Introduction and Object Review

Daniel Archambault

Pronounced: Arshambo-

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  - And still very nervous

More About Me..

- I’m Canadian, eh...
- Grew up in the capital of the country
  - that’s Ottawa, Ontario
- I am fortunate to have studied/lived in many countries
  - Queen’s University, Kingston, Canada
  - Univ. of British Columbia, Vancouver, Canada
  - Univ. of Victoria, Victoria, Canada
  - INRIA Bordeaux Sud-Ouest, Bordeaux, France
  - Univ. College Dublin, Dublin, Ireland
  - Swansea University, Swansea, Wales
- CS has taken me to some pretty cool places

The Teaching that I'm doing with Everyone

- Software Engineering Principles CS-115
  - Advanced Programming Concepts
  - Data Structures
  - Theory and Algorithms
- 15 Credits, Lectures, (9x) Labs, (2x) Assignments, 1 exam
- Assessment
  - Assignments (20%)
  - Labs (10%)
  - Examination (70%)
- Two lectures a week (you must attend both)
  - Monday 4pm in Twyni 002
  - Tuesday 10am in Twyni 002
- Labs: CoFo 104
  - You will only be signed off in your allocated lab
  - Labs will not be signed off over email. Do not email your labs.

Keeping up with labs means passing

- Why? It's 10% of the module?! %@&#!
    - two years ago 87% of those who failed the labs failed the module
        - two students passed the labs and slept through exam accidentally
    - it is the *minimal* practice required
- Please attend you weekly lab in your allocated time slot.
- This time programming gets real.

Office Hours and Contact

- My Office: CoFo 334
- Office Hours: **Monday & Tuesday @ 3pm**
- Questions about the course material? Use the forum.
- Private and personal questions
  `d.w.archambault@swansea.ac.uk`

- I'm much better at explaining things in person
- Please make use of my office hours!

How to Study for this Course

- **Java for Everyone: Late Objects**, by C. Horstmann, Wiley, 2013.

1. Be prepared to take notes
    - I tend to organise a course around lectures
    - and use texts as support and alternate explanations
2. Thus, attendance is **extremely important** for CS-115

Class Ground Rules

1. Treat everyone in the class with respect
    - that includes your fellow students
    - that includes me (you'd be surprised)
2. There is no such thing as a stupid question
    - never be afraid to ask a question
    - but don't try to negotiate marks with me
3. Give your best effort for all parts of the assignment
    - the worst thing you can do, in my mind, is not submit
    - or demonstrate very little effort
4. Be positive and have fun!

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- Obviously, no copying of code from the Internet...

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- Avoiding the technical stuff will hurt your career prospects.

Programming (Dun! Dun! Dun!) NOOOOOOO!

```
++i || i++ ?
```

O(n!) O(nlgn) O(lgn)??

```
Class? Object?
Ahhh! Make it Stop!
```

```
if (fear > 42) {
  --confidence;
  System.exit (42);
}
```

```
#ifndef MY _SYMBOL
#define MY_SYMBOL

#end
```

```
Need to understand
recursion
to understand
recursion?
```

```
(a < b) ? No Clue : Scream;
```

I CAN'T DO
THIS!!! AHHH!

```
Syntax error:  Unreachable Code!!!
```

```
java.lang.NullPointerException??
```

```
if (!compile) {
  int r = rand ()% 100;
  permuteCode (r);
  defeatCompiler ();
}
```

- Learning advanced programming is hard for everyone
  - some appear more confident then others
- Be wary of overconfidence...

Keys to Success

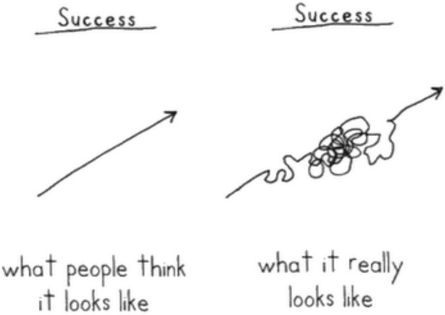

Image by Bernard Goldbach

1. Accept that you still have many things to learn.
2. Accept that everyone is unsure of themselves
   - corollary: some people really are good at looking confident (i.e. Trump)
3. Work hard and be prepared to make lots of mistakes

Need Help with the Course Material?

- Attention less experience programmers!

Need Help with the Course Material?

- Attention less experience programmers!
- And overconfident ones...

Need Help with the Course Material?

- Attention less experience programmers!
- And overconfident ones...
- Attend my office hours to learn how to program
  - Monday and Tuesday at 3pm
  - This session is **completely optional**

Questions?

Classes and Objects!

Working Towards Software Engineering

- You are about to enter the *too much code zone*
- Very shortly, you will not be able to:
  - code without some sort of a design sketch
  - hold the entire software system in your brain!
- Thus, several levels of abstraction are needed

Abstract Data Types

- Structure software using **Abstract Data Types** for encapsulation
- Consists of one or more classes working together
- Parts of abstract data types:
    - What data is stored?
    - What operations can you perform on it?
- Can be a complex system hidden from the user
- ADT as a wall between a software component and the outside world
- Can be modelled as Java interfaces
- An implementation of an ADT is a data structure

Object-Oriented Design

- We use one or more **classes** to construct our data structure
- Parts of a class:

Object-Oriented Design

- We use one or more **classes** to construct our data structure
- Parts of a class:
  - Attributes
    - The data stored by the class
  - Behaviours
    - The operations which can be performed by the class

Class vs Object

- Class
  - A description of the data that can be stored (attributes)
  - A description of the methods which can be executed on them
  - int, char, String....
- Object
  - An instance of those values which can be stored
  - An instance of the methods which can be executed on them
  - 6, 'c', “Hello”

Analogy

- Class
- Instance of a Class

Analogy

- Class
  - `int`
- Instance of a Class

Analogy

- Class
  - `int`
- Instance of a Class
  - 3, 8, 7, -4

What is a Class?
DVD Demo (Code Next Page)

DVD Human Program

```
//Somewhere, in a main method, far far away...
...
DVD d1 = new DVD ("Kiki la petite sorcière");
DVD d2 = new DVD ("Spirit of the Marathon");
DVD d3 = new DVD ("Love Actually");
d1.openCase ();
d2.readBackOfCase ();
d3.openCase ();
d1.closeCase ();
d3.removeDVD ();
d3.putDVDBack ();
d1 = d3;
d1.isCaseOpen();
d2 = null;
d2.openCase();
```

Structure of a Class

- Meanwhile inside the DVD class...
- Classes always begin with a capital letter

```
public class DVD
{
   ...
   //Some attributes (data) associated with the class
   private String title;
   private int runningTime;
   ...
    public DVD (String title)
   {
      this.title = title;
      <rest of constructor>
   }

    public void setRunningTime (String runningTime)
   {
      this.runningTime = runningTime;
   }
   ....
}
```

Attributes

- A description of what is stored in the object
- Attributes always begin with a small letter

```
...
//Some attributes (data) associated with the class
private String title;
private int runningTime;
...
```

Behaviours

- What can be done with or to objects
- In class design, it is the operations on the data
- Anything that modifies an attribute is a behaviour
- Always begins with a small letter

```
...
 public void setRunningTime (String runningTime)
{
   this.runningTime = runningTime;
}
....
```

Constructors

- Constructs a new object
- Operations needed to initialise a new object

```
...
 public DVD (String title)
{
   this.title = title;
   <rest of constructor>
}
...
```

Public vs Private

- Attributes and behaviours can be public and private
  - public means accessible to other classes
  - private means accessible only to the designed class
- In good coding style, attributes are never public

```
...
//Some attributes (data) associated with the class
private String title;
//BAD Dan! No public attributes for you!
public int runningTime;
...
```

Static vs Non-Static

- Attributes and behaviours can be static or not
  - Static means it's associated with the class (there is only one copy)
  - If it's not static, it's associated with an object (one copy per instance)
- Example
  - Each DVD may have its own title
  - There is only one number of DVDs in the classroom
- Usually, most of your attributes are non-static

```
...
//Some attributes (data) associated with the class
private String title;
private static int totalNumberOfDVDs;
...
```

What is `this`

- Non-static methods, like constructors, associated with an object
  - Inside a non-static method, inside a particular instance of an object
  - A reference is always needed to change value of that object
  - This reference is `this` in Java

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