

Imperial College London Activity Report



Nobuko Yoshida
Imperial College London

<http://mrg.doc.ic.ac.uk>

Current Members

- **Post-doc** Raymond Hu, Julien Lange, Nicholas Ng, Xinyu Niu, Alceste Scalas and Bernardo Toninho
- **Pre-doc** Romyana Neykova (passed viva)
- **Phd students** Weizhen Yang (viva in January), Juliana Franco, Assel Altayeva and Eva Graversen

Interactions with Industries

Strange Loop

SEPTEMBER 15-17 2016 / PEABODY OPERA HOUSE / ST. LOUIS, MO



Nobuko Yoshida
Imperial College, London

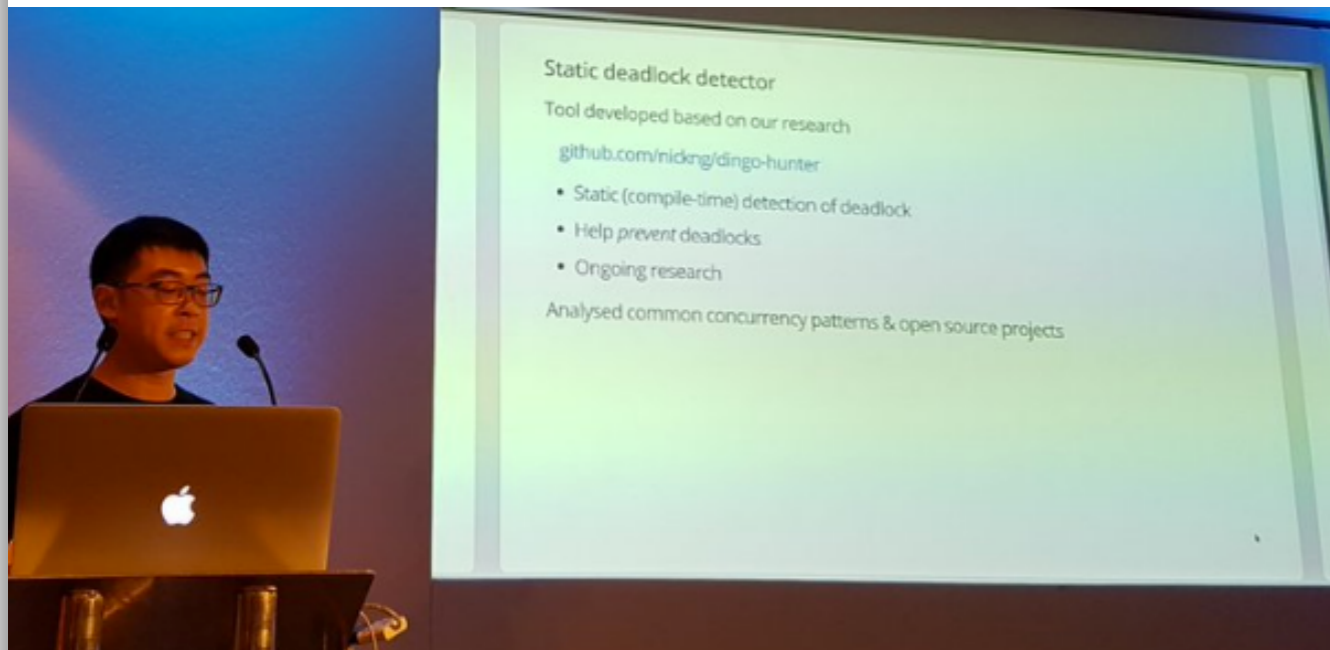


Adam Bowen @adamnbowen · Sep 15

I didn't even know that session types existed an hour ago, but thanks to Nobuko Yoshida's great talk at [#pwlconf](#), I want to learn more.

DoC researcher to speak at Golang UK conference

by Vicky Kapogianni
20 July 2016



DoC researcher to speak at industry-focused Golang UK conference on results of concurrency research

[Click here to add content](#)



.@nicholascwng rocking on @GolangUKconf about static deadlock detection in [#golang](#) [#gouk16](#)



Interactions with Industries

F#unctional Londoners Meetup Group

6 days ago · 6:30 PM

Session Types with Fahd Abdeljallal



43 Members

Synopsis: Session types are a formalism to codify the structure of a communication, using types to specify the communication protocol used. This formalism provides the... [LEARN MORE](#)

Distributed Systems vs. Compositionality

Dr. Roland Kuhn
@rolandkuhn — CTO of Actyx

actyx

Current State

- behaviors can be composed both sequentially and concurrently
- effects are not yet tracked
- Scribble generator for Scala not yet there
- theoretical work at Imperial College, London (Prof. Nobuko Yoshida & Alceste Scalas)

Tutorials and Invited Lectures

- *Raymond Hu* has been nominated for the 2016 Student Academic Choice Awards for Concurrent Models and Programming Course at Imperial.
- JLFA, Invited lectures to PhD students/Post-doc researchers, Saint-Malo, France ([January 2016](#))
- BETTY Summer School, Invited lectures, by *Raymond Hu*, Cyprus ([July 2016](#))
- Keio University, Lectures to Undergraduates and Masters, Japan ([August 2016](#))
- FM'17, Tutorial, by *Raymond Hu*, Cyprus ([November 2016](#))

Conference Publications

- [CC'17] *Rumyana Neykova* and NY, Let It Recover: Multiparty Protocol-Induced Recovery
- [FoSSaCs'17] *Julien Lange* and NY, On the Undecidability of Asynchronous Session Subtyping.
- [FASE'17] *Raymond Hu* and NY, Explicit Connection Actions in Multiparty Session Types
- [POPL'17] *Julien Lange, Nicolas Ng, Bernardo Toninho*, and NY, Fencing off Go: Liveness and Safety for Channel-based Programming.
- [FPL'16] Xinyu Niu, *Nicholas Ng*, Tomofumi Yuki, Shaojun Wang, NY and Wayne Luk, EURECA Compilation: Automatic Optimisation of Cycle-Reconfigurable Circuits.

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- [ECOOP'16] *Alceste Scalas* and NY, Lightweight Session Programming in Scala.
- [CC'16] *Nicolas Ng* and NY, Static Deadlock Detection for Concurrent Go by Global Session Graph Synthesis.
- [RC'16] Francesco Tiezzi and NY, Reversing Single Session.
- [TPFM'16] Mariangiola Dezani-Ciancaglini, Silvia Ghilezan, Svetlana Jaksic, Jovanka Pantovic and NY, Denotational and Operational Preciseness of Subtyping: A Roadmap.
- [WadlerFest'16] *Bernardo Toninho* and NY, Certifying Data in Multiparty Session Types.

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- [TACAS'16] *Julien Lange* and NY, Characteristic Formulae for Session Types
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Publications (Journals)

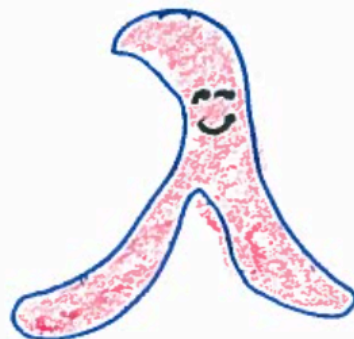
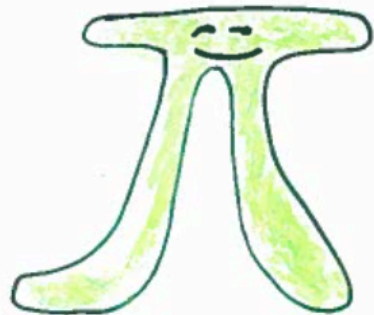
- [JACM] Kohei Honda, NY and Marco Carbone. Multiparty asynchronous session types.
- [JLAMP] *Bernardo Toninho* and NY, Certifying Data in Multiparty Session Types.
- [Acta Inf] *Dimitrios Kouzapas*, Jorge A. Perez and NY, Characteristic Bisimulation for Higher-Order Session Processes.
- [LMCS] *Rumyana Neykova* and NY, Multiparty Session Actors.
- [LMCS] Tzu-Chun Chen, Mariangiola Dezani-Ciancaglini, *Alceste Scalas* and NY, On the Preciseness of Subtyping in Session Types.
- [FPTL] Many authors with *Raymond Hu*, *Rumyana Neykova*, *Nichoas Ng* and NY, Behavioral Types in Programming Languages.

- [\[Acta Inf\]](#) Marco Carbone, Fabrizio Montesi, Carsten Schurmann and NY, Multiparty session types as coherence proofs.
- [\[LMCS\]](#) Soren Debois, Thomas Hildebrandt, Tijs Slaats and NY. Type Checking Liveness for Collaborative Processes with Bounded and Unbounded Recursion.

PHIL &

SESSION

TYPES



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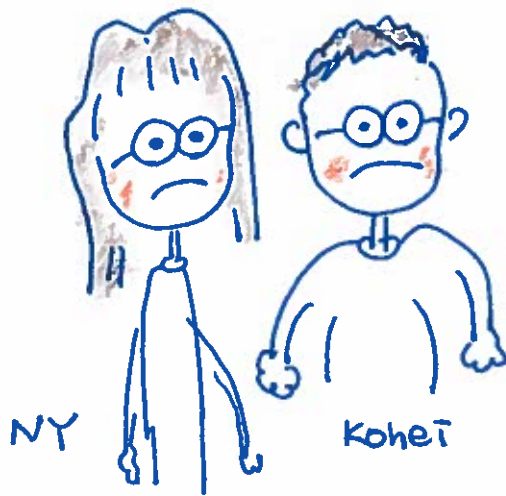
ABCD

program grant 2013-2018

EPSRC



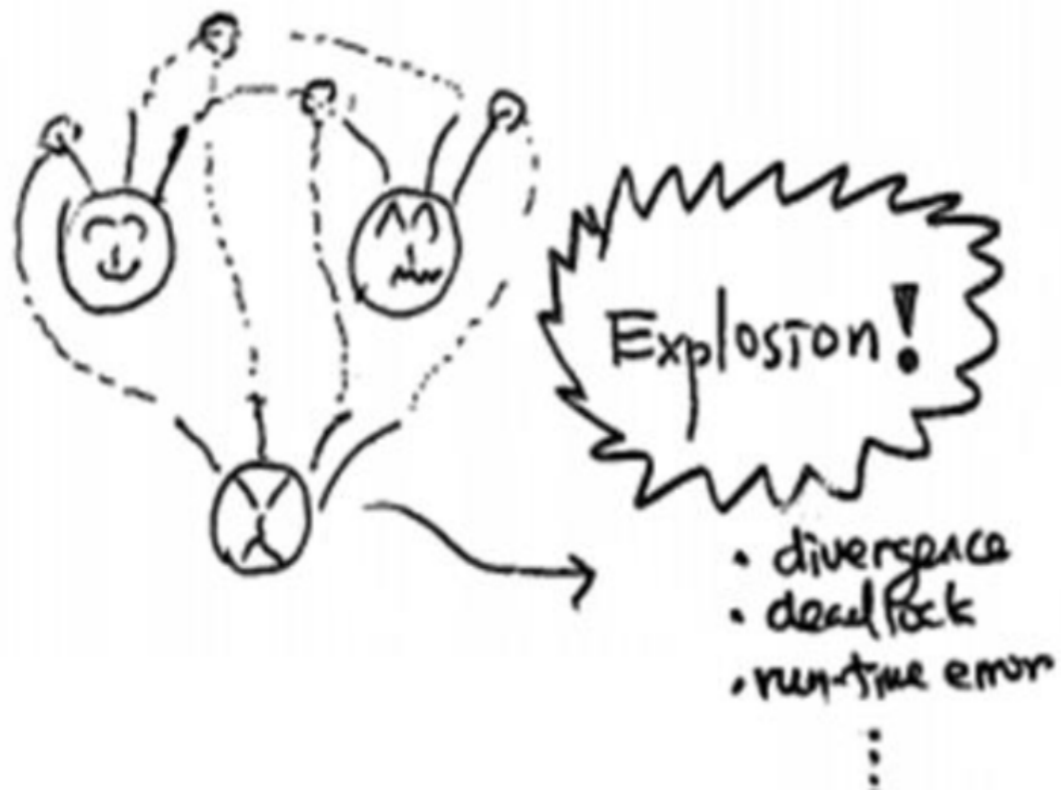
Propositions
as Sessions @ ICFP'12



HOD

Imperial College

Session Types and Open Problems



Nobuko Yoshida
Betty Meeting 6th October 2016

The π -calculus as a Descriptive Tool

$$\lambda \quad M ::= x \mid \lambda x.M \mid MN.$$

$$\pi \quad P ::= \sum \pi_i.P_i \mid P|Q \mid \nu x.P \mid !P \mid \emptyset.$$

$$\text{with } \pi ::= x(y) \mid \bar{x}(y).$$

λ in π

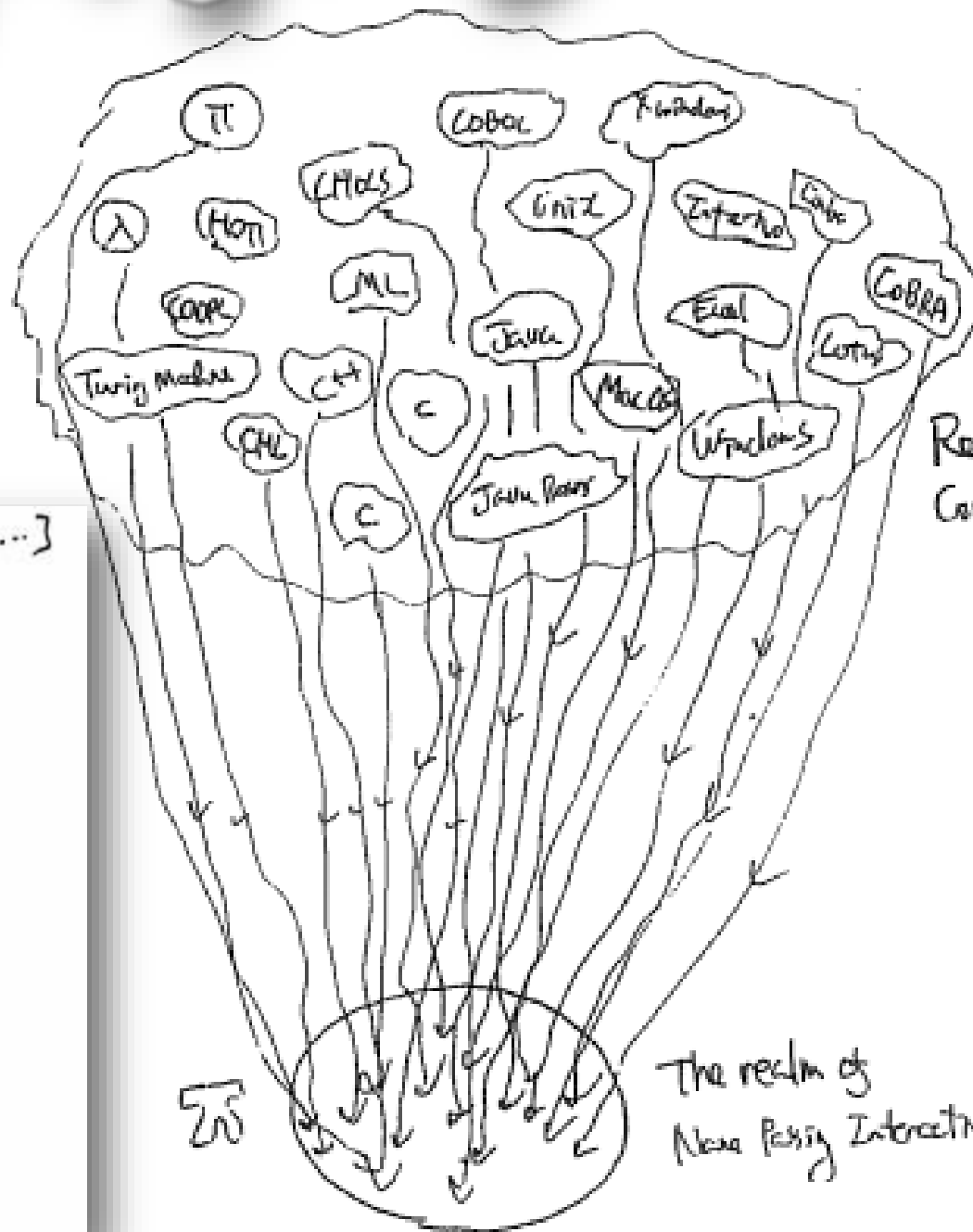
$$[x]_u \stackrel{\text{def}}{=} \bar{x}(u).$$

$$[\lambda x.M]_u \stackrel{\text{def}}{=} u(x).[M]_u.$$

$$[MN]_u \stackrel{\text{def}}{=} (\nu f_x)([M]_f \mid \bar{f}(x) \mid [x=N]_u)$$

$$\text{with } [x=N]_u \stackrel{\text{def}}{=} !x(u).[N]_u.$$

* Examples of Representable Computation.

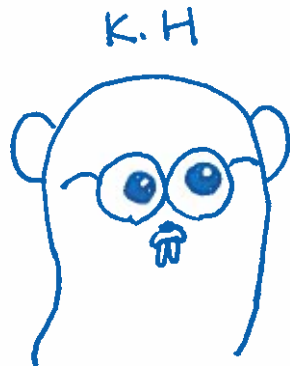
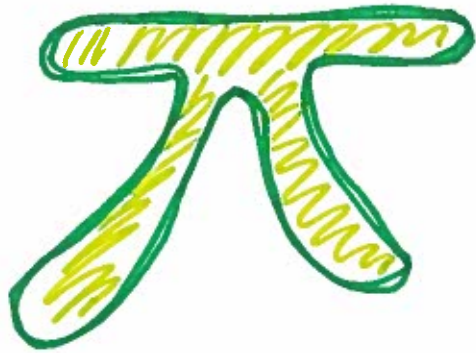


- λ -calculus [MPW89, Milner90, Milner92, ...]
- Concurrent Object [Walker91]
- ω -order term passing [Sangiorgi 92]
- Various data structures [Milner 92, ...]
- Proof Nets [Bellin and Scott 93]
- Abstract "constant" interaction [HRS4]
- Strategies on Games [HO95]

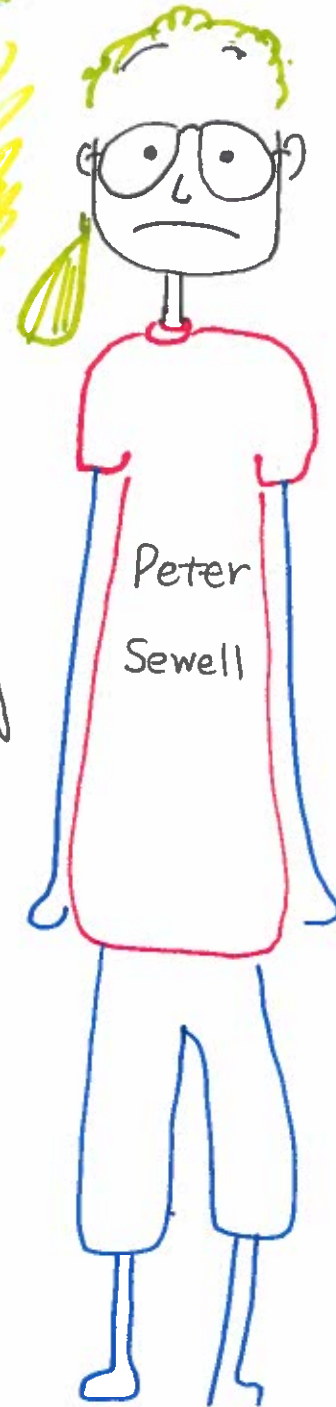
Realms of Computational Behaviors

The realm of New Policy Interactions

Cambridge



Adriana
Compagnoni



Invited Talks and Seminars

- Excluding Meetings and Conference presentations.
- Rumyana Neykova, Seminars at Uppsala and Camerino (February and April 2016)
- Alceste Scalas, Seminar at Novi Sad (March 2016)
- Raymond Hu, Seminar at Manchester Uni (June 2016)
- Julien Lange, Seminars at Southern Denmark and Paris 7 (August and November 2016)
- Bernardo Thoninho and Nicholas Ng, Cambridge (November 2016)
- NY, Dagstuhl, Pennsylvania, NII, Nagoya, Lisbon (Keynote talk), Berkeley and Paris 6

Industry Partners

- Red Hat: Gary Brown, Mark Little
- Thoughtwork: Steve-Ross Talbot
- The November Group LLC: Matthew Arrott
- Cognizant (Zero Deviation Life Cycle Platform)
Bippin Makoond, Shyam.Chivukula, Anoop Chaturve,
Venkatesh Shivalingaiah.
- Weaveworks
Matthias Radestock and Alexis Richardson

Plans

- Industry-oriented workshop (next year)
- Collaborations with Industry Partners
- Investigations of use cases (P1,P2,P4,P6)
- Stable Scribble with assertions (Java/F#) (P1,P2,P4,P5,P6)
- Actor Extension (Erlang/Scala) (P1,P2,P4,P6)
- Applications of synthesis, automata and model checking (Go) (P4,P7)
- Behavioural theories and logical analysis of multiparty sessions (P7)