Python Programming

Beginners Workshop

held at the Fablab Lisbon

January 2016

Requirements for the Workshop

- Installation of the Python program
  Download from http://www.python.org the current version of python3
- At http://python-rocks.blogspot.com there is a growing number of articles, that give additional explanations and useful links for this workshop.

The installation of Python provides us with a simple editor and a console window to execute Python commands and programs:

IDLE

There are better editors and development tools available, but for the beginning, IDLE should work well.

„I need more information!“

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Many sources of help and useful information are available:

- The original Python documentation (F1 in the IDLE)
  ➡ create a link to the local documentation in your working environment
- Python documentation online at https://docs.python.org/3/
- There are many online tutorials on the web,
  e.g.: http://www.python-course.eu/python3_course.php
  or, more advanced: http://docs.python-guide.org (hitchhiker's guide)
- Documentation and tutorials are also available in portuguese:
  https://wiki.python.org/moin/PortugueseLanguage
- Ask your tutor (by mail: python-ws@bodens.de)

➡ **Go and search the Internet**

Usage of the Python shell (console)

Use of literal values

- Enter numbers, like: 3, 17 or 23482398473982457293487592465
- Enter simple calculations: like 2+3 or 7*12
- Try divisions, like: 12/4, 9/3, 11/5
- See the difference between integers and floating point numbers (3.14)
- Enter text strings, like: „hallo world“ or 'I am tired'
- Try out different mathematical operators: +, -, *, **, /, //, %, &, |
- Try the logical operators: <, >, ==, !=

➡ **The Python shell can be used as a calculator**

More usage of the Python shell

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Use of variables

- Try to assign a name to a value (variable), like: a=7, b=2*3.9, t="what"
- Enter the name of the variable
- Understand the difference between a name and a (literal) value

Call of functions

- print()
- len() - length of strings
- int() - convert a value to an integer, like: int("765"), int(3.75)
- max(), min() - for numeric values
- input() - what does happen here?

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Writing a first program

The infamous „Hello World“

- Use the IDLE editor (or any editor of your choice)
- Write a print statement
- Save the program text as a .py file
- Execute it (in the IDLE shell or on the command line)

The second program: Interaction with the user

- Ask the user for his/her name
- Write a greeting message like: „Hello Alice, it's nice to meet you“
- Save and execute the script

Control the flow

Conditional execution of a statement

- Let the user enter a number,
- then tell him/her, if the number is even or odd
- Use an if … else … statement

➡ **Indentation matters (no braces! - but colons!)**

- Execute a print statement several times
- Use a for loop and the range function
- Save and execute the script

Iterations

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„for item in list:“

- Loop over an iteration
- Use „break“ to leave the loop
- Use „continue“ to skip the rest of the block
- „for“ also has an optional „else“ part

„while condition == True:“

- Loop with a condition expression
- Infinite loops can be useful
- Usage of „break“ and „continue“ as in „for“ loops

Import of Modules

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Import of modules from the Python standard library

- Math-Module
  - import math - offers these functions (examples):
    - math.sqrt() calculates the square root
    - math.sin(math.radians(30)) => 0.5
- Time-Module
  - import time
    - time.time() - returns the current time in seconds (as a float)
    - time.sleep(2.0) - waits for 2 seconds
- Random-Module
  - import random
    - x = random.random() - returns a float: 0.0 <= x < 1.0
    - x = random.choice(list-of-items) – returns one of the items in the list

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Workshop Projects (1)

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Things we could do in the next few weeks

- Sure not all of them – the time is too short
- Perhaps not each of them – some may be too complex

- Easy Projects:
  - Rock, Scissor, Paper (simple game against the computer)
  - Hangman (word guessing)
  - Mastermind (decode numbers)
  - Towers of Hanoi (a puzzle)

Workshop Projects (2)

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Things we could do in the next few weeks

- Useful Projects
  - Work with files and directories, search and rename Files
  - Music player
  - Read and write Office documents (Excel), process data
  - WebScraper – Get data from the Internet
  - ScreenBot – Automate browser games (not only for games)
  - Gui-Application programming

- Simulations
  - Game of Life
  - Elevator Simulation

Workshop Projects (3)

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Things we could do in the next few weeks

- Artistic and Creative
  - Maze generator
  - Fractal graphics
  - Fractal Gallery (work with HTML)
  - Turtle graphics

- Other
  - Work with the Laser Cutter (SVG)
  - Work with the Raspberry Pi
  - Client-Server-App (Group Chat application)
  - Text-Adventure game
  - Puzzle solving

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Rock, Paper, Scissor

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Write a Program to play RPS with the computer

- The rules are simple:
  - Rock wins against Scissor (makes it 'unsharp')
  - Scissor wins against Paper (cuts it)
  - Paper wins against Rock (wraps it)
  - Equal bets are draws, no win points
- The computer makes an internal bet on R, P or S
- The user enters his bet
- The computer shows the result. (my bet, your bet, I win, you win, draw)
- The computer counts the win points.
- Who first gets 10 win points, wins the game

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Access to Files

„open() for reading“

- Open returns a „file“ object
- Beware: strings are not bytes. Encoding matters
- A file can be used as an iterator over the lines
- Closing files „.close()“ is recommended, can be manually, or automatically: „with“ context


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