McMaster University
Department of Computing and Software
Dr. W. Kahl

CAS 743 — Functional Programming

2009-09-14

Outline

Instructor: Dr. Wolfram **Kahl**
Department of Computing and Software
McMaster University

Room: ITB-245

E-Mail: kahl@cas.mcmaster.ca

Course Pages: http://www.cas.mcmaster.ca/~kahl/FP/2009/

This is where you find further information, announcements, and useful links. Electronic versions of the assignment sheets will also be kept there.

It is the student's responsibility to be aware of the information in the course Web pages, and to check regularly for announcements.

Literature:

Useful Textbooks:

Simon Thompson. *The Craft of Functional Programming*. Pearson — Addison Wesley. Second Edition, 1999. ISBN: 0-201-34275-8 (uses Haskell 98)

Richard Bird. *Introduction to Functional Programming using Haskell*. Prentice Hall Series in Computer Science. Prentice Hall Europe, 1998. ISBN: 0-13-484346-0 (appeared before Haskell 98, slightly more decoupled from language details)

Compulsory — read two chapters per week:

Bryan O'Sullivan, Don Stewart, John Goerzen. *Real World Haskell*. O'Reilly, 2008. URL *http://www.realworldhaskell.org/*. (***available on-line***; emphasises practical applications)

Recommended by some:

Hal Daume III: *Yet Another Haskell Tutorial*, http://www.isi.edu/~hdaume/htut/

Essential: The Haskell Website: http://haskell.org/

Schedule:

Monday, Wednesday, 11:30–13:00

Grading:

- 55% Programming work – standard split:
  - 25% Assignments (details to be announced)
  - 30% Project with Presentation (details to be announced)

  Where applicable, a student can negotiate with the instructor (partial) replacement of later assignments with project components.
- 15% Paper Presentation (details to be announced)
- 30% Final Exam (possibly oral)

All examinations in this course will be **Closed Book**. That is, no written or printed material nor a calculator or other electronic aid may be used during the examinations. The instructor reserves the right to conduct any deferred exams orally.

Contents

The major topics are most likely to be presented in an interleaved manner that allows applying theory in practice with less delay. Topics will include, but not necessarily be limited to:

- Practice of Pure Functional Programming (in Haskell), including:
  - Type classes and instances
  - Datatype definitions, abstract datatypes, the role of class instances in datatype abstraction
  - Computations and State in the purely functional setting: Monads, I/O
  - Advanced datatype abstraction using multiparameter classes; monad transformers; modular interpreters
  - Combinator libraries and embedded domain-specific languages; parsing combinators
- Foundations of Functional Programming:
  - Term rewriting systems, λ-calculus, general concepts of reduction systems, evaluation strategies
  - Type systems, parametric polymorphism, ad-hoc polymorphism, second-order polymorphism, Hindley-Milner typing
  - Category theory
- Dependently Typed Programming

Course Adaptation

The instructor and university reserve the right to modify elements of the course during the term.

The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes.

It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

Academic Ethics

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at http://www.mcmaster.ca/academicintegrity.

The following illustrates only three forms of academic dishonesty:

(1) Plagiarism, e.g. ***the submission of work that is not one's own*** or for which other credit has been obtained.

(2) Improper collaboration in group work.

(3) ***Copying or using unauthorised aids in tests and examinations.***

Discrimination

The Faculty of Engineering is concerned with ensuring an environment that is free of all adverse discrimination. If there is a problem that cannot be resolved by discussion among the persons concerned, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Office or the Human Rights Consultant, as soon as possible.