Questions last lecture ?

Intelligent Control
Lecture 4 – Functions and Modules

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De persoonlijke hogeschool

Contents

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Function

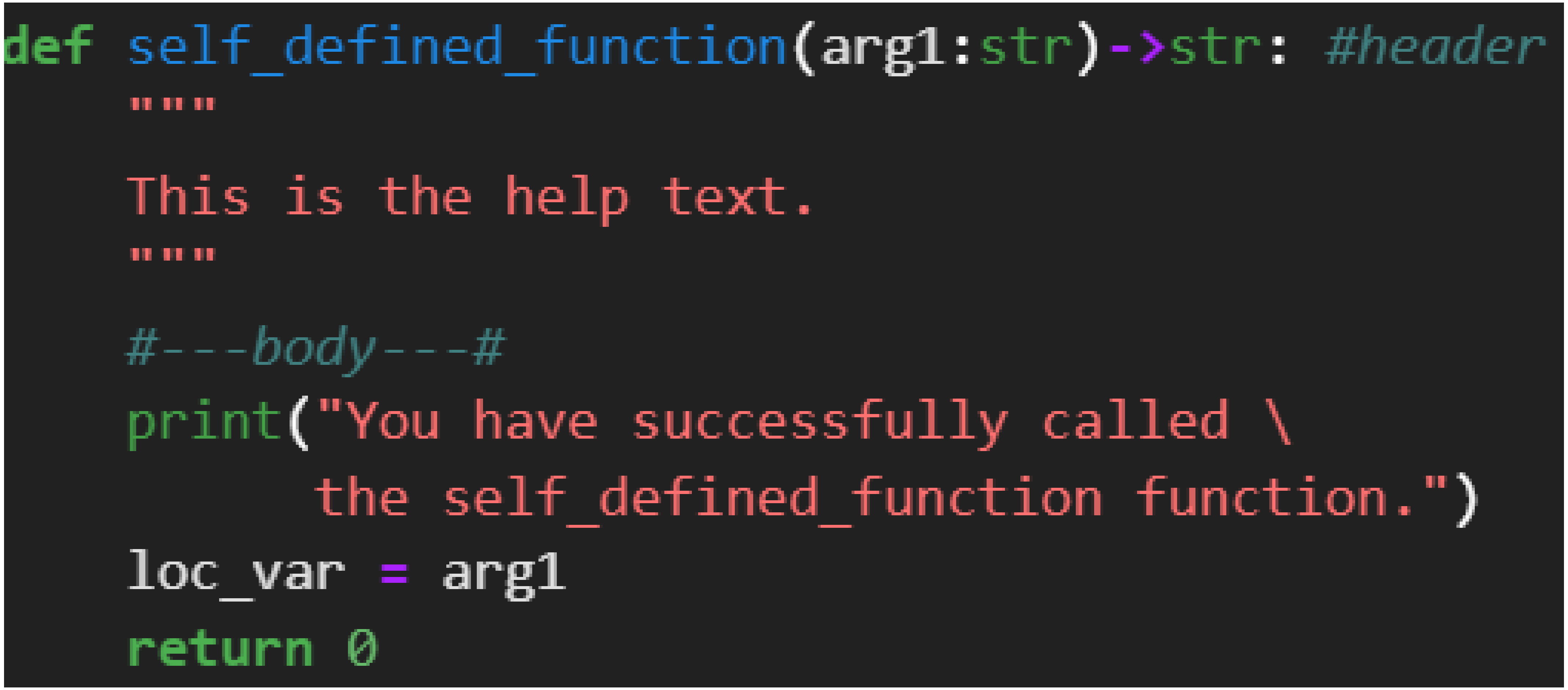
A named sequence of statements that performs useful operation.

Functions are also objects.

function name -> function object

header, body, parameter

Function definition



```
def self_defined_function(arg1:str)->str: #header
    """
    This is the help text.
    """
    #---body---#
    print("You have successfully called \
          the self_defined_function function.")
    loc_var = arg1
    return 0
```

Function call

```
output_result = self_defined_function()

self_defined_function()
```

Function call

```
output_result = self_defined_function(arg1)

self_defined_function(arg1)
```

Function call

A function must be defined before the function call.

Typically you should define all function you use before the ‘main’ body

Function call

You can call python functions inside python functions.

You can even call a function inside itself.

Function parameters(argument)

Default value:

```
def self_defined_function(arg1 = 0):
```

Variable number of positional parameters:

```
def self_defined_function(arg1 = 0,*other):
```

Function variables and parameters are local!

Function parameters(argument)

Variable number of keyword parameters:

def self_defined_function(arg1 = 0,*other, **options):

use

if options.get('keyword_name'):

to check specific keywords

Function parameters(argument)

Let’s say we have:

```
def this_func(c, d):
    c += 1
    d[0] = 3

a = 1
b = [1, 2]
this_func(a, b)
print(a, b)
```

Function parameters(argument)

Let’s say we have:

```
def this_func(c, d):
    c += 1
    d[0] = 3

a = 1
b = [1, 2]
this_func(a, b)
print(a, b)
```

Result:

```
1 [3,2]
```

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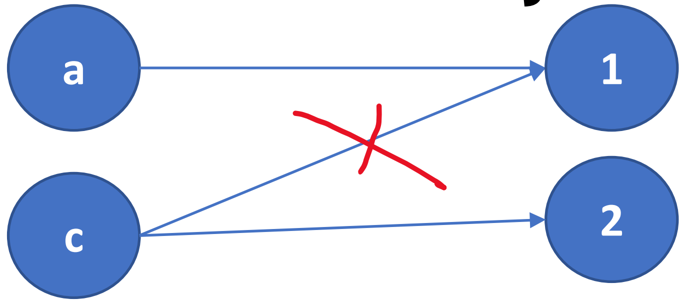
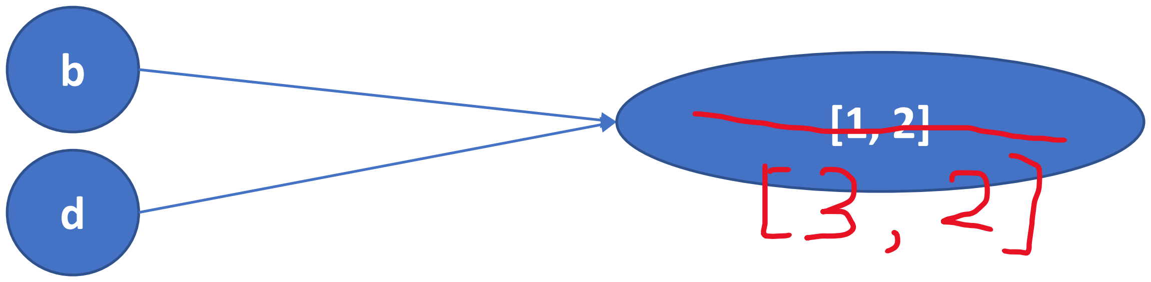
Function parameters(argument): call by reference and call by value

Immutable: call by value



Mutable: call by reference



```
def this_func(c, d):
    c = 2
    d[0] = 3

a = 1
b = [1, 2]
this_func(a, b)
print(a, b)
```

Function parameters(argument)

Now we have:

```
def this_func(c, d):
    c += 1
    d[0] = 3
    d = [7, 8]
    d.remove[7]

a = 1
b = [1, 2]
this_func(a, b)
print(a, b)
```

Function parameters(argument)

Now we have:

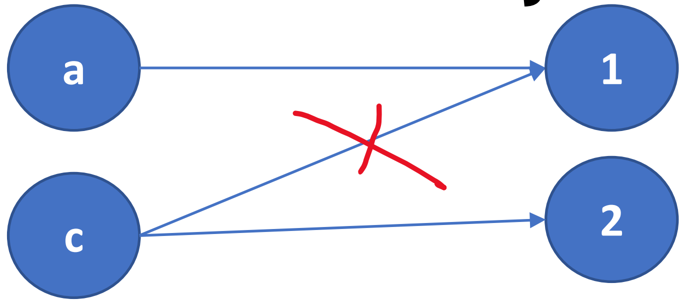
```
def this_func(c, d):
    c += 1
    d[0] = 3
    d = [7, 8]
    d.remove[7]

a = 1
b = [1, 2]
this_func(a, b)
print(a, b)
```

Result:

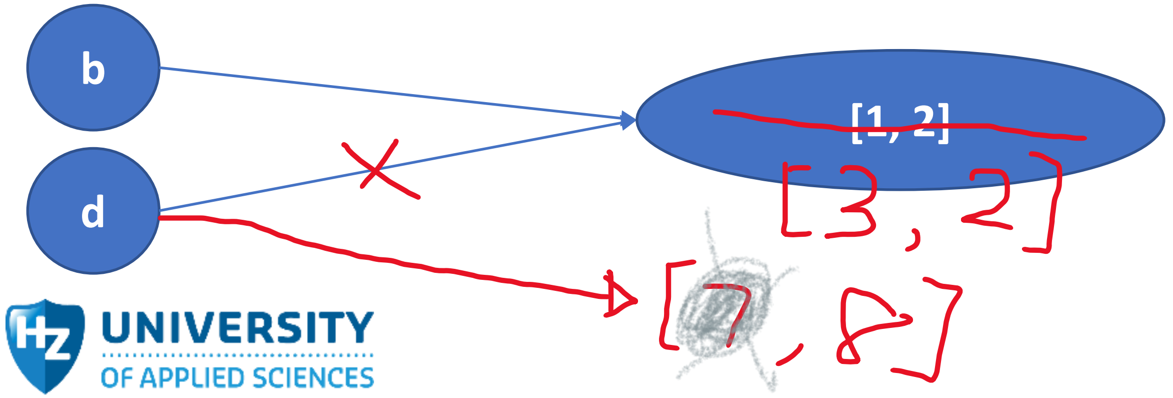
1 [3,2]

Function parameters(argument): call by reference and call by value

Immutable: call by value



Mutable: call by reference



```
def this_func(c, d):
      c += 1
      d[0] = 3
      d = [7, 8]
      d.remove[7]

a = 1
b = [1, 2]
this_func(a, b)
print(a, b)
```

Void and Fruitful Function

Void: do not have return or do not have return value

```
def func():
    pass

def func(inputtxt):
    print(inputtxt)

def func():
    return
```

Fruitful: returns something

```
def add_one_more(a,b):
    c = a + b + 1
    return c

def add_one_more(a,b):
    return a + b + 1

def one_more(a,b):
    return a, b, 1
```

Modules

Stored in a separate file

Easily portable and maintainable

Some examples: sys; math; datetime; gc;
numpy; matplotlib …

Using modules

Can be imported for use

When you import a module, python runs the module script once!

import module_name

Or

from module_name import specific_function

Using modules

If you use
import module_name
Then to use functions inside: module_name.specific_function()

If you use:
from module_name import specific_function
Then you can directly call specific_function()
But you can only use the imported functions mentioned in the from import line.

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Using modules

You can also do:

import module_name as mn

Then

To call a function in the module, you do: mn.specific_func()

Scripting your own module

```
if __name__ == '__main__’:  # test function
        your code here
```

This is to prevent test being executed at import.
And to enable some stand-alone script to be imported as modules.(Code reuse!)

Scripting your own module

Again, you can use triple quotes at the beginning of you script to record your docstrings for documentation.

Wrap-up

- ✓ Function and function definition
- ✓ Parameters
- ✓ Parameter transfer
- ✓ Void & Fruitful
- ✓ Modules
- ✓ Importing modules
- ✓ Scripting your own module
- ✓ Wrap-up

Wrap-up

✓ **Practice makes perfect.**

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A few things to announce before the end of this lecture

- ❑ On Friday we will be having a midterm Q&A session. This session will be based on presentations and questions.

- ❑ Every group should prepare a presentation before the lecture:
  - ✓ Ideally 2 out of 3 students of each group should get a chance to speak in presentation.
  - ✓ 2-5 slides
  - ✓ Total time: 5 to 7 minutes
  - ✓ First 3 minutes: Introduce something that you have learned in this course up till now that is particularly interesting to you or your group members.
  - ✓ Last 2 to 4 minutes: prepare one question related to this course, for all students to discuss. Can be open questions, can be quiz questions(the answer should not be obvious), can be of other form. This question should be worth discussion for 1.5 to 5 minutes.

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A few things to announce before the end of this lecture

- ❑ Plagiarism check meetings will be organized immediately after the submission. (will be recorded, have your campus card ready)
  - ❑ Time scale: On 23rd January 2023, Monday afternoon, 3 pm to 7 pm.
  - ❑ You need to provide the full reasoning for anything that you just submitted. What you say must match what you submitted.
  - ❑ Not everyone will be checked, it is purely random. About 40% to 60% of the students will be check. At least one member of each group will be checked.
  - ❑ Passing this meeting does not mean that you are safe for the plagiarism check.

- ❑ Defense and grade announcement meetings: (will be recorded, have your campus card ready)
  - ❑ One meeting for each group, will last about an hour.
  - ❑ First 45 minutes would be the defence:
    - ✓ Roughly every student can get 2 to 5 questions.
    - ✓ It is possible that you need to do some live coding. So get your laptop ready.
    - ✓ If the student is suspected for plagiarism during the defense, typically when one (or more) insufficient is given, the corresponding activity and student might be reported to the exam board.
  - ❑ Last 15 minutes:
    - ✓ Announce the grade and Q&A.

A few things to announce before the end of this lecture

- ❑ Do not forget to schedule your mid-term meetings for the ‘Spy-school’ assignment before Christmas.