

CoLab¹ Research: On Foundation, Mechanisation and Implementation of Session Types

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Session types are a type formalism used to model and verify communication protocols among agents in concurrent and distributed systems. Since their conception in early '90s, session types have developed into an impressive area of research, spanning across theory, implementations and more recently mechanisation in proof assistants such as Coq, Agda etc.

In this short talk, I will focus on the research done within the Concurrency Lab (CoLab) at the University of Glasgow, which I lead.

On foundations of session types, we are interested in connections with linear types via encodings [2] and linear logic [1,3], and understanding more complex properties such as deadlock freedom [1,3].

On mechanisation of session types, we have been working on mechanising a linear pi-calculus and its type inference system [6,7] and we aim to use this framework as a foundation for session types in the future. This work is ongoing and thanks to an STSM supported by EPN, we have expanded our collaborations and now working with University of Torino.

On implementation of session types, we have developed software tools based on *typestates*—state machines in tight correspondence with session types. A correspondence which is made precise by the StMungo tool [5]. Tools developed within CoLab include Papaya [4], an implementation of typestates in Scala with alias control; Timed St/Mungo², a timed version of [St]Mungo tools [5]; and Coconut, a typestate-based library for C++ language³.

References:

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¹ <https://colab-glasgow.github.io/>

² <https://github.com/CoLab-Glasgow/timed-mungo>

³ https://github.com/ArwaAlsubhiM/Coconut_tool