MPhil in Advanced Computer Science
Advanced Topics in Concurrency

Leader: Glynn Winskel
Timing: Lent or Easter terms
Prerequisites: Category theory, Denotational Semantics
Structure: 8 Lectures

AIMS

This module aims to provide an introduction to ‘hot’ research topics in the theory of concurrency. As such its precise contents should vary from year to year (perhaps concentrating solely on event structures one year, or quantum processes another). The syllabus below has as theme the view of processes as (generalized) relations.

SYLLABUS

1. A simple domain theory for concurrency (3 lectures). The Higher-Order Process LAnguages HOPLA and Affine-HOPLA. Transition semantics. Denotational semantics w.r.t. a domain theory based on relations between path orders. The domain theory as a categorical model of linear logic. Full abstraction. Soundness and adequacy for HOPLA. Accompanying logics. Mention of Nominal HOPLA.


OBJECTIVES

On completion of this module students should:

• Be familiar with a domain theory for concurrency and (fairly concrete) techniques for solving recursive domain equations and establishing the logical relations needed for adequacy.

• Understand a range of models for concurrency (Petri nets, event structures, Mazurkiewicz trace languages, transition systems) and how they are related by adjunctions.

• Have an understanding and intuition of presheaf models for concurrency.
ASSESSMENT

By take-away exam. A grade in the form a percentage will be assigned by GW.

RECOMMENDED READING

Available from http://www.cl.cam.ac.uk/users/gw104/:


Marcelo P. Fiore, Gian Luca Cattani, Glynn Winskel: Weak Bisimulation and Open Maps. LICS 1999: 67-76

Glynn Winskel: Relations in Concurrency. Invited (tutorial-style) paper LICS 2005: 2-11

Last updated: August 2008