Meeting Information

The 74th meeting will be organised at the University of Strathclyde in Glasgow by the Mathematically Structured Programming Group.

Dates

Monday 2016-06-13 to Friday 2016-06-17.

The meeting will start at 8.45 on Monday morning (but Conor will be there by 8.15am, making coffee, so you can bring breakfast if you want) on the 13th and end with lunch on Friday the 17th. Most people will arrive on Sunday the 12th and a buffet-style dinner will be provided.

Participants

- Conor McBride
- Johan Jeuring
- Patrik Jansson, (arriving with KL1477 at 16.05 on Sunday, staying at Premier Inn, "George Square" with continental breakfast, leaving with KL1478 at 16.55 on Friday)
- Nick Wu
- Carroll Morgan (arrived Saturday; staying at Premier Inn)
- Jeremy Gibbons (arriving Sunday 17:16 at Glasgow Central with Richard Bird, staying at Babbity Bowster)
- Tom Schrijvers
- Fritz Henglein
- Lambert Meertens
- Roland Backhouse
- Richard Bird (travelling with Jeremy Gibbons, staying at Babbity Bowster)
- Patrick Bahr
- Doaitse Swierstra (arrival Sunday KL 1475, 12:40, departure Friday KL1476, 13:25, Premier in, sharing with Roland)
- José Pedro Magalhães
- Wouter Swierstra
- Peter Höfner
- Graham Hutton (Premier Inn)
- Jose N. Oliveira (arr. Sun 12th, 8.30pm, LHR-GLA BA1486; dep. Sat 18th, 9.00am, GLA-LHR BA1477; Merchant City Inn)
- Andres Löh (arrival GLA 16:05 (KLM 1477 from AMS) on Sunday, departure GLA 13:25 (KLM 1476 to AMS) on Friday, staying at Premier Inn)
- James McKinna
- Florian Rabe
- Alberto Pardo (Merchant City Inn)
- Sam Lindley
- Meng Wang
- Ralf Hinze

Organizational and administrative matters

Friday morning, June 17, 2016.

Membership

These private matters are not recorded in the public version of the minutes.

Formal resolution

The members and observers of WG2.1 present at the 74rd meeting, in Glasgow, express their gratitude to Conor McBride, Melanie Selfe, James Chapman, Aive Kalmus, Fredrik Nordvall Forsberg, Stuart Gale and Dr Livingston (I presume) for being such especially good hosts for our visit to what, finally, has turned out to be Sunny Scotland. Our experiences during the week took us from the intense depths of retronasal organoleptic analysis, where we discovered the connection between sniffing, sipping and, eventually, COBOL, to the rarefied heights of Livvy at the top, where we demonstrated that it was harder to predict the outcome of a football match than to resolve a nondeterministic function. Our only regret is that we did not succeed, at any point, in finding even a single Glaswegian who did not turn out to be an old friend of Conor's.

Next meetings

M75 (Feb 2017): Montevideo/Uruguay (Pardo); the Doodle will be sent around very soon. M76 (~Oct 16–20, 2017): Lesbos? (Meertens). M77 (Jul 18, 2018): NL/Germany? (Hinze). M78 (Mar 2019) China/Australia/NZ/Japan (?).

Technical presentations in scheduled order

Richard Bird, *Greedy algorithms and refinement* (Monday, June 13, 2016, 10:30)

No abstract provided.

Doaitse Swierstra, *A question to type theorists* (Monday, June 13, 2016, 11:36)

No abstract provided.

Ernie Cohen, *Reasoning about probabilistic choice* (Monday, June 13, 2016, 11:53)

No abstract provided.

Graham Hutton, *Cutting Out Continuations* (Monday, June 13, 2016, 13:30)

In the field of program transformation, one often transforms programs into continuation-passing style to make their flow of control explicit, and then immediately removes the resulting continuations using defunctionalisation to make the programs first-order. In this talk, we show how these two transformations can be fused together into a single transformation step that cuts out the need to first introduce and then eliminate continuations. Our approach is calculational, uses standard equational reasoning techniques, and is widely applicable. (Joint work with Patrick Bahr.) (Paper.)

Roland Backhouse, *Factor theory made calculational* (Monday, June 13, 2016, 14:30)

No abstract provided.

Johan Jeuring, *Diagnosing student activities - rewriting and refinement* (Monday, June 13, 2016, 16:00)

...

J.N. Oliveira, *Towards a linear algebra semantics for query languages* (Monday, June 13, 2016, 17:23)

This talk will address the formal semantics of query languages which offer data aggregation operations. I will take as motivation the remark by Jim Gray (et al, 1997) that "GROUP BY is an unusual relational operator". In fact, relational algebra alone is unable to express data aggregation properly. I will propose (typed) linear algebra as a theoretical framework able to smoothly cope with the quantitative and qualitative aspects of data aggregation, in a unified way. By relying chiefly on blocked, 'divide & conquer' matrix algebra, the approach offers "for free" a framework for interpreting queries in a data-distributed, map-reduce style.

Nicolas Wu, *Monad Transformers and Modular Algebraic Effects - What Binds Them Together* (Tuesday, June 14, 2016, 09:03)

Monads and algebraic effects are two alternative approaches for expressing purely functional side-effects. While the two approaches have been well-studied, there is still much confusion about their relative merits and expressiveness, especially when it comes to their comparative modularity. This talk clarifies the connection between the two approaches. We introduce the notion of modular algebraic effects, and show how these correspond to a specific class of monad transformers. In particular, we show that every modular algebraic effect gives rise to a monad transformer. Moreover, every monad transformer for algebraic operations gives rise to a modular effect handler. This is joint work with Tom Schrijvers, Maciej Pirog and Mauro Jaskelioff.

Patrik Jansson, *FLaBloM - Functional Linear Algebra with Block Matrices* (Tuesday, June 14, 2016, 10:32)

At the meeting in Zeegse I talked about a formalisation of parallel parsing using matrix algebra (joint work with J-P. Bernardy, see ValiantAgda at arXiv). Now I present some work in progress on representing matrices recursively as 2x2 (block)-matrices and computing the reflexive, transitive closure (with proof of correctness) in Agda. (Joint work with Adam Sandberg Eriksson.)

Patrick Bahr, *Rewrite Semantics for Guarded Recursion* (Tuesday, June 14, 2016, 11:05)

...

Wouter Swierstra, *Pi-Ware - A hardware description language embedded in Agda* (Tuesday, June 14, 2016, 14:19)

...

Tom Schrijvers, *Tabling with Sound Answer Subsumption* (Tuesday, June 14, 2016, 15:07)

Tabling is a powerful resolution mechanism for logic programs that captures their least fixed point semantics more faithfully than plain Prolog. In many tabling applications, we are not interested in the set of all answers to a goal, but only require an aggregation of those answers. Several works have studied efficient techniques, such as lattice-based answer subsumption and mode-directed tabling, to do so for various forms of aggregation. While much attention has gone to expressivity and efficient implementation of the different approaches, soundness has not been considered. This talk shows that the different implementations indeed fail to produce least fixed points for some programs. As a remedy, we provide a formal framework that generalises the existing approaches and we establish a soundness criterion that explains for which programs the approach is sound. This is joint work with Alexander Vandenbroucke, Maciej Pirog and Benoit Desouter.

Sam Lindley, *Liberating effects with rows and handlers* (Tuesday, June 14, 2016, 16:12)

...

James McKinna, *Bidirectional Transformations are Proof-relevant Bisimulations, over the Bicategory of Relations* (Wednesday, June 15, 2016, 09:10)

I explain, and elaborate on, the technical terms in the title, and justify the claim

Florian Rabe, *Towards a Universal Framework for Representing Programming Languages* (Wednesday, June 15, 2016, 10:41)

In the previous meeting, I presented MMT --- a universal framework for representing formal languages, which focuses on representing individual language features as reusable modules. MMT allows composing individual languages from their features and then inheriting MMT's generic implementation support (e.g., IDE, type-checker) out of the box. MMT has been applied successfully to formalize the features of declarative languages such as *type theories, logics, and set theories* (e.g., lambda-abstraction, conjunction, axiom of choice). (MMT overview paper) (Slides from previous meeting) In this talk, I present *initial ideas* for applying the same approach to *programming languages*. The ultimate goal is to build a library of formalizations of the syntax, semantics, and interrelations of common programming language features, including the features found in functional, imperative, and object-oriented languages.

Slides

Ralf Hinze, *Two-level turtles* (Wednesday, June 15, 2016, 11:25)

...

Meng Wang, *Un-preprocessing - Extended CPP that works with your tools* (Thursday, June 16, 2016, 09:03)

...

Jeremy Gibbons, *APLicative programming with Naperian functors* (Thursday, June 16, 2016, 10:23)

> APL is famous (as well as for its funny squiggles) for rank polymorphism—operations can be applied not only to scalar arguments, but silently lifted to act pointwise also on sequences and matrices of arguments. Not only does this work for structured arguments of identical shape (when it's a kind of zipWith); it also works for arguments of different dimension, eg to add an integer to (each element of) a vector or a vector to (each row of) a matrix. Some recent work by Olin Shivers as developing a Scheme-like language called Remora to provide this feature, including a new ad-hoc type systems to constrain how lifting works. I'll show how to do it using ordinary—well, somewhat fancily—typed functional programming. It's a matter of that marvellous Scottish invention, Naperian functors. slides-wg21m74.pdf

Fritz Henglein, *Generic tries and fast joins* (Thursday, June 16, 2016, 11:33)

> ...

Alberto Pardo, *An Approach to Correct-by-Construction Compilers* (Thursday, June 16, 2016, 16:07)

> One common approach to formal compiler construction is to first write the compiler, having in mind in that process the semantics of the involved languages, and then, as a second step, perform the proof of correctness of that compiler. This approach is known as externalist and has been investigated in different formal settings such as formal specification methods (in particular algebraic ones), categorical formalisations of programming languages, dependently-typed languages, etc. In this talk, we present preliminary results of on-going work on an alternative approach to compiler construction that follows an internalist discipline. This means that we develop simultaneously the compiler and its correctness proof. Our development is performed in Agda. The idea is to decorate the data types that model the abstract syntax of each language with the semantics description of that language and write the compiler between those decorated types. That way, compiler correctness reduces to type-correctness. Modulo minor details, the texts of the compiler and its proof are almost the same. We show the translation between a simple while language and a semi-structured code for a stack machine. Although we do not use that framework, our approach has similarities with McBride 's Ornaments. This is a joint work with Emmanuel Gunther, Miguel Pagano and Marcos Viera.

James Chapman, *A modular approach to normalisation proofs to stlc* (Thursday, June 16, 2016, 17:13)

> ...

Location

The meeting will be held on campus at the University of Strathclyde: we're in room LT210, in Livingstone Tower (Google maps).

The entrance is on the north side of the building, on Richmond Street: use the main door at street level, rather than the side door with the stairs or ramp. Once in the door, you should see a statue of a famous explorer: turn right at the statue and you will find some stairs; go up one floor, then turn right and keep going; we're in the south-west corner of the building.

Power outlets in LT210 are few and far between, which will help enforce the no-laptops rule. EDUROAM should work ok (in the breaks) and locals can help you find places higher up in the building where you can get electricity, etc. (The department is at the top of the building.)

Accommodation

There are lots of hotels near Livingstone Tower. They are all resistant to offering reasonable prices to large groups, so it is best if you make plans as individuals or in small groups. Here are some options.

* The closest is the Premier Inn, "George Square" (actually,it's a bit nearer us, in George Street). If you're sureyou're coming and willing to pay in advance, they have a good"saver" deal (£245 for our five nights, at time of writing.) http://www.premierinn.com/gb/en/hotels/scotland/strathclyde/glasgow/glasgow-city-centre-george-square.html?INNID=GLACIT&ARRdd=12&ARRmm=06&ARRyyyy=2016&NIGHTS=5&ROOMS=1&ADULT1=1&CHILD1=0&COT1=0&INTTYP1=SB&SID=4&ISH=true&BRAND=PI
A sensible cancellation policy will cost more (£411 at timeof writing). For those willing to pay up front, I think thisis the best plan...until the price goes up.
* Only slightly further away, in North Frederick Street is theZ hotel http://www.thezhotels.com/z-glasgow At time ofwriting, 5 nights from the 12th of June costs £290 (norefunds) or £406 (with option to cancel)
* Some nice pubs nearby have friendly service and rooms upstairs:Babbity Bowster http://babbitybowster.com/rooms/ and Rab Ha's http://www.rabhas.com/
* The Brunswick Hotel http://www.brunswickhotel.co.uk/booking.html is also quite handy for us, and is currently offering rooms at£85 per person per night.
* If you want to stay at the Grand Central Hotel,https://book.thegrandcentralhotel.co.uk/Search.aspx the price currently being quoted on their website just now is£84.48 per person per night. It's ten minutes' walk fromLivingstone Tower. Making a group booking adds £30pppn andworsens the cancellation conditions.

Breakfast costs extra in some of these places: whether it's worth the money depends on your needs and tastes. We're in Glasgow's Merchant City, which has plenty of alternative sources of caffeine and food. I shall ensure that our own venue has supplies of tea and coffee, and we have a couple of convenience stores very nearby. If you want the full cooked breakfast experience, however, your hotel will surely provide.

If you need any further information about hotels or help with booking,
please contact Conor (conor@strictlypositive.org).

Food

We've lined up a selection of local eateries to feed us: as we're a large group, we'll need to preorder, so your cooperation will be appreciated.

Sunday dinner at Conor and Melanie's (as specified by email)

Monday lunch Blackfriars (36 Bell Street, G1 1LG); **dinner** Taco Mazama (take-away, to be enjoyed in LT1415)

Tuesday lunch Yiamas (16-20 Bath Street, G2 1HB); **dinner** Poco Havana (48a W Regent St, G2 2RA); **whisky** The Good Spirits Company (23 Bath St, G2 1HW)

Wednesday lunch Riverhilll Cafe (picnic); **dinner** China Blue (96 Renfield St, G2 1NH)

Thursday lunch The Dhabba (44 Candleriggs, G1 1LD); **dinner** Fratelli Sarti (42 Renfield Street, G2 1NE)

How to get there

By plane. Fly to Glasgow International Airport, then take the number 500 bus as far as George Square: the bus stops just outside Glasgow Queen Street railway station. Or fly to Prestwick, then take the train to Glasgow Central Station. Or fly to Edinburgh, then get the CityLink Air bus to Cathedral Street, opposite Strathclyde University Library, then walk southward across campus.

By train. Our central location is convenient for both of Glasgow's main railway stations. Glasgow Queen Street station will be offering a much reduced service due to works on its main tunnel, but its "low level" platforms will still be in operation, offering a 70 minute service to Edinburgh, connecting with the East Coast Mainline: Queen Street station opens onto the northern edge of George Square, with Strathclyde campus a short walk east. Meanwhile, Glasgow Central station is the terminus for West Coast Mainline services from London Euston: exit by the main gate onto Gordon Street; turn right then left onto Renfield Street; walk up (north) as far as West George Street, then turn right (east) and keep going for George Square and Strathclyde.