
Numerical validation of half precision simulations

Fabienne Jézéquel^{1,2}, Sara Sadat Hoseininasab^{*1}, and Thibault Hilaire¹

¹Laboratoire d'Informatique de Paris 6, LIP6 – Sorbonne Université, CNRS, LIP6, 75005 Paris, France.
– France

²Université Panthéon-Assas – université Paris 2, Panthéon-Assas – France

Résumé

In this talk, we show how to control the numerical quality of half precision computations using stochastic arithmetic. The CADNA library that is used to estimate rounding errors and detect numerical instabilities in floating-point codes has been improved and extended to support half precision. A performance gain up to a factor 20 has been observed wrt accuracy estimate in arbitrary precision. Furthermore, we present how to generate codes mixing half, single, and double precision with a requested accuracy on results providing a user-defined numerical quality of the code. Control of robustness and floating-point auto-tuning taking into account half precision have been successfully performed on various numerical simulations, in particular a control application.

^{*}Intervenant