

Perspectives in Mathematical Sciences IV/II (Fall 2023)

Teacher: Jacques Garrigue

Course Subject

Part 3 of the course is “Typed Lambda-Calculi and the Curry-Howard isomorphism”.

Purpose

Starting from mathematical logic, the lambda-calculus has become one of the main foundations of programming language theory. Through the introduction of types, it has demonstrated a close connection between proofs and programs, known as the Curry-Howard isomorphism. It has been applied both to functional programming languages and type theory based proof assistants. We will give a quick tour through some of the type systems developed for lambda-calculus, and show their implications both for programming and logic.

Evaluation

Evaluation will be based on a report.

If you wish, you can send it by mail to garrigue@math.nagoya-u.ac.jp.

References

We will not use no textbook, but the following books may be of interest to those wishing to know more.

- Henk Barendregt, “The lambda-calculus : its syntax and semantics”, North-Holland, 1981.
- Jean-Yves Girard, Yves Lafont and Paul Taylor, “Proofs and types”, Cambridge University Press, 1990. <http://www.paultaylor.eu/stable/Proofs+Types.html>
- 大堀 淳, “プログラミング言語の基礎理論”. 共立出版, 1997.

Course Plan

The course shall progress as indicated below

1st lecture (12/12) Lambda calculus : syntax

2nd lecture (12/19) Simply-typed lambda-calculus

3rd lecture (12/26) Intuitionistic logic and the Curry-Howard isomorphism

4th lecture (1/16) Second-order lambda calculus (System F)

5th lecture (1/23) Dependent type systems and applications

Office Hour

Every Wednesday 12:00~13:00 Math. Bld., Room 455.

Course URL

Course material and other information can be found on TACT or at the course URL:

<http://www.math.nagoya-u.ac.jp/~garrigue/lecture/>