Fortgeschrittene funktionale Programmierung

LVA 185.A05, VU 2.0, ECTS 3.0
SS 2017

– Vorbesprechung –

(Stand: 28.02.2017)

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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
- Testing and verification, equational reasoning
- Monadic and combinator parsing, pretty printing
- Functional vs. logical programming
- Parallelism in functional languages
- Functional reactive systems
- ...

Goals

- Overview and insight into 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

Accounts for

- Elective course (Wahlfach) within the Master program 066 937 Software Engineering&Internet Computing (3.0 ECTS)
- Elective course (Wahlfach) within the Master program 066 931 Computational Intelligence (3.0 ECTS)
- Elective course (Wahlfach) within the Master program 066 950 Informatikdidaktik (3.0 ECTS)
- 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

Overall Organization

- Lectures
  - Usually once a week
- (Programming) assignments
  - Usually weekly; to be worked on and solved by teams of (typically) 2 students (usually once a week)
- Final oral examination
  - On submitted assignments and course material.

Org. of Lectures, Assignments in more Detail

Lectures

- Block style: Usually every Thursday from 4.15 p.m. to 5.45 p.m., seminar room on the ground floor of the Institutsgebäude at Argentinierstr. 8.

Assignments

- Programming assignments: Usually every Tuesday; starting on March 14, 2017; about 8 assignments in total.
- Submissions: Automatically collected and checked a week after publication at 3.00 p.m.; must be stored in the home directory of your group account.
- Second submission after bug fixing: Another week later.

Course Material

- Lecture slides, assignments available on the homepage of the course.

Assessment, Grades

Grade on Programming Assignments

- 100 points/assignment; about 8 assignments in total.
- Half of the points of first submissions for second submissions of assignments.
- 50% in total of the points for programming assignments are required for a positive overall grade on assignments.

Final Grade

- Based on grades on assignments and on final oral examination.
- Positive overall grade only, if both parts are positive.

Registration, Accounts, Passwords

Registration

- Via TISS on or before March 10, 2017, in teams of 2 students (in exceptional cases of 1 or 3 students)
- *Cancelling a registration:* Via TISS on or before March 31, 2017.

Accounts

- Each team of students receives an account for the machine `g0.complang.tuwien.ac.at`
- Account information and initial password will be send to every team member via email to the generic standard address `e<Matr.Nr>@student.tuwien.ac.at`

For further information

- Visit the homepage of the course: `www.complang.tuwien.ac.at/knoop/ffp185A05_ss2017.html`

Usage of Computers, Working at Lab, at Home

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

Recommended Reading: Basics

1. Jens Knoop. Slides and companion material of the course LVA 185.A03 Funktionale Programmierung. Institute of Computer Languages, TU Vienna, 2016/2017.
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, 3rd edition, 2011.
4. Peter Pepper. Funktionale Programmierung in OPAL, ML, Haskell und Gofer. Springer-V., 2. Auflage, 2003.
5. Peter Pepper, Petra Hofstedt. Funktionale Programmierung. Springer-V., 2006.
6. ...

Recommended Reading: Advanced

1. Jeremy Gibbons, Oege de Moor. The Fun of Programming. Palgrave Macmillan, 2003.
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. Addison-Wesley, 2nd edition, 1995.
6. Lectures on Advanced Functional Programming. International Summer Schools 1995, 1996, 1998, 2002; Springer-V., LNCS volumes 925, 1129, 1608, 2638.
7. ...

Further Reading, Web Ressources

Further Reading Recommendations

- Specific reading recommendations will be provided for every chapter on-the-fly of the course.

Web Ressources

- Haskell Homepage: `www.haskell.org/`
- Haskell Tutorial: `www.haskell.org/tutorial/`
- Hugs Interpreter: `www.haskell.org/hugs`

Team, Course Homepage

Team

- Jens Knoop
- Ulrich Neumerkel

Course homepage

`www.complang.tuwien.ac.at/knoop/ffp185A05_ss2017.html`

A Perfect Add-On

...in the past:

- Prof. Dr. Andreas Frank
  Institut für Geoinformation und Kartographie

  LVA 127.008 VU 2.0, ECTS 3.0
  Haskell-Praxis: Programmieren mit der Funktionalen Programmiersprache Haskell
  Tue, 3.00 p.m. to 4.30 p.m.
  Seminar room 127, 3rd floor, Gußhausenstr. 25-29

  (The course will be held in English.)

Note: This course will most likely not be held this term!

Interested in Studying Abroad?

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

- Linköping University, Sweden
- Aalto University, Finland
- 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!

Nicht zuletzt:
Vorlesung und Übung leben mit Ihnen! Ihre Rückmeldungen, Anregungen, Verbesserungsvorschläge sind willkommen!
Natürlich auch Hinweise, wenn Ihnen etwas gut gefallen hat!