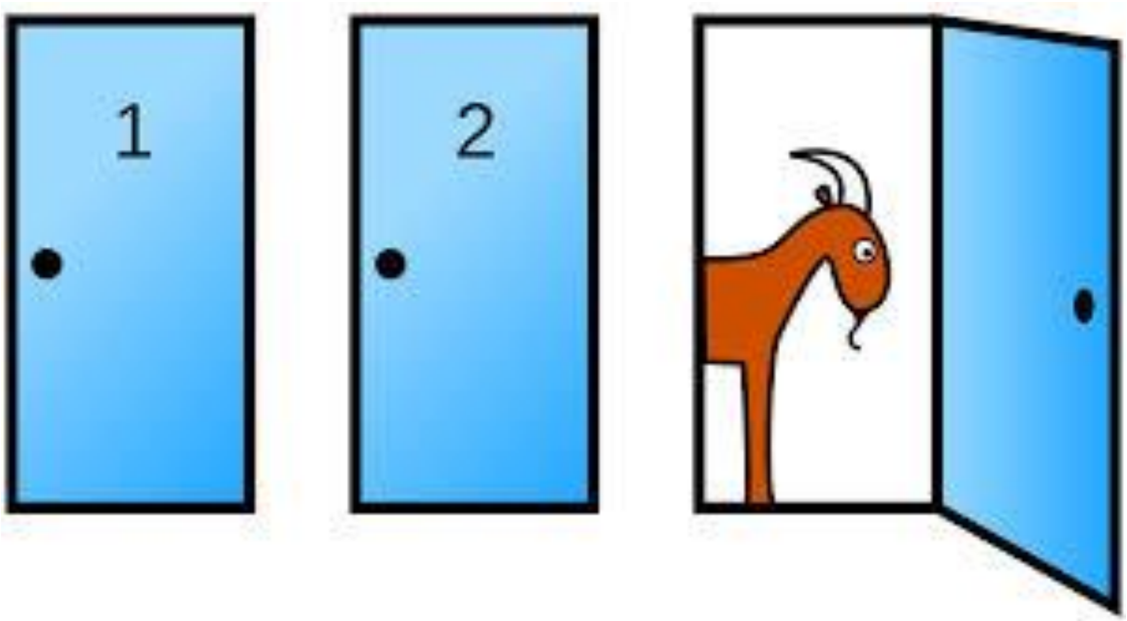
- How:
  - NO **while** in the **act ()**
  - Transform methods used in act() from ‘while’ into ‘if’
  - Use **instance variables** instead of local variables

    local variables: variables in (sub)methods

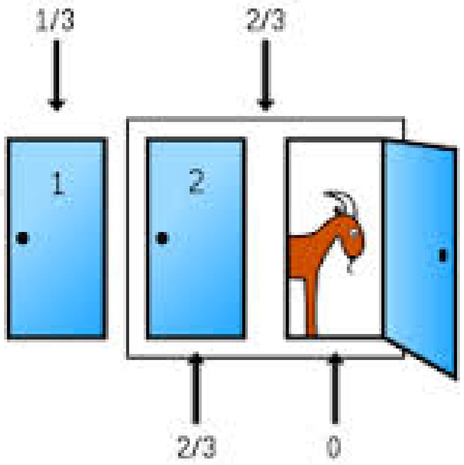
(last exercises in assignment 6)

3 doors, 2 goats and a car

3 doors, 2 goats and a car



3 doors, 2 goats and a car



- If Strategy: **No Swapping**
  - P(car) = 1/3
  - P(goat) = 2/3
- If Strategy: **With Swapping**
  1. If 1st choice is car -> other door is goat

     P(goat) = P(car on 1st choice) * P(goat on 2nd choice)

     = 1/3 * 1 = 1/3
  2. If 1st choice is a goat -> the other is a car

     P(car) = P(goat on 1st choice) * P(car on 2nd choice)

     = 2/3 * 1 = 2/3

Computational thinking

- **Working in a structured manner:**
  - Breaking problems down into subproblems
  - Design, solve and test solutions to subproblems
  - Combing these (sub)solutions to solve problem
- **Analyzing** the quality of a solution
- **Reflecting** about the solution chosen and proces
- **Generalizing** and re-use of existing solutions

Wrapping up

Homework for Wednesday 8:30 Feb 24th:

- Assignment 6:
  - **FINISH assignment 6**
  - **email** MyDodo.java and ‘IN’

    to **Renske.weeda@gmail.com**