

Programming for Artists and Designers

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Introduction

- Welcome to Programming for Designers and Artists!
- We are repeating a worthwhile (and successful) experiment!

It says:

- Why shouldn't Artists - and others - be able to understand and write programs?
 - It is like learning another language!
Artists cannot learn foreign languages?
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- Personally.... I don't think so!

Organization

- Teachers: Charles Wüthrich (Lectures)
Francesco Andreussi (Exercitations)
- You have a (solvable) problem:
 - Are you really interested into learning programming?
 - If not, and you are sitting here just for getting the credits for a Wissenschaftsmodul: it is not the place for you.
- We ask for a lot of commitment...
- PLUS the will to learn something that you can use through your whole life.
- If this is not your purpose: it is just not the place for you!
- So, are you willing to take the challenge?

Organization

- Exercitations:
 - You will get assignments.
 - You will have to deliver assignments at a specific deadline.
 - You miss the deadline by one second, the assignment will be not passed.
 - More than one assignment fail, and you fail the whole course.
- Mark: 50% Assignments and 50% Big Final Assignment
- Exercitations start on the week starting Nov. 11th.
- The course is loosely based on the Princeton University course "*Introduction to Programming in Java: An interdisciplinary Approach*" by R. Sedgewick
<http://introcs.cs.princeton.edu/java/home/>

What do we learn here?

- Programming in Java.
- Writing clean and reusable programs.
- Some basics of Computer Science, so you have an idea of how to program "anything"
 - Applications.
 - Interactive applications.
 - Hardware near programming (sensors, triggers....).
 - Complex systems you can play with, and are not delivered to developers....

What on earth is a Program?

- Artists think it is something greasy pizza eating nerds develop....



What on earth is a Program?

- It is NOT: it is something that everyone has been doing quite often!
- Program: A sequence of instructions that takes some input and delivers in a finite time a correct result (= output).
- There is plenty of real life examples for programming: they do not necessarily involve computers.

A real life example

- Perhaps most common example?
- Cooking recipes!
- To the delight of good food appreciators: I will present a typical recipe from the place I come from
- Scaluppinn al Marsala
(Veal scallops with Marsala wine)

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Scaluppinn al Marsala

Ingredients (4 servings):

*4 Slices of veal scallops
(100 g. each),*

100 g. Butter,

250 ml. Marsala wine,

Flour,

Pepper, salt.

Preparation:

Flatten the scallops with a mallet. Cover with flour a flat dish, and dip both sides of each scallop in the flour, so that each side is covered with flour.

In a large pan heat at high flame the butter and 100 ml. of Marsala wine until the mixture is at frying temperature.

Put the veal in the pan, and let it brown on both sides.

Add the remaining Marsala wine, lower the flame and let the Marsala wine evaporate until formed a thin coating on the meat.

Add salt and pepper, and serve.

Some thoughts on recipes

- There are two parts in a recipe:
 - The ingredients
 - The description
- Description has to be exact.
- Reader needs to be able to read and execute.

- One can see ingredients as input
- And food as output (hopefully tasty)

Some thoughts on recipes

- ... *"Reader needs to be able to read and execute"*:
What does this mean?
 - Description has to be built out of single steps the user is able to follow.
 - The single atomic steps are the instructions of the recipe
 - An atomic instruction is an instruction one assumes the reader can follow
- What does this translate into for a computer?
 - Atomic instructions are computer instructions.
 - Computers can only follow these.
 - Which leads us to the following definition for a program

Definition of Program

Program: A finite sequence of well defined instructions which, given an input, will produce in a finite time a required output.

This definition hides more constraints than one would expect at first sight.

Definition of Program

Program: A finite sequence of instructions in a programming language which, given an input, will produce in a finite time a required output.

- We need well defined instructions
- We need an input.
- We have a required output: the program has to be correct, i.e. produce the required output, otherwise it does not do what we want.
- And this in a finite time, because otherwise one would wait forever.
 - In other words, the program has to terminate correctly.

Scaluppinn al Marsala: Instructions

Preparation:

Flatten the scallops with a mallet. Cover with flour a flat dish, and dip both sides of each scallop in the flour, so that each side is covered with flour.

In a large pan heat at high flame the butter and 100 ml.

of Marsala wine until the mixture is at frying temperature. Put the veal in the pan, and let it brown on both sides.

Add the remaining Marsala wine, lower the flame and let the Marsala wine evaporate until it formed a thin coating on the meat.

Add salt and pepper, and serve.

In instruction notation:

- Flatten the scallops with a mallet.
- Cover with flour a flat dish,
- Dip both sides of each scallop in the flour.
- Put butter and 100 ml. Marsala wine in pan.
- Heat at high flame until frying temperature is reached.
- Add veal scallops and brown both sides of the slices.
- Turn fire to low
- Add rest Marsala wine.
- Let wine evaporate until it formed a thin coating.
- Season with salt and pepper.
- Serve.

Parallels between recipes and computer programs

- In the last slide, each step of the recipe is exactly defined.
- In a way, it is the equivalent of the execution of a single line of code in a computer language.
- One could see the cook as a processor with precise capabilities:
 - Flatten
 - Dip
 - Increase or lower flame
 - Add ingredients
 - etc ...

- Some recipes become very complicated
- Maybe require parallel processing
- Like computer programs, recipes can have all degrees of complexity, and take up to several days to complete.

Back to programs

- Instructions are unit of execution of the computer.
- Input is data.
- Output is transformed data, and must be the required one.
- Output has to be obtained in a finite time.
- The instructions must work in a deterministic way, that is, the same input must always produce the same output.
 - This is called a predictable algorithm, or a predictable program.
- In a way, a program is computer instructions processing input in a finite time.
- On a computer, instructions are expressed in a particular programming language.
- These instructions will be translated by the interpreter or compiler to instructions in the a language directly executable by the computer processor.

Thanks

- Thank you for listening!