COMPUTATIONAL TECHNOLOGIES FOR RELIABLE COMPUTER SIMULATIONS

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The present talk is devoted to one of the most challenging problems in mathematical modelling and numerical analysis, which also has great importance for most of applications in industry: *reliable verification of accuracy of approximate solutions obtained via computer simulations.* This task is strongly related to the so-called *a posteriori error estimates*, giving computable bounds for modelling errors of various types and detecting zones, where such errors are excessively high and some mesh-refinement algorithm should be used.

On the base of a model boundary value problem of elliptic type we shall present effective technologies and discuss relevant implementation issues on how:

- to obtain two-sided (upper and lower) a posteriori error estimates for verifying the overall accuracy of computed solutions
- to derive two-sided (upper and lower) a posteriori error estimates aimed at control of local errors
- to develop parallel numerical procedures for computing the above types of a posteriori estimates

The estimates to be presented are capable of giving bounds independently of the technique used to obtain approximate solutions. Numerical tests will be presented.