

Fortgeschrittene funktionale Programmierung

LVA 185.A05, VU 2.0, ECTS 3.0
SS 2012

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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

- ▶ Overview of 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) within the Master program 066 937 “Software Engineering/Internet Computing” (3.0 ECTS)
- ▶ As elective course (Wahlfach) within the Master program 066 931 “Computational Intelligence” (3.0 ECTS)
- ▶ As elective course (Wahlfach) within the Master program 066 950 “Informatikdidaktik” (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.A03 Funktionale Programmierung (VU 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: Basics

1. Jens Knoop. Slides and companion material of the Course “Funktionale Programmierung”, Institut für Computer-sprachen, TU Wien, 2011/2012.
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-V., 2. Auflage, 2003. (In German)
5. Peter Pepper, Petra Hofstedt. *Funktionale Programmierung*, Springer-V., 1. Auflage, 2006. (In German)
6. Wolfram-Manfred Lippe. *Funktionale und Applikative Programmierung*, Springer-V., 2009. (In German)
7. ...

Reading Material: Advanced

1. Lectures on *Advanced Functional Programming*, International Summer Schools 1995, 1996, 1998, 2002; erschienen als LNCS 925, 1129, 1608, 2638, Springer-Verlag.
2. Jeremy Gibbons, Oege de Moor. *The Fun of Programming*, Palgrave Macmillan, 2003.
3. Chris Okasaki. *Purely Functional Data Structures*, Cambridge University Press, 1999.
4. Simon L. Peyton Jones. *The Implementation of Functional Programming Languages*, Prentice-Hall, 1987.
5. Andrew W. Appel. *Modern Compiler Implementation in ML*, Cambridge University Press, 1998.
6. Ravi Sethi. *Programming Languages: Concepts and Constructs*, 2nd edition, Addison-Wesley, 1995.
7. ...

Reading Material: Advanced

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

Registration, Accounts, and Passwords

In detail:

- ▶ Registration:
 - ▶ Via the electronic registration management system of AB E185.1 on or before 25 March 2012
 - ▶ For further information visit the homepage of the course:
www.complang.tuwien.ac.at/knoop/ffp185210_ss2012.html
- ▶ Creation of account (including account name and password):
 - ▶ ...automatically in the course of registration.
- ▶ Deregistration:
 - ▶ On or before 1 April 2012; also via the electronic registration management system
- ▶ In case of questions&problems regarding the electronic registration:
 - ▶ David Flamme (studass@complang.tuwien.ac.at)

Lecture, Assignments, Project

- ▶ Lectures (block style): usually each 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 15 March 2011.
- ▶ Assignments: Usually each Tuesday; starting on 20 March 2012.
- ▶ Assignments and slides of lectures available on the homepage of the course.
- ▶ Submissions: 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.
- ▶ 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 (Argentinierstr. 8, Lab on the ground floor of the Institutsgebäude, 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:
`www.complang.tuwien.ac.at/knoop/ffp185210_ss2012.html`
- ▶ E-mail: `knoop@complang.tuwien.ac.at`
- ▶ Ulrich Neumerkel
David Flamme (`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 127, 3rd floor, Gußhausenstr. 25-29

Prof. Dr. Andreas Frank

Institut für Geoinformation und Kartographie

(The course will be held in English).

Interested in studying abroad?

The Erasmus/LLP-Programme of the European Union offers a plenty of exciting opportunities, e.g.

- ▶ Universidade do Minho, Braga, Portugal
- ▶ Technical University of Lissabon, Portugal
- ▶ The University of Copenhagen, Denmark
- ▶ Universität Halle-Wittenberg, Germany
- ▶ Universität Paderborn, Germany
- ▶ Universidad Politècnica de València, Spain
- ▶ ...

For further information please visit:

<http://www.complang.tuwien.ac.at/knoop/erasmus>

Ich wünsche Ihnen

...viel Erfolg bei dieser Lehrveranstaltung und dass Sie auch über die unmittelbare Veranstaltung hinaus davon profitieren!

Zu guter Letzt:

Vorlesung und Übung leben mit Ihnen! Ihre Rückmeldungen, Anregungen, Verbesserungsvorschläge sind willkommen!

Natürlich auch Hinweise, wenn Ihnen etwas gut gefallen hat!