

Understanding Process Semantics

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Motivation

Process Theory aims to study the *behaviour* of systems that compute and evolve interacting with other systems. Distributed computing, reactive systems —vending machines, mobile phones...— and communication protocols are classic examples of such systems, but so are chemical reactions or biological interactions.

A corner stone in the definition of the semantics of processes is the notion of equivalence: when are two behaviours *essentially* the same? Many different equivalence relations between processes have been proposed, and it is agreed by the community that the choice of a suitable semantics may depend on the concrete subject of study.

This flexibility can be view as an advantage of Process Theory, which is adaptable to different definitions of processes and notions of equivalence between them. However, this multiplicity has led to a mostly independent study of every semantics. This might obscure not only the practical applications of the theory but also the real insight that Process Theory could bring about processes behaviours.

Abstract

We have proposed a generic study of process semantics where order and equivalence relations between processes become the central topic. The target is to look for patterns, families and properties of these relations that allow us to establish a meta-theory that provides generic results for arbitrary semantics.

In the talk we will summarize our research in this direction during the last few years. We will present some of the main contributions, such us:

- uniform characterisation of semantics,
- relations between semantic equivalences and preorders,
- general algorithms to generate complete axiomatisations,
- unification of observational and axiomatic semantics.

All these results provide a new perspective of the semantics of processes and —we hope!— a better understanding of the relations amongst them improving also their applicability.

The talk will assume no (very deep) prior knowledge on the subject. It hopefully will be a good and general survey of the work on the topic, stressing not only the main results but also our research methodology.