Informatics 1

Functional Programming Lecture 1

Introduction

Don Sannella

University of Edinburgh

Welcome to Informatics 1, Functional Programming!

Informatics 1 course organiser: Paul Anderson

Functional programming (Inf1-FP)

Lecturer: Don Sannella

Teaching assistant: Karoliina Lehtinen

Computation and logic (Inf1-CL)

Lecturer: Michael Fourman

Teaching assistant: ???

Informatics Teaching Organization (ITO)

Gregor Hall

Where to find us

IF – Informatics Forum

FH – Forrest Hill

Inf1 course organiser: Paul Anderson dcspaul@inf.ed.ac.uk IF 1.24

Functional programming (Inf1-FP)

Lecturer: Don Sannella Don.Sannella@ed.ac.uk IF 5.12

Teaching assistant: Karoliina Lehtinen M.K.Lehtinen@sms.ed.ac.uk IF 5.34

Informatics Teaching Organization (ITO):

Gregor Hall FH 1.B15

Lectures

- Monday 14:10–15:00, David Hume Tower, Lecture Hall C
- Tuesday 11:10–12:00, Appleton Tower, Lecture Theatre 5

Sometimes, Inf1-FP swaps lecture slots with Inf1-CL.

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Like this week — extra Inf1-FP lecture on Friday!

- Friday 23 Sep, 14:10-15:00, Appleton Tower, Lecture Theatre 4

Required text and reading

Haskell: The Craft of Functional Programming (Third Edition),
Simon Thompson, Addison-Wesley, 2011.

or

Learn You a Haskell for Great Good!
Miran Lipovača, No Starch Press, 2011.

Reading assignment

This week	Thompson: parts of Chap. 1-3 and 5
	Lipovača: parts of intro, Chap. 1-2
Later weeks	See the course web page

The assigned reading covers the material very well with plenty of examples.

There will be no lecture notes, just the books. *Get one of them and read it!*

Linux / DICE Tutorial

Tuesday	20 September 2016	2–4pm	Forrest Hill Drill Hall
Wednesday	21 September 2016	2–4pm	Forrest Hill Drill Hall
Thursday	22 September 2016	2–4pm	Forrest Hill Drill Hall

Forrest Hill Drill Hall, FH 1.B30

Get You Installed a Haskell

Tuesday	20 September 2016	2–4pm	Forrest Hill Drill Hall
Wednesday	21 September 2016	2–4pm	Forrest Hill Drill Hall
Thursday	22 September 2016	2–4pm	Forrest Hill Drill Hall
Friday	*23 September 2016*	*3–5pm*	*Forrest Hill Drill Hall*

Forrest Hill Drill Hall, FH 1.B30

Forrest Hill Drill Hall

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Forrest Hill Drill Hall

Lab Week Exercise and Drop-In Labs

Monday	3–5pm (demonstrator 3:00-4:00pm)	Forrest Hill Drill Hall
Tuesday	2–5pm (demonstrator 3:00-4:00pm)	Forrest Hill Drill Hall
Wednesday	2–5pm (demonstrator 3:00-4:00pm)	Forrest Hill Drill Hall
Thursday	2–5pm (demonstrator 3:00-4:00pm)	Forrest Hill Drill Hall
Friday	3–5pm (demonstrator 3:00-4:00pm)	Forrest Hill Drill Hall

Forrest Hill Drill Hall, FH 1.B30

Lab Week Exercise

submit by 5pm Friday 30 September 2016

Do all the parts

Tutorials

ITO will assign you to tutorials, which start in Week 3.

Attendance is compulsory.

Tuesday/Wednesday	Computation and Logic
Thursday/Friday	*Functional Programming*

Contact the ITO if you need to change to a tutorial at a different time.

You *must* do each week's tutorial exercise! Do it *before* the tutorial!

Bring a *printout* of your work to the tutorial!

You may *collaborate*, but you are responsible for knowing the material.

Mark of 0% on tutorial exercises means you have no incentive to *plagiarize*.

But *you will fail the exam if you don't do the tutorial exercises!*

Beginner-Friendly Tutorials

Some tutorials are labelled as *beginner friendly*.

Ask for one of these if:

- you have no previous programming experience; and/or
- you just aren't so confident

All tutorial exercises will cover the same tutorial exercises.

The beginner-friendly tutorials will proceed more carefully.

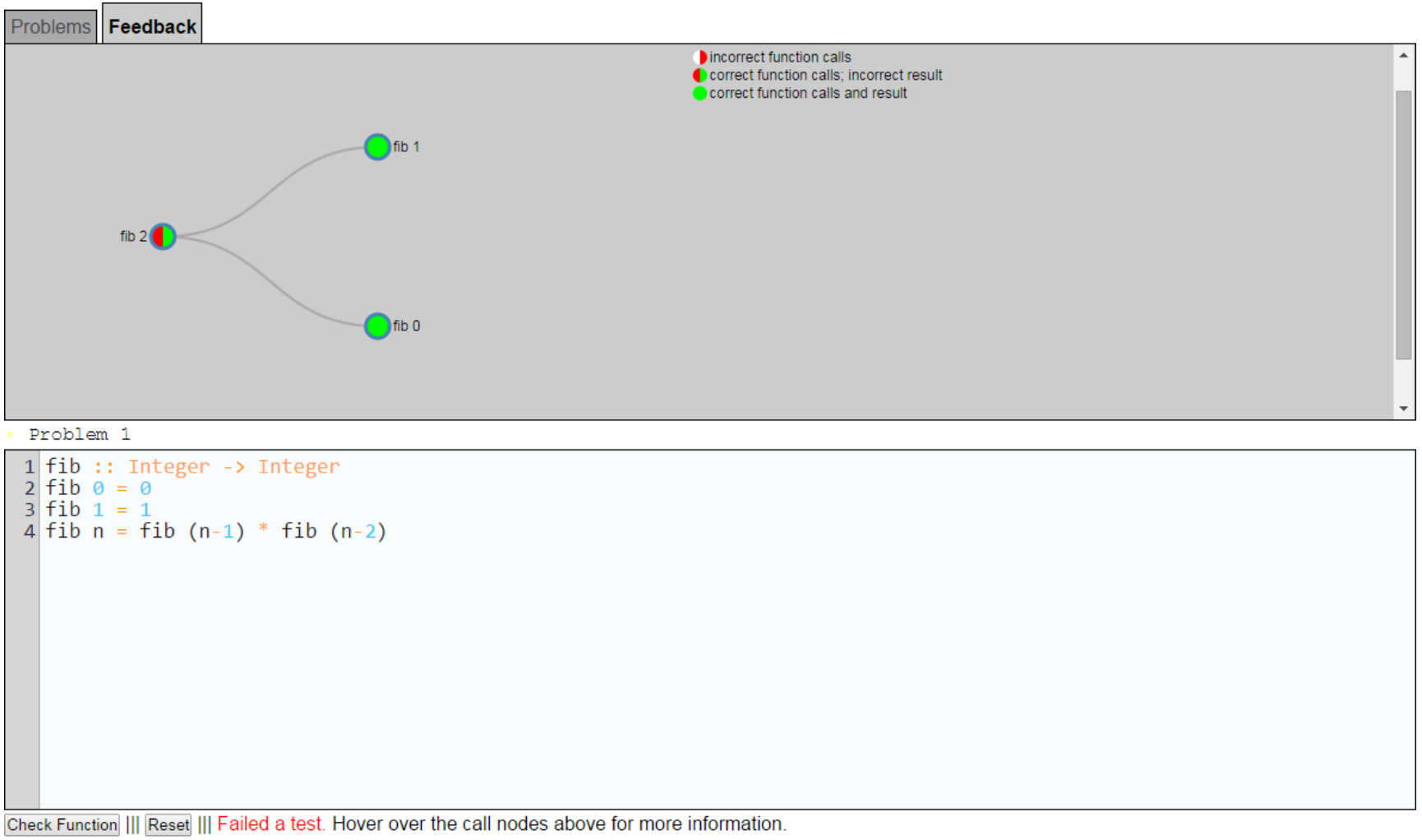
Their priority is to make sure that all students are keeping up.

Contact the ITO if you need to change into or out of a beginner-friendly tutorial.

Automated Feedback

CamlBack (UCLA) will give automated feedback on tutorial exercises.

Use is optional, but it's good to get immediate feedback.



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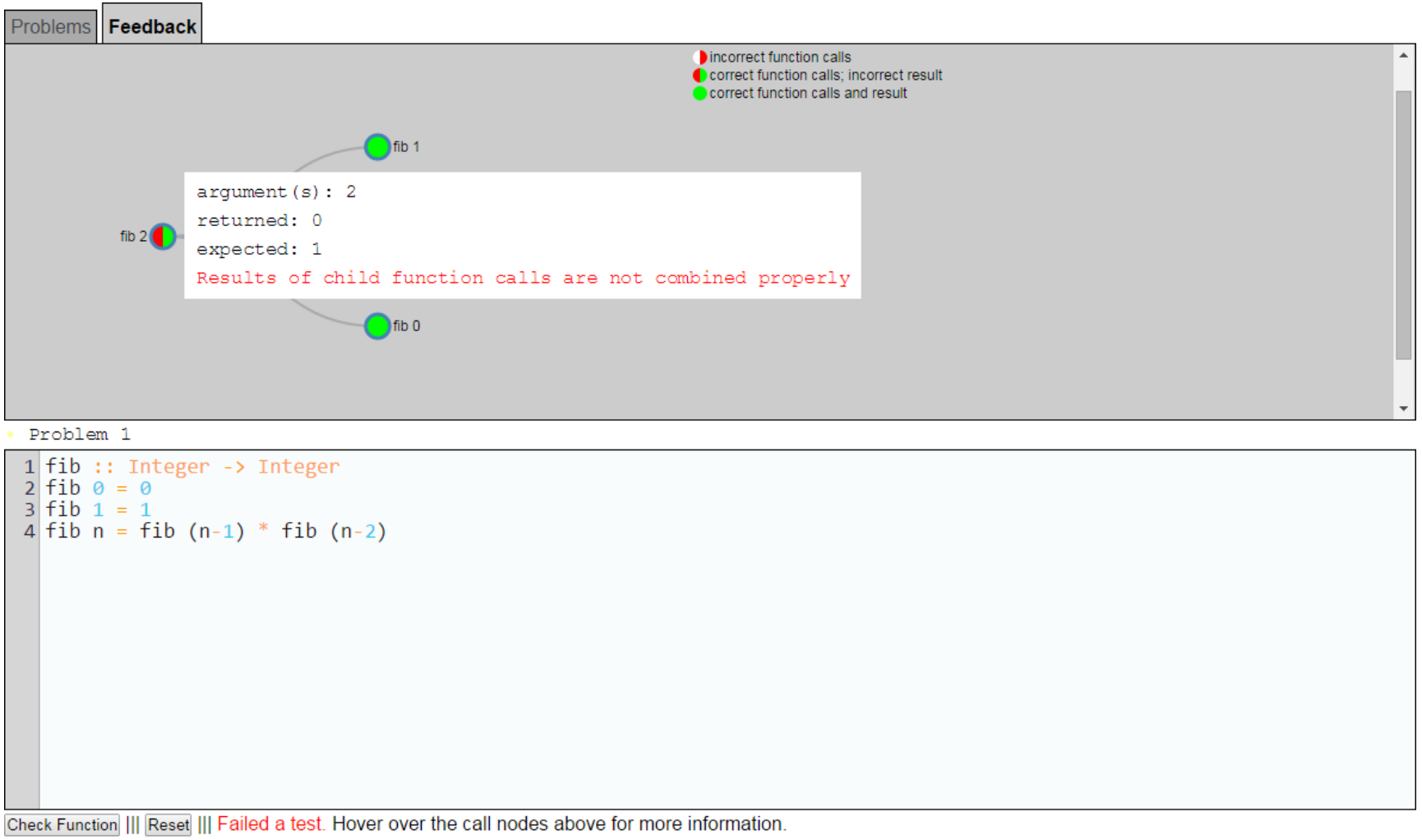

Formative vs. Summative

0%	Lab week exercise
0%	Tutorial 1
0%	Tutorial 2
0%	Tutorial 3
10%	Class Test
0%	Tutorial 4
0%	Tutorial 5
0%	Tutorial 6
0%	Tutorial 7
0%	Mock Exam
0%	Tutorial 8
90%	Final Exam

Course Webpage

See *http://www.inf.ed.ac.uk/teaching/courses/inf1/fp/* for:

- Course content
- Organisational information: what, where, when
- Annotated lecture slides, reading assignment, *tutorial exercises*, solutions
- Past exam papers
- Programming competition
- Other resources

Any questions?

Questions make you *look good*!

Don's *secret technique* for asking questions.

Don's *secret goal* for this course

Ask

Use the Ask online Inf1-FP forum:

- For *asking questions* outside lectures
- For *reading answers* to questions asked by others
- For *writing answers* to questions asked by others

See the course webpage for the link and for sign-up instructions

Part I

Introduction

Why learn Haskell?

- Important to learn many languages over your career
- Functional languages increasingly important in industry
- Puts experienced and inexperienced programmers on an equal footing
- Operate on data structure *as a whole* rather than *piecemeal*
- Good for concurrency, which is increasingly important

Operating on data structure as a whole rather than piecemeal:
In an imperative language, you often use a loop to operate on the items in a data structure, one at a time.
In a functional language, you tend to operate on the whole data structure: Whoosh!
This leads to higher-level thinking about algorithms.

Linguistic Relativity

"Language shapes the way we think, and determines what we can think about."

Benjamin Lee Whorf, 1897–1941

"The limits of my language mean the limits of my world."

Ludwig Wittgenstein, 1889–1951

"A language that doesn't affect the way you think about programming, is not worth knowing."

Alan Perlis, 1922–1990

Look at these web pages:

Jane Street Capital: www.janestreet.com/technology/

Facebook:

www.wired.com/2015/09/
facebooks-new-anti-spam-system-hints-future-coding/

Functional Programming is Black Magic

http://www.quora.com/... (see course web page)

ICFP 2016: conf.researchr.org/home/icfp-2016

Families of programming languages

- Functional

  Erlang, F#, Haskell, Hope, Javascript, Miranda, OCaml, Racket, Scala, Scheme, SML

  - More powerful
  - More compact programs

- Object-oriented

  C++, F#, Java, Javascript, OCaml, Perl, Python, Ruby, Scala

  - More widely used
  - More libraries

Functional programming in the real world

- Google MapReduce, Sawzall
- Ericsson AXE phone switch
- Perl 6
- DARCS
- XMonad
- Yahoo
- Twitter
- Facebook
- Garbage collection

Functional programming is the new new thing

Erlang, F#, Scala attracting a lot of interest from developers

Features from functional languages are appearing in other languages

- Garbage collection Java, C#, Python, Perl, Ruby, Javascript
- Higher-order functions Java, C#, Python, Perl, Ruby, Javascript
- Generics Java, C#
- List comprehensions C#, Python, Perl 6, Javascript
- Type classes C++ “concepts”