

A Logical Framework for Systems Biology and Biomedicine

Joëlle Despeyroux
INRIA & CNRS (I3S)

Abstract

We advocate here the use of computational logic for systems biology, as a unified framework well suited for both modeling the dynamic behaviour of biological systems, expressing properties of them, and verifying these properties. The potential candidate logics should have a traditional proof theoretic pedigree (including a sequent calculus presentation enjoying cut-elimination and focusing), and should come with (certified) proof tools. Beyond providing a reliable framework, this allows the adequate encodings of our biological systems. We have up to now three candidate logics; all based on linear logic. The examples we have considered so far, in systems biology and in medicine, are simple ones - coming with completely formal (interactive) proofs in Coq. Future works includes using automatic provers, which will eventually extend existing automatic provers for linear logic. This should enable us to specify and study more realistic examples, and to provide a system for disease diagnosis and therapy prognosis.