Algorithms and Computational Thinking
Autumn 2018

Tuesday, 25th September 2018

Understanding compilers

In the first TP, we wrote python programs and executed them in PyCharm. Python is an interpreted language. An interpreted language is a high-level language, run and executed by an interpreter (a program that converts the high-level language to machine code and then executes it); it processes the program a little at a time.

A compiled language on the other hand is a high-level language whose code is first converted to machine-code by a compiler (a program that converts the high-level language to machine code) and then executed by an executor (another program for running the code).

For this exercise, we will write some programs in **Scala** which is a compiled language, where everything gets compiled to the byte code and runs within the virtual machine.

For students using their own computers, you will have to first install Java Development Kit (JDK) :
`http://www.oracle.com/technetwork/java/javase/downloads/index.html`
and Scala simple build tool (SBT) :
`https://www.scala-lang.org/download/.`

Writing your first program in Scala

Follow the steps below to write, compile and run Scala program.

1. Create a folder called scala on the Desktop
2. Open **TextEdit** or any text Editor of your choice (Application → TextEdit).
3. Next, write the following lines of code in the editor.

   ```
   object Hello extends App {
         println("Hello world!")
   }
   ```
4. Save the file as *hello.scala* in the scala folder located on the Desktop.

5. In Scala, the main program needs to be executed in the context of an object, so we will create an object with a main method. It has a method named main which accepts an array of strings as parameters. *println* will print *Hello World!*, similar to *print("Hello World")* as you did in Python.

6. To compile the program, open the *Terminal* on your computers. *(Application → Terminal)*. After that, you have to navigate to the folder which contains your program. To do that, you have to type *cd Desktop/scala/* and then type enter.

7. In order to compile the code, type *scalac hello.scala* and enter. scalac is the compiler. This will produce two new files, *Hello.class* and *Hello$.class*. You can check these two files by going to the folder present on your Desktop.

8. Finally, we can run the code by typing *scala Hello*, which will print *Hello world!* on the terminal. scala is the executer, here a virtual machine.

9. Please follow these steps to create, compile and run scala programs.

Exercises

1. Take two numbers from the user and print the sum.

```
object UserInput extends App {
  var num1 = scala.io.StdIn.readLine("Enter first number: ")
  var num2 = scala.io.StdIn.readLine("Enter second number: ")
  var s = num1.toInt + num2.toInt
  println(s"Sum: $s")
}
```

Explanation : The code needs to be executed in the context of an object, which is performed by the line *object UserInput extends App*. The user input is taken by the line *scala.io.StdIn.readLine* and the entered number is stored is the variable *num1*. The number is converted from String to Int by the line *num1.toInt*. *println* prints the sum on the terminal as done before.

2. Use the Scala cheatsheet provided on the exercises page and try out the examples as you did for python in the previous week. Follow the same approach to write the program, compile and run.