

Advanced Functional Programming

(SS 2009, 185.210, VL 2.0, ECTS 3.0)

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Thursday, 4:15 p.m. – 5:45 p.m., Lecture room on the
groundfloor, Argentinierstr. 8, 1040 Vienna

Occasionally: Friday, 4:15 p.m. – 5:45 p.m., Lecture room EI
3a, 2nd floor, Gußhausstr. 25-29, 1040 Vienna

Course Objectives

...advanced concepts and principles of functional programming, applications and implementation issues of functional programming languages.

- Functional data structures and algorithms
- Combinator libraries and embedded domain-specific languages
- Programming with streams, programming with monads
- Monomorphic and polymorphic type checking
- Parsing (monadic parsing vs. combinator parsing)
- Functional vs. logical programming
- Parallelism in functional languages
- Graphical user interfaces
- ...

Goals

- Overlook about advanced concepts of functional programming and their application in practice
- Profound understanding of the foundations of functional programming
- Insight in advantages and limitations of a purely functional style of programming

Creditable for

- As elective course (Wahlfach) towards the Master program 066 937 “Software Engineering/Internet Computing” (3.0 ECTS)
- As elective course (Wahlfach) towards the Master program 066 931 “Computational Intelligence” (3.0 ECTS)
- As examination course (Prüfungsfach) towards the Erasmus-Mundus Master program 066 011 “DDP Computational Logic (Erasmus-Mundus)” (3.0 ECTS)

Prerequisites

- Completed Bachelor program
- Basic knowledge of the functional programming style as imparted e.g. in the course *LVA 185.161 Funktionale Programmierung* (VL 2.0 ECTS 3.0)

Course Organization

...depending on the number of participants.

- Lecture
- Programming assignments (Laborübung) in teams of 2 or 3 students
- Seminar-like parts
- Final (oral) examination (assignments and course material)

Course Materials (On-line)

- Information about Haskell: <http://www.haskell.org/>
- Haskell-Tutorial: <http://www.haskell.org/tutorial/>
- Hugs-Interpreter: <http://www.haskell.org/hugs>

Reading Material (Off-line) 1(3)

Basics

1. Jens Knoop. Slides and companion material of the Course "Funktionale Programmierung", WS 2008/2009. Institut für Computersprachen, TU Wien, 2008/2009.
2. Richard Bird. *Introduction to Functional Programming using Haskell*, Prentice-Hall, 2nd edition, 1998.
3. Simon Thompson. *Haskell: The Craft of Functional Programming*, Addison-Wesley (Pearson), 2nd edition, 1999.
4. Peter Pepper. *Funktionale Programmierung in OPAL, ML, Haskell und Gofer*, Springer-Verlag, 2. Auflage, 2003. (In German)
5. Peter Pepper, Petra Hofstedt. *Funktionale Programmierung*, Springer-Verlag, 1. Auflage, 2006. (In German)
6. ...

Reading Material (Off-line) 2(3)

Advanced

1. Lectures on *Advanced Functional Programming*, International Summer Schools 1995, 1996, 1998, 2002; erschienen als LNCS 925, 1129, 1608, 2638, Springer-Verlag.
2. Chris Okasaki. *Purely Functional Data Structures*, Cambridge University Press, 1999.
3. Simon L. Peyton Jones. *The Implementation of Functional Programming Languages*, Prentice-Hall, 1987.
4. Andrew W. Appel. *Modern Compiler Implementation in ML*, Cambridge University Press, 1998.
5. Ravi Sethi. *Programming Languages: Concepts and Constructs*, 2nd edition, Addison-Wesley, 1995.
6. ...

Reading Material (Off-line) 3(3)

Hints to further readings will be provided on-the-fly during the course.

Registration and Deregistration / Accounts and Passwords

In detail:

- Registration:
 - Via the electronic registration management system of AB E185.1 on or before 20 March 2009
 - Further informations are available on the homepage of the course: http://www.complang.tuwien.ac.at/knoop/ffp185210_ss2009.html
- Creation of account (including account number and password):
 - ...automatically in the course of the registration.
- Deregistration:
 - On or before 31 March 2009, using as well the electronic registration management system
- In case of questions&problems regarding the electronic registration:
 - Leonid Narinsky (Studienassistent)
studass@complang.tuwien.ac.at

Lecture, Assignments, Project

- Lecture (block-fashion); usually Thursday from 4:15 p.m. to 5:45 p.m., lecture room on the ground floor, Argentinierstr. 8; for the first time today on 12 March 2009.
- Usually each Thursday a new assignment; first time on 19 March 2009.
- Assignments and slides of lectures available through homepage of the course.
- Submissions: ...will be automatically collected and checked one week after publication at noon; must be stored in the home directory of your account.
- Second submission after fixing bugs: Another week later at noon.
- In total ca. 7 assignments, possibly a larger project with presentation in the audience (seminar style).

Usage of Computers

- Server: `g0.complang.tuwien.ac.at`
- Terminals for course usage (Argentinierstraße 8, Lab on the ground floor of the building at Argentinierstr. 8, 1040 Vienna)
- Usage of other computers is encouraged (e.g. at home)
- Required software: Hugs (available free of charge)
- Solutions of assignments must be delivered on `g0.complang.tuwien.ac.at`

Assessment

- Based on final examination and grades on assignments
- Positive grade only, if all parts are positive
- Final examination: oral
- Points (pts) for solutions: max. 100 pts/assignment, ca. 7 assignments in total
- Minimum 50% in total of the points for an positive overall grade on assignments
- half of the points for second deliveries of assignments

In case of questions and problems

- Homepage:
`http://www.complang.tuwien.ac.at/knoop/ffp185210_ss2009.html`
- E-mail: `knoop@complang.tuwien.ac.at`
- Gergö Barany (Assistant lecturer)
Leonid Narinsky (Studienassistent)
`studass@complang.tuwien.ac.at`

A perfect Add-on

...this term:

- LVA 127.008
Haskell-Praxis: Programmieren mit der Funktionalen Programmiersprache Haskell
(127.008 VU 2.0h ECTS 3.0)
Tue, 3 p.m. to 4:30 p.m.,
Seminar room 123, 3rd floor, Gußhausenstr. 25-29
Professor Dr. Andreas Frank
Institut für Geoinformation u. Kartographie

(The course will be held in English; the first meeting was on 10 March 2009).