Formal verification of tricky numerical computations

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Inria
LRI, CNRS UMR 8623, Université Paris-Sud
PCRI - Bâtiment 650
Université Paris-Sud
91405 ORSAY Cedex
FRANCE
sylvie.boldo@inria.fr

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Computer arithmetic has applied formal methods and formal proofs for years. As the systems may be critical and as the properties may be complex to prove (many sub-cases, error-prone computations), a formal guarantee of correctness is a wish that can now be fulfilled.

This talk will present a chain of tools to formally verify numerical programs. The idea is to precisely specify what the program requires and ensures. Then, using deductive verification, the tools produce proof obligation that may be proved either automatically or interactively in order to guarantee the correctness of the specifications. Many examples of programs from the literature will be specified and formally verified.