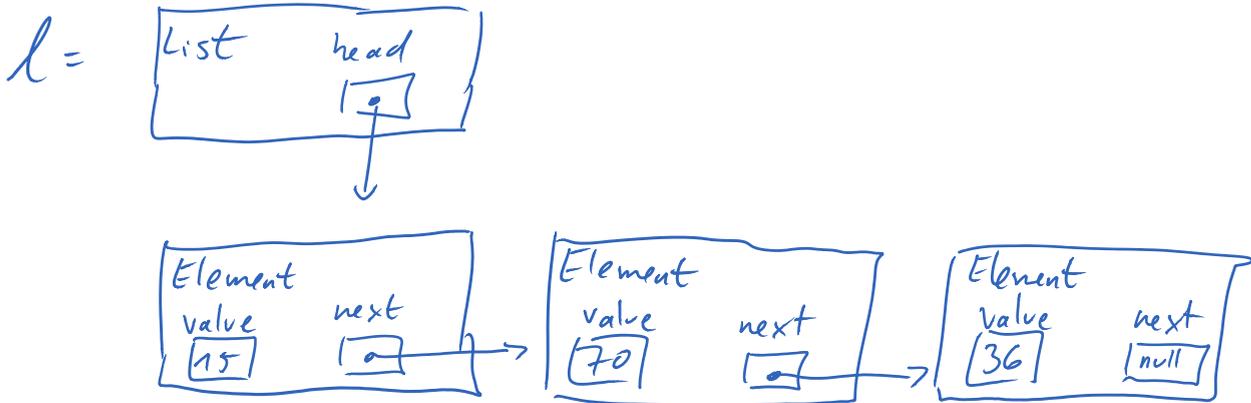


Functional Programming (Slide 1+2)

Example to illustrate the difference between functional + imperative programming: Slide 3



Corresponds to the list [15, 70, 36]

Characteristics of imperative programs:

- Program consists of instructions executed after another.
- Execution of instruction changes values of variables and of memory. This can lead to side effects (e.g., erasing the list l in our example).
- Programmer has to consider representation of data in memory \Rightarrow easy to create bugs!

Implementation of "length" in the functional language Haskell:

Define "list length" \rightarrow needed for declarative programming:

(A) If the list l is empty, then $\text{len}(l) = 0$.

(B) If l is not empty and xs is the list l without its first element, then $\text{len}(l) = 1 + \text{len}(xs)$.

Syntax for lists in Haskell:

$x : xs$ stands for the list resulting from the list xs by inserting the element x in front

$$15 : [70, 36] = [15, 70, 36] = 15 : 70 : 36 : []$$

$$\text{len} :: [a] \rightarrow \text{Int}$$

$$\text{len} [] = 0$$

$$\text{len} (x : xs) = 1 + \text{len} xs$$

} Haskell-program
for len

Execution of a fun. program: provide an expression, computer tries to simplify it

$$\begin{aligned} \text{len } [15, 70, 36] &= 1 + \text{len } [70, 36] \\ &= 1 + 1 + \text{len } [36] \\ &= 1 + 1 + 1 + \text{len } [] \\ &= 1 + 1 + 1 + 0 \\ &= 3 \end{aligned}$$

Characteristics of functional programming:

- Recursion, no loops

- Parametric polymorphism:

The same function can be used for arguments of different types.

- next week: lecture instead of exercise course
 ↳ 2 lectures on Tuesday (April 19)
- first exercise sheet issued on Wed (April 20)
 has to be returned on Tue (April 26) before ex.
 course
- exercises have to be solved in groups of four
 (German or English)
- Website: <http://verify.rwth-aachen.de/fp16>
 contains transparencies, ex. sheets, notes from the lecture,
 course notes (German), video, literature
- 3 hour lecture (no more lectures at the end of the
 semester)
- 50% of the points in exercises are needed to
 participate in exam
- Exam: August 17 / Sept 19 (written exam)
- For exercises: please register via our website
 until April 20

For exam: please register via
 Campus Office (until May 20)

"Vorgetragene Masterprüfung": register at ZPA

June 6-16

Should we change the times of Tuesday
 lecture + ex. course?

Currently: Ex. Course 13:15 - 14:45
Lecture 15:15 - 16:45

other possibilities:
10:15 - 11:45
12:15 - 13:45
14:15 - 15:45
16:15 - 17:45

Please enter your preferences until ^{this} Friday (April 15),
in Doodle Poll.